Scientists in Schools

Evaluation of the *Scientists in Schools* Pilot Project

Photo: Carey Baptist College

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Executive Summary

Scientists in Schools (SiS) is an initiative of the Australian Government Department of Education, Employment, and Workplace Relations (formerly the Department of Education, Science and Training), whose Quality Outcomes Programme provided funding to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) for a pilot project during Semester 2, 2007.

Aims of the SiS Pilot Project

Through the establishment of sustained and ongoing partnerships between scientists and school communities, and the holding of a symposium on cutting edge science, the project aimed to

1. bring the practice of real world science to students and teachers,
2. inspire and motivate teachers and students in the teaching and learning of science,
3. provide teachers with the opportunity to strengthen their knowledge of current scientific practices,
4. enable scientists to act as mentors or role models for students,
5. broaden awareness of the types and variety of careers available in the sciences,
6. enable teachers and scientists to share ideas and practices with other teachers and scientists, and
7. increase scientists' engagement with the broader community, thus raising public awareness of their work and its social and economic importance.

Findings from the Project Evaluation

Targets Achieved

The target of 500 scientist-teacher partnerships to be established in 500 schools by December 2007 was achieved. The predominant school level involved was upper primary and the most common curriculum area was Living Things, but there were partnerships in every discipline considered and at every school level. Approximately 56% of SiS partnerships were set up in primary schools and 44% secondary schools, demonstrating a disproportionately high involvement with secondary schools compared with primary schools given that the ratio of primary to secondary schools in Australia is about 4.5:1.

Although 500 schools had partnerships in place by the end of 2007, only about one third had actually begun their activities. Many had made plans to begin in 2008. In those partnerships that had started, the most common type of contribution made by the scientist involved visits to the school to make presentations to the students. However, there was a large variety of interactions that occurred, and were planned to occur, between scientists, teachers and students.

Nature of Partnerships

No one typical kind of partnership was found. The nature of the partnership depended on the context which was determined not only by the level of the student and the discipline area, but the geographic factors, community issues, the structure of the school and the flexibility allowed by its timetables, facilities and willingness of staff, and the employment context of the scientist. The ability of the SiS pilot project to allow this kind of flexibility and variation in interaction was considered a major strength. It also demonstrated

the ability to form partnerships at a distance, with some partnerships operating essentially by email and enabling rural and remote schools involvement in the project.

Benefits to Participants

The findings indicate that all participants in working partnerships benefited from the project. Teachers benefited by increased knowledge and understanding of real-world, contemporary science; increased opportunities for professional learning through communication with scientists and other teachers; increased access to resources; increased awareness of the types and variety of careers available in the sciences; and increased motivation. Scientists benefited through communication with teachers and other scientists about their work; improved methods of communication with students; increased motivation and enthusiasm in their job; legitimisation of the partnership in their workplace; and better understanding of the community's awareness and perceptions of science, scientists and their work. Students benefited by increased knowledge and understanding of real-world, contemporary science; opportunities to experience real science with real scientists; and an increased awareness of the types and variety of careers available in the sciences.

Success of Symposium

A symposium was held as part of the SiS project to bring together 50 partnerships to discuss cutting edge science and encourage networking. The symposium was considered to be an outstanding success by both scientists and teachers. Feedback from the participants indicated increased self knowledge, provision of resources/ideas for teaching, provision of excellent networking opportunities, inspiration and enthusiasm for the participants, increased awareness of what was happening in other partnerships, information on how to engage students, demonstration of the types of research that CSIRO is involved in, and illustration of the importance and necessity of community scientific literacy. The symposium also provided an ideal opportunity for partners to become familiar with each other.

Effectiveness of Matching and Monitoring Partnerships

Central to the success of the SiS pilot project was the building of an effective database to manage and monitor participation in the project. Operationally the database worked well, helping the project to run on time, and interviews with the Project Team indicated satisfaction with its performance.

The registration and matching process was effective in terms of its procedures and was generally endorsed by respondents to the online survey. The monitoring process was limited due to the short time frame of the pilot program and the limited number of staff involved in the project, but also received support from respondents.

Major challenges experienced in the project related to getting the partnerships up and running in the short time frame provided, finding sufficient registrants in the appropriate locations and discipline areas that would allow all registrants to be matched, finding time to follow up partnerships after their creation, and encouraging involvement from some major science organisations as the major source of scientists.

Recommendations

Based on the results of the independent evaluation, the following recommendations are made:

1. **The SiS project be continued with support from the Project Team.**
   Many partnership activities will not begin until 2008 and without the support of the Project Team, a proportion of these partnerships are unlikely to realise their potential.
2. **The SiS website be maintained and extended.**
   Additional information and resources for both teachers and scientists are required, including detailed case studies of successful partnerships, testimonials, electronic communication between scientists and teachers, resources, concise guidelines for scientists on a variety of topics to increase understanding and communication with school aged students.
3. **Additional support be provided to the partnerships.**
   To maintain and strengthen partnerships, additional support is required, for example, in the form of increased promotion of the program, opportunities for face-to-face networking, regular monitoring of the partnerships, and examples of the workings of successful partnerships.
4. **Further evaluation in 2008, to allow time for the real outcomes of the project to become evident.**
   As the majority of partnerships have yet to begin, further evaluation should occur towards the end of 2008 to assess the success of the project on a wider basis, the longevity of the partnerships, and the factors that influence longevity.

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Evaluation of the Scientists in Schools Pilot Project

Background to the Pilot Project

Scientists in Schools (SiS) is an initiative of the Australian Government Department of Education, Employment, and Workplace Relations (formerly the Department of Education, Science and Training), whose Quality Outcomes Programme provided funding to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) for a pilot project during Semester 2, 2007. The project was supported by Australia's Chief Scientist, Dr Jim Peacock, who remained involved as champion for the project and chair of the project's steering committee.

Through the establishment of sustained and ongoing partnerships between scientists and school communities, the project aims to

1. bring the practice of real world science to students and teachers,
2. inspire and motivate teachers and students in the teaching and learning of science,
3. provide teachers with the opportunity to strengthen their knowledge of current scientific practices,
4. enable scientists to act as mentors or role models for students,
5. broaden awareness of the types and variety of careers available in the sciences,
6. enable teachers and scientists to share ideas and practices with other teachers and scientists, and
7. increase scientists' engagement with the broader community, thus raising public awareness of their work and its social and economic importance.

By the end of Semester 2, it was intended to have established a total of 500 partnerships, and it was agreed that partnerships already underway (such as those associated with the Student Research Scheme and CREST) could be included in this total.

CSIRO Education undertook the SiS Pilot Project by establishing a website which formed the central component of the Project. Teachers and scientists were invited to register their interest in the program online, and the Project Officers were able to use the registration information provided to link teachers in primary and secondary schools with suitable scientists. In addition, CSIRO Education prepared support materials for both participating teachers and scientists. During the project, CSIRO Education was available to provide advice and assistance to partnerships where required.

In addition, a major part of the SiS Pilot Project was the bringing together of 50 partnerships (50 teachers and 50 scientists) for a symposium on a topic of major scientific importance, Energy and Climate Change, held at the CSIRO Energy Centre in Newcastle. The symposium, held on October 25 – 26, 2007, provided opportunity to bring partnership members together, some of whom had not met face-to-face, to assist communication and planning, as well as to experience some cutting edge science. A copy of the symposium program is included as Appendix 1.

Purpose of the Evaluation

The evaluation was designed to assess the outcomes of the project in terms of

1. the procedures used to set up partnerships and monitor participation;
2. the contribution to the project of the planned symposium;
3. benefits to students, including
    a. increased knowledge and understanding of real world, contemporary science,
    b. opportunities to experience scientists as role models/mentors, and
    c. increased awareness of the types and variety of careers available in the sciences;
4. benefits to teachers, including
    a. updated and strengthened knowledge of current science and scientific practices,
    b. opportunities for professional learning through communication with scientists and other teachers, and
    c. increased awareness of the types and variety of careers available in the sciences;
5. benefits to scientists, including
    a. opportunities to communicate with teachers, students and other scientists about their work,
    b. increased understanding of the community's awareness and perceptions of science, scientists and their work, and
    c. improved methods of communication with students and teachers.

In addition, the evaluation aimed to provide recommendations relating to the actions and resources required to continue and expand the SiS pilot project in the future.

Approach Taken in the Evaluation

The main activities of the evaluation were to

1. maintain close contact with the project team and review with them the processes of setting up and using the database, matching and monitoring partnerships.
2. attend the symposium for informal data collection from participants. Researchers also prepared and analysed evaluation/feedback sheets for the symposium, and had access to the notes from workshop sessions held.
3. conduct case studies of a representative sample of partnerships using interviews with teachers and scientists. Most of these were carried out in association with the Symposium, where both partners were available.
4. invite case study teachers to obtain written comments from a class of students using a short, open-ended survey.
5. prepare an online survey for teachers and a parallel survey for scientists, open to all partnerships, to be hosted on the CSIRO SiS website. The invitation to participate in the survey was advertised via email and other routine communication between the project team and partnerships.
6. analyse data from all sources and prepare a report of the findings.

The researchers applied for, and received, approval from the Curtin University of Technology Human Ethics Research Committee for the approach taken in the evaluation. Permission was obtained from the carers of all children who provided data to the researchers.

Preparation of the Instruments and Data Collection

Several survey instruments were developed by the researchers for use in the evaluation. These included the Symposium Evaluation Form, Interview Schedule for Case Studies of Partnerships, Student Survey Form, and Online Surveys for Scientists and Teachers. All instruments were designed to reflect the SiS pilot project aims and to detect any unexpected outcomes. With the exception of the Interview Schedule for Case Studies of Partnerships, all instruments were screened by the Project Team, and the researchers responded to any comments to improve the instruments. The purpose of each instrument is described below, and copies of each are provided in Appendices 2 to 7.

Symposium Evaluation

The SiS symposium was designed to complement the partnership component of SiS by bringing together teachers and their partner scientists. The symposium was designed to achieve three aims:

1. To inform and inspire teachers about contemporary scientific research.
2. To inform and inspire scientists about contemporary school science education.
3. To better integrate contemporary scientific research into classrooms.

As the intention was to focus on a major science issue relevant to Australia, the theme for the inaugural SiS symposium was "Energy and Climate Change". The CSIRO Energy Centre in Newcastle was specially selected as the venue for the symposium as the facility featured a unique combination of energy-efficient design and small-scale generation units capable of delivering most of its power needs. The CSIRO Energy Centre is the headquarters for both CSIRO Energy Technology and the Energy Transformed Flagship, and is located at the same site as the National Solar Energy Centre.

Attendance at the Symposium

Fifty two partnerships were selected from the current registered total of 316 to attend the symposium. Selection took into account the following factors:

- there was an existing partnership and both partners had to attend as there was an emphasis on sharing with other partnerships,
- all states and territories were proportionally represented,
- all education sectors were represented,
- a range of different science organisations were represented,
- both remote and metropolitan teachers were represented
- there was a balance of primary and secondary schools, and
- there was a gender balance.

A summary of the number of partnerships from each state is presented in Table 1.

Twenty one other people were invited to the symposium. They included persons from CSIRO Education, Department of Education, Science and Training, State Department of Education representatives, representatives from the Catholic Education Commission and the National Council for Independent Schools Association of Australia, and a member of Curtin University of Technology as the evaluator.

Table 1. Origin of Partnerships Attending the Symposium

State/Territory	Number of partnerships attending	Number of registered partnerships
ACT	2	17
NSW	13	74
NT	1	6
QLD	18	101
SA	3	20
TAS	5	18
VIC	7	54
WA	3	26

Structure of the Symposium

A program for the Symposium can be found in Appendix 1. The speakers for the symposium were selected based upon an organisers' brainstorm, personal recommendations, and selecting local Newcastle people if possible. Other factors included relevance to the theme, youth/mature balance, and gender balance. Sessions relevant to education initiatives were also included, where teachers could showcase what they had achieved to date.

Two break out discussion sessions were programmed into the symposium – one towards the end of each day. These breakout groups consisted of 10 people (5 teacher-scientist pairs) with a facilitator/recorder. Notes from the discussion sessions were provided to the researchers to assist in the evaluation and these were used to cross-check that all themes/issues arising during the project had been uncovered in data collection and analysis. After the symposium, all participants were issued with a Certificate of attendance and a CD-ROM containing all of the scientists' presentations.

Symposium Evaluation Form

The symposium evaluation form requested identification of the participant as a registered SiS teacher, a registered SiS scientist, or other person, and three questions. The first question asked participants if they enjoyed the symposium, the second question asked participants to list the main points that they would take away from the symposium, and the third question asked participants for their opinion of whether or not there should be a symposium in 2008, and to give a reason(s) to support their answer. A copy of the questionnaire can be found in Appendix 2. Forty-seven teachers, 49 scientists and 14 other participants completed the symposium evaluation form.

Interview Schedule for Case Studies of Partnerships

The purpose of the case studies was to obtain detailed information about how the partnerships had progressed, and the perceived benefits obtained from the partnership to all participants.

Thirteen partnerships (that is, both scientist and matched teacher) attending the symposium were interviewed for the case studies. The partnerships were chosen aiming for as wide a spread as possible over states, location of schools (metropolitan, regional or remote) and school level (primary or secondary) with guidance from the Project Team. Interviews were conducted before, during or after the symposium. Most interviews were face-to-face, with both partners present. However, the last four interviews were conducted by phone after the symposium, with the members of two partnerships being interviewed separately. The interview schedule consisted of seven questions that asked for the context of the partnership; a description of how the partnership was progressing; the perceived benefits to the students, teachers and scientists from the partnership; how the symposium could be improved; and perceived outcomes from the symposium. For those partnerships that had just started, these questions were forward looking. Each interview took approximately 30 minutes. All interviews were audio-taped, with permission, and then transcribed. Only one participant asked not to be audio-taped and written notes were taken during this interview. A copy of the interview schedule can be found in Appendix 3.

Saturation, in terms of information obtained from the interviews, was reached within 13 case studies, with common themes being readily identified and repeated. It was decided that additional case studies would not result in any further new information and attention was turned to dealing with other aspects of data collection.

A summary of the case study interviews by state, location, level and whether the partnerships had started activities or not is provided in Table 2.

Table 2. Summary of the Case Study Interviews

Interview #	State	Location	Level of school	Started
1	WA	Regional	Primary	Yes
2	WA	Metropolitan	Primary	Yes
3	Qld	Regional	Primary	Yes
4	Qld	Regional	Secondary	Yes
5	SA	Metropolitan	Primary	Yes
6	Qld	Regional	Secondary	Yes
7	SA	Metropolitan	Secondary	No
8	Tas	Regional	Secondary	Yes
9	ACT	Metropolitan	Primary	Yes
10	NT	Metropolitan	Primary	Yes
11	Qld	Regional	Secondary	No
12	SA	Metropolitan	Secondary	No
13	Qld	Remote	Primary	Yes

Interview Schedule for Project Team

Two members of the Project Team, the Project Manager and a Project Officer, were interviewed to determine the effectiveness of the procedures used to establish and monitor the partnerships and the effectiveness of the database. The interview questions sought information to describe and illustrate the procedure used for the registration of participants, and the matching and monitoring process for the partnerships. Information was also obtained about the establishment and use of the database.

Members of the Project Team were interviewed using a semi-structured format. Interviews occurred in the member's office at CSIRO Education (Canberra) immediately after the symposium. The Project Officer was interviewed first. Any additional questions resulting from this interview were then directed to the Project Manager. The interview with the Project Officer lasted approximately two hours, and the interview with the Project Manager lasted approximately one hour. Comprehensive notes were made during the interviews. The processes involved in establishing and monitoring the partnerships and the use of the database were illustrated through the SiS website, emails and the database. Where possible, hard copies of examples were obtained for reference.

Student Survey Form

Feedback was obtained from students about their participation in the program using two forms, one for primary students and one for secondary students. The one-page forms requested demographic data, including year level and sex of the student, and also the topic covered in the SiS partnership. Each form had four questions asking about what was learned from the scientist, what it was like working with the scientist, what students learned about careers in science, and whether or not the student became more interested in a science career. The wording and the amount of response expected from each question varied between the two forms. In addition, for teachers who had very young primary classes, there were suggested simplifications to the form. Copies of the forms are provided in Appendices 4 and 5.

Data were collected by providing interested teachers attending the symposium with a set of forms for their students and copies of information forms for parents with permission slips to enable the researchers to use the data provided by students. Forty five teachers took the sets of forms, although not all had begun their partnership activities.

Four teachers completed the forms with their class(es) and posted them to the researchers. Sets of students' responses were obtained from a Year 8 secondary class, a class of Year 5 and a class of Year 6 from one school, and a Primary Extension and Challenge (PEAC) group of Years 6 and 7 from a third school. The teacher in a small remote school provided responses across the range of primary Year levels by following suggestions to prepare a form to allow drawing for Prep to Year 1 students, a form with a Y-chart for Years 2 and 3 students and using the evaluation form provided for older primary students.

Online Surveys for Scientists and Teachers

The Online Surveys were designed as broad data collection instruments and all participants in SiS partnerships were invited to respond. Copies are included in Appendices 6 and 7. The survey contained five sections and parallel versions were prepared for scientists and teachers. Because anonymity of responses was assured, respondents did not provide identifying data and therefore it was not possible to match the responses of partnership pairs.

Section A requested demographic data to describe the school involved in the partnership, and scientists were asked how much travel was involved to reach the school or venue.

Section B was identical on both surveys. It collected data about the partnership, requesting reasons for participation, subject and year levels involved, means of communication between scientists and teachers, whether or not the partnership had begun, and the nature of the contribution of the scientist to the partnership. To ensure coverage of a wide range of ways scientists might contribute to the partnership, thirteen possible contributions were suggested, to which respondents could answer yes or no and provide an explanatory comment, and respondents were asked to add other contributions if appropriate. Those who had not begun their partnership were asked to skip to Section E, thus ensuring that data were collected about partnership activities that had actually occurred.

Section C also was identical on both surveys and sought respondents' perceptions about the benefits of the partnership to students. Thirteen possible benefits were listed, to which respondents answered yes or no and could provide a comment, and they were asked to describe any other benefit. Scientists were asked to indicate if they were unsure of any benefit to students.

Section D was unique to scientists or teachers and asked for information about the benefit of the partnerships to them, personally. Scientists were offered ten, and teachers were offered eight, possible benefits and both were asked to describe any others. In addition, respondents were asked to "give a specific example(s) of something that was working really well in the partnership", and also "to give a specific example(s) of something that is not working well" and how they thought it could be improved.

Sections E and F were common to both surveys. Section E sought information about the usefulness of the SiS website and resources, whether or not they were happy with the way they were partnered, and whether, overall, they regarded their partnership as successful. Comments were requested in each of these areas. Section F asked whether or not respondents thought their partnership would continue, how the SiS project could be improved, and invited them to make any other comments they wished.

Access to the Online Surveys was publicised by an invitational email sent by the Project Officer to all registered scientists and teachers. The surveys were open from November 19 to December 7, 2007. A reminder email was sent out on December 3 and the survey remained open for an additional week, finally closing on December 14. The surveys elicited usable responses from 194 scientists and 206 teachers.

Results from the Evaluation of the Scientists in Schools (SiS) Pilot Project

In this section the findings from each aspect of the data collection are reported and described. These outcomes are then used in the final section of the report to make recommendations about the SiS pilot project.

Procedures Used to Set Up and Monitor Partnerships and the Database

An overview of the process used for setting up the partnerships is shown in Table 3, which presents a flowchart of the registration and matching process for the partnerships together with possible issues that could arise and the action taken by the Project Team to overcome these issues.

Registration for the SiS project was achieved through the SiS website. Separate, but similar, information and registration forms were completed by the scientists and the teachers. Information for scientists on the website included: What's involved?, What's in it for me?, police checks and security, support materials, the registration process, and FAQs. The teachers had similar information except the second title was What's in it for me and my students?

Registration for the scientist required the following information: name, position, organisation, postal address, contact details (work phone, mobile, fax, email), current science area, highest qualification, year qualified, age group (20-35, 35-50, and 50+), and supervisor's name and contact details. Scientists were then asked to identify the year level (lower primary, middle primary, upper primary, junior secondary and senior secondary) and subject area of interest (Earth and Space, Living Things, Energy and Force, Matter, Mathematics, and Engineering and Technology) with which they wanted to help the teacher. More than one year level and/or one subject area was permitted. Scientists were also asked if they had completed a police check, the location they would like to be partnered, their willingness to travel to the school, their willingness to work in a non face-to-face partnership, and any school projects in which they were currently involved.

Registration for the teachers required the following information: name, position, school, postal address, contact details (work phone, mobile, fax, email), role, and principal's name and contact details. Teachers were then asked to identify the year level (lower primary, middle primary, upper primary, junior secondary and senior secondary) and subject area of interest (Earth and Space, Living Things, Energy and Force, Matter, Mathematics, and Engineering and Technology) with which they wanted a scientist to help. Again, more than one year level and/or one subject area was permitted. Teachers were also asked if they were willing to work in a non face-to-face partnership, and if they were currently involved in any scientist-partnership project.

Once registered, participants were sent a confirmation email. Scientists who did not have a suitable police clearance were provided with information to obtain such a clearance. Scientists were asked to complete an attached form, provide photo identification, and return these directly to the Project Team who would forward the information to the Australian Federal Police (AFP). Various states had additional clearance arrangements that also had to be met. For example, some Queensland scientists required a Blue Card, whilst some Western Australian scientists required a Working with Children Check. Teachers were advised that the Project Team was working on matching them with a scientist, but this process could take some time. Teachers were also

notified that most scientists would need to obtain police checks, which could also slow down the matching process.

Table 3. Flowchart of Procedures Used to Set Up Partnerships

Step	Potential Issues	Action
Teacher/scientist registers; data arrives in email inbox.	Website doesn't work (unavailable, firewall issues, etc)	Manual entry by team over the phone
Import data from email into database		
Send registration confirmation email including police check information for scientists	Scientist has current valid police check or equivalent	Obtain copy of check and advise scientist and partner (if matched) of status
	Scientist has no current valid police check or equivalent	Obtain completed forms and photo ID, submit to AFP, advise of status when check complete
	Scientist likely to be matched with ACT or NSW school	Obtain signed Prohibited Employment Declaration form for ACT or NSW as appropriate and advise scientist and partner (if matched) of status when received
	Scientist requests blue card (Queensland)	Send completed blue card form to Queensland Government for processing; advise scientist and partner (if matched) of status when complete
Check notes for specific partnership requests	Scientist may have chosen school/s from list of unmatched schools on website.	If school still available, immediate match; if not, contact scientist about other options.
	Scientist or teacher may specify partner.	If requested partner already registered, immediate match; if not, contact school/scientist to ask them to register.
Use database to find possible matches based on State, subjects, levels, notes and location	Location matches but levels or subject areas don't match	Contact scientist/teacher to discuss whether preferences are adjustable
	Specific request from teacher not matched by scientists in that location	Consider scientists from outside location; contact possible scientists to discuss remote partnership

Table 3 (cont'd). Flowchart of Procedures Used to Set Up Partnerships

Step	Potential Issues	Action
	No suitable match for teacher	Contact potential sources of scientists to find a suitable match, for example: - local government - local businesses/industries - universities - CSIRO sites - professional associations - state government departments - umbrella industry associations - existing partnered scientists
	No suitable match for scientist	Contact local schools and/or regional and State education offices (all sectors) to find a suitable match
Match found – send partnership email with support material to scientist, teacher and supervisors	Police check status	Advise of status in partnership email
	Scientist or teacher dissatisfied with match	Contact dissatisfied party to discuss issues if appropriate; if still dissatisfied advise partner, dissolve partnership, list both parties as unmatched if appropriate
	Scientist or teacher withdraws from program	Advise partner, mark partnership as 'withdrawn', mark partner as available
	Teacher moves schools; scientist continues with current school	Find a new contact teacher at current school and send contact details to scientist; check if original teacher wants a new scientist partner at new school; if so, update contact details and mark as available
	Teacher moves school; scientist moves with teacher	Update teacher contact details and forward to scientist
	Scientist or teacher unable to contact partner	Team member attempts to contact partner to discuss partnership and advise complainant of result
Follow up	Teacher or scientist provides comments or update about partnership	Copy comments to database notes
	Particularly strong, successful or interesting partnership	Mark for case study; note as possible partnerships for Symposium and/or promotion

Procedure for Partnerships

The partnership process was directly related to the information the teachers and scientists provided about their location, year level of interest and subject area of interest from the database. However, any specific information requesting a certain scientist, teacher, or school was initially addressed and matched if possible. Where a direct match could be made with location, year level and subject area, both the scientist and the teacher were sent an email informing them of their partner's details. Attached to this email were support materials that included: background information about working with schools/scientists, suggestions for ways to work together, and teaching and learning resources (including student worksheets) for use in the classroom. Partners were encouraged to make contact with each other via an introductory sheet that was part of the support materials. A thank you letter from Australia's Chief Scientist was emailed to participants three months after commencement of the program. Once a scientist and a teacher had been "assigned" to one another, that is, matched, they were considered a partnership. When the scientist's police clearance had been obtained, the Project Team notified both the scientist and the teacher by email.

Where there was no direct match of location, year level and subject area the Project Team looked at alternative ways of obtaining a match. These included contacting registered scientists or teachers about adjusting their year level or subject area, considering registered scientists from outside the location to set up a remote partnership, contacting potential sources of scientists (for example, universities, CSIRO and government departments) to find a suitable match for a registered teacher, and contacting schools or education offices to find a potential teacher for a registered scientist.

Two Project Officers handled the partnership process. One officer worked with Queensland, Northern Territory and Western Australian participants, while the other officer worked with the remaining states.

Monitoring Partnerships

The monitoring process involved dealing with particular issues of the partnership as they arose, and providing follow-up to the partnerships.

Particular issues arising in the partnerships included the scientist or teacher dissatisfied with the match, the scientist or teacher withdrawing from the program, the teacher moving school but the scientist continuing with the school, the teacher moving school and the scientist moving with the teacher, and the scientist or teacher unable to contact their partner. Each of these issues was handled in a personal manner by the Project Officers through contact with either the teacher or the scientist or both.

A one page feedback form was sent out on October 16, 2007 to all partnerships attending the symposium. This form asked for participant's details, partnership status, partnership style and partnership requirements. Apart from this form, the only other form of monitoring was individual emails and phone calls to and from participants which generally tended to report positive experiences.

The SiS Database

A Microsoft Access database was custom built by a database developer in conjunction with the Project Team. The database drew upon an existing database used by CSIRO Education and was built by the same developer. Several layers of security were included to ensure that only authorised staff members have access to the database, thus protecting the privacy of the stored data.

The purpose of the database was to collect data about participants and partnerships, facilitate matching of scientists and teachers according to their requests and requirements and produce reports about participants and partnerships. To this end, the database can import data from Microsoft Outlook and can export data and reports to Microsoft Excel and Microsoft Word.

In order to reduce duplication of data input and to ensure "clean" data, a commercial database of all schools in Australia is embedded in the SiS database.

The data from the online registration form are automatically sent by email to the SiS email address, from where they can be imported into a temporary area in the database, cleaned, then imported into the database proper, at which time the record is allocated a unique key.

The database shows possible matches for each individual, based on subject and level preferences and the State or Territory of the individual. Other requests, such as location preferences, preferred schools/scientists and other requirements, must be addressed manually by the Project Officers. Partnerships can be created within the database by "assigning" two individuals to one another.

Extensive notes fields in the database allow the Project Officers to record information about the individuals and the partnerships throughout the project, and partnerships can also be flagged as requiring follow-up or as potential subjects for case studies. Police check information is also stored in the database for all scientists.

A number of reports and queries have been developed to allow data to be collated in useful ways, such as the number and location of partnerships, information about the schools and organisations involved in Scientists in Schools, unmatched teachers or scientists and sub-groups of partnerships such as those who attended the symposium.

The database can also generate individual and group emails, which are created in Microsoft Outlook from a user-generated list of email templates and which are the main focus of communication between the Project Team and participants.

Findings from the Symposium

The findings from the symposium evaluation form are presented in relation to the three questions asked. Forty-seven teachers, 49 scientists and 14 other participants completed the symposium evaluation form.

Question 1. Did you enjoy the symposium?

All teachers, scientists and others reported that they enjoyed the symposium.

Question 2. What are the main points that you will take away from the symposium?

The main points that the participants believed they would take away from the symposium are summarised in Table 4. As most attendees provided responses which contained comments about several points, there were 177 different comments from the teachers and 184 different comments from the scientists, an average of 3.8 responses per teacher and per scientist. The 14 other participants provided 37 different comments, an average of 2.6 responses per other participant.

To facilitate reporting, the comments were clustered into categories, and Table 4 reports those categories where there were more than 10 responses from either the teachers, scientists or other participants. The discussion of each of these categories is supported with quotes from the scientists, teachers and others.

Knowledge for self

The most common response from teachers [T], scientists [S] and other participants [P], in what they would take away from the symposium was an increase in their knowledge of climate change and energy sources.

> A whole new bank of scientific knowledge for myself and an increase in awareness and consciousness. [T17]
>
> Up to date information of global warming and energy issues that can be used with science classes. [T9]
>
> Greater knowledge of climate change and how we can help guide the future by teaching kids. [S34]
>
> Learnt about latest technologies and energy solutions – amazing advances. [S7]
>
> Specific factual information on some of the science issues relating to climate change and energy. [P10]
>
> The lectures were excellent. It is great to have cutting edge science first hand. It models the sort of contact teachers can have with scientists. [P14]

Table 4. Summary of the Main Points Scientists, Teachers and Other Participants Would Take Away from the Symposium

Category of Comment	Scientists		Teachers		Other Participants	
	Number	%	Number	%	Number	%
Knowledge for self	33	67.3	38	80.9	8	57.1
Finding out about other partnerships	18	36.7	13	27.7	7	50.0
Networking	14	28.6	19	40.4	4	28.6
I am more inspired/enthused	14	28.6	14	29.8	-	-
Resources/ideas for teaching/school	12	24.5	23	48.9	4	28.6
Communities and scientific literacy	12	24.5	6	12.8	-	-
Partnerships- my partnership	12	24.5	7	14.9	-	-
Impressed with teachers' enthusiasm	10	20.4	-	-	6	42.9
CSIRO Research – Australia's future	8	16.3	11	23.4	2	14.3
How to engage students/make science more accessible	7	14.3	11	23.4	1	7.1
Total points	184		177		35	

Note. Analysis based on 184 responses from 49 scientists, 177 responses from 47 teachers, and 35 responses from 14 other participants. Only categories with at least 10 comments from one group are reported.

Finding out about other partnerships

Teachers, scientists and other participants believed that finding out what other partnerships were doing was an important outcome of the symposium. This was the second most common responses for scientists and other participants, and fifth for teachers. The other participants also commented on the positive interactions between the partnerships.

> The importance of establishing a sound partnership between the scientist and the teacher has been a solid and repetitive point throughout the breakout sessions of the symposium. [T15]
>
> Information I have learned about how other SiS partnerships are working, and also how to avoid possible pitfalls. [T22]
>
> There is a vast variety of ways that teachers and scientists are working together. [T25]
>
> The best sessions were the breakout discussions where teachers and scientists had the opportunity to share their experiences. [T45]

The variety of partnerships formed – primary school versus secondary school, rural and remote associations - and the variety of activities entered into. [S2]

Excellent to talk to other science teachers and see how they are using their partnerships in the classroom. [S8]

Encouragement that other partnerships were dealing with similar issues. [S14]

Gained ideas from other teachers/scientists about what teacher-scientist interactions work. [S36]

I found it really interesting to find out what other partnerships were/weren't finding was working. For example, that practical work that encouraged ingenuity, investigation and a degree of competition was found to yield the best results from a learning perspective as well as in catching the interest of students. [S48]

Positive interactions between scientists and teachers in partnerships and between partnerships. [P9]

Getting pairs together is a good idea in ensuring that contact begins and remains in a sustainable way. People are more likely to keep in touch if they have met with their partner. [P14]

Networking

The importance of networking was the third most common response for teachers and scientists and fourth most common for other participants.

Sensational networks – have loads of email addresses from various scientists who are willing to allow my students to contact them. [T1]

The establishment of many contacts from all over Australia who will be able to assist with coursework that is contemporary and difficult to find. [T9]

Contact and conversations with other scientists and teachers. [S1]

Made contact and asked questions of Australian experts on these [energy and climate change] issues. [S21]

Networking excellent opportunity to work with teachers and scientists from around Australia. [P7]

I am more inspired/enthused

Both teachers and scientists found that the symposium gave them more enthusiasm for the SiS project.

Bursting to get back to school to put in place new ideas I've heard about from the other teachers during our breaks. [T1]

Enthusiasm to promote scientific knowledge in my school – implement a number of new ideas into the whole school and my classroom. [T17]

Rejuvenation and renewed sense of purpose. [T18]

Enthusiasm – a keenness to make a difference and teach my students how they can make a difference. [T38]

I found the symposium to be a refreshing and enthusiastic forum. [S13]

Active, captivating and inspirational interactions with teachers. [S16]

More enthusiasm for the SiS program. [S30]

Great to see so many scientists/teachers that have a great passion for improving the science quality in our schools. It is very encouraging for the future. [S45]

Resources/ideas for teaching/school

Resources and ideas that could be used for teaching or shared with the school were the second most common response from teachers, fifth from scientists and the other participants. The latter group specifically commented on being made aware of the availability of scientists as a resource.

An array of ideas which I can implement in class. [T18]

Lots of content and applications of science in the real world to use in the classroom and pass onto my colleagues to use. [T9]

Can do a number of energy projects at the school – lots of good ideas. [S37]

Many ideas on programs we can set up that bring real science into the school and have an environmental/global warming focus. [S40]

That scientists are very accessible/approachable people interested in sharing what they know. [P2]

There are lots of scientists out there keen to share what they are doing and give of their time to help the kids. [P13]

Communities and scientific literacy

The need for the community to have a raised awareness and understanding of global warming was mentioned by both teachers and scientists.

Importance of community awareness and education. [T13]

There is a diverse range of options for our energy future and the general public needs to have a broad understanding of the choices they will be faced with in the future. [T41]

Community engagement, for example via schools/SiS, will make a significant difference to attitudes and the ability to meet new targets to reduce energy demand and carbon dioxide emissions. [S33]

We as scientists should not take this for granted and take advantage of programs such as SiS and CSIRO Education to instil scientific ideas and concepts into the general community. [S38]

Partnerships – my partnership

The symposium provided an ideal opportunity for scientists and teachers to become more familiar with their partners.

Got to know my scientist. [T38]

A clearer way forward has crystallised with my partner scientist as to how we will work together. [T39]

Excellent opportunity to meet my partner teacher and do some planning (we are separated by 100s km). [S8]

It has provided a real kick-start to the relationship. [S19]

Teachers' enthusiasm and inspiration

Some scientists and other participants were quite inspired by the teachers' enthusiasm and commitment to the program, and the excellent work that some teachers were already achieving in the classroom.

> The enthusiasm of the teachers for our topic areas and research. [S9]
>
> There are some very motivated teachers in the community teaching their students at a high level and quality, for example the Esperance Energisers. This enthusiasm will stay with the students through out their schooling career, perhaps even longer. It also shows other teachers what is possible when you encourage students to excel. [S49]
>
> Teachers like learning from scientists. It is refreshing, informative and reminds them of why they became teachers in the first place – because they love learning. [P5]
>
> Goal to inform and inspire teachers – well and truly achieved. [P7]
>
> The amount of good science being done in schools at all levels: primary → secondary. [P9]
>
> There is a large number of keen and enthusiastic educators 'out there' doing great things in our schools. [P13]

CSIRO Research – Australia's future

The important research and role that CSIRO plays in Australia's future was considered important by teachers, scientists and others.

> A satisfaction that our scientists are working towards reducing carbon dioxide emissions and developing other energy sources that are environmentally friendly. [T8]
>
> By showcasing the talent of CSIRO's scientists it is reassuring to know that they have the 'best interest' of Australia's environment at heart. They came across as highly knowledgeable in their fields. [T35]
>
> Energy research is outstanding in Australia. [S10]
>
> It put into perspective the influence that we can have in the future development of sustainable fuels and energy usage. [S32]
>
> Australian scientific intellectual capacity is a well kept secret in the educational sphere. [P4]
>
> Confirmed respect for scientists working in the energy field. [P6]

How to engage students/make science more accessible

Means of engaging students in science was a common concern for both teachers and scientists, while the others considered the role that scientists can play in making science more accessible.

> Engaging our kids in research/problem-based learning is really important to excite them as active citizens. The Esperance example was a testament of this. [T4]
>
> The urgency and need to make science more accessible and meaningful to students. [T14]
>
> The need to engage the next generation of scientists. [T16]
>
> Importance of enthusing students about science being a tool for them to become an agent of change. [T22]
>
> Options for what to do with students. [S3]

The importance of engaging interest and curiosity in the classroom. [S15]

Enthusing students in science is number one outcome. [S22]

There is plenty of opportunity in exciting kids of all ages in exposure to science (engaging all years). [S26]

The role scientists can play in making science accessible to students. [P8]

Question 3. Should SiS have a symposium next year? Why/why not?

The majority of participants believed that there should be a symposium in 2008, as shown in Table 5. The undecided scientists gave reasons both for and against having the symposium in 2008. The undecided others stated that the teacher-scientist partners should be the ones making that decision, not them.

Table 5. Numbers of Scientists, Teachers and Other Participants Who Believed that there Should Be a Symposium in 2008

	Yes	No	Undecided	Total
Scientists	42	3	4	49
Teachers	43	4	0	47
Others	10	1	3	14

The main reasons why participants believed there should be a symposium in 2008 are summarised in Table 6. There were 80 different comments from the teachers, 69 different comments from the scientists and 19 comments obtained from the other participants. Table 6 only reports categories where there were more than 5 responses by either the teachers, scientists or other participants. Comments relating to each of these reasons are illustrated with quotes from the written responses.

Sharing ideas/networking

The most common response from teachers and scientists given for a symposium in 2008 was the sharing of information in terms of ideas, resources and networking that takes place at the symposium.

Share with other teachers what we have done. Teachers love hearing what other teachers are doing. I want to know what all the other partnerships are doing. I don't want to miss out if they are involved in something really exciting. [T30]

It's important to network with other teachers – especially across other states. The transference of knowledge and expertise is enhanced by professional dialogue. [T35]

It is important to establish networks of interested parties not just isolated teacher/scientist pairs. [S33]

It does help impart the idea that people are not just out there "on their own". [S35]

I believe that we can all learn from one another. The more we get together to share the more we can take back to our schools. [P13]

Table 6. Summary of the Main Reasons Why Scientists, Teachers and Others Think There Should Be a Symposium in 2008

Category of Reasons	Scientists		Teachers		Others	
	Number	%	Number	%	Number	%
Sharing ideas/networking	16	38.1	28	65.1	2	20.0
Importance of contemporary science	11	26.2	15	34.9	5	50.0
Builds on the partnerships	9	21.4	6	14.0	4	40.0
Yearly in states/regions	8	19.0	5	11.6	2	20.0
Provide case studies of partnerships	8	19.0	4	9.3	2	20.0
More teacher-scientist time required	5	11.9	2	4.7	-	-
Provides enthusiasm/inspiration	4	9.5	7	16.3	1	10.0
Bring science to the forefron of Australia's thinking	4	9.5	6	14.0	-	-
Total reasons	69		80		19	

Note. Analysis based on 69 responses from 42 scientists, 80 responses from 43 teachers, and 19 responses from 10 other participants. Only categories with at least 5 comments from one group are reported.

Importance of contemporary science

The second most common response from the teachers and scientists, and the most common response from the other participants, was the importance of keeping science knowledge up-to-date.

> When and where else in the world would a humble rural Queensland high school teacher get to meet, talk to and/or listen to leading scientists in their respective fields. [T22]
>
> Great opportunity to see what researchers are doing in some of the 'big' areas. [S10]
>
> Subjects learnt by school children need to be applicable to real life. SiS offers the opportunity for teachers to learn what is going on in R&D, and bring this info back to the classroom. [P8]

Builds on the partnerships

All three groups of participants believed that the symposium provided an ideal opportunity to build on partnerships and develop better relationships.

> Importance of professional relationships. Teachers are horribly isolated in schools meeting with the real scientists gives us a future path to finding new info after the symposium. I have many emails to send inviting people to visit. [T5]
>
> A symposium provides the opportunity for both groups to gain critical face to face time and build momentum to sustain the science/teacher concept. Without the symposium it would take years to build the same community spirit. [S19]

> Getting pairs together is a good idea in ensuring that contact begins and remains in a sustainable way. People are more likely to keep in touch if they have met with their partner [P14]

Provides enthusiasm/inspiration

Both the teachers and scientists believed the symposium was an excellent forum for reigniting the enthusiasm in science.

> There is nothing else like it!!! It enthuses science teachers, and in turn, that will enthuse their students. [T2]

> It was very encouraging to hear from the teachers the benefits and enjoyment that the school students gain from the partnerships. It has given me motivation and inspiration. [S32]

Brings science to the forefront of Australia's thinking

Both the teachers and scientists believed the symposium provided an opportunity for science to move to the forefront of thinking.

> To build capacity and momentum to bring science to the forefront of Australia's thinking. [T1]

> The issue of "Science Education" and future science and technology in Australia is a national problem for all of industries, governments and schools. National means all parties are aware of the issues facing science and technology in our "whole" of nation. [S5]

Hold the symposium in 2008 subject to the following suggestions

While the majority of participants agreed that the symposium should be held again in 2008, they suggested that the symposium should be held yearly in the states or regions, more case studies of partnerships should be provided, and more scientist-teacher time should be provided in the symposium rather than lecture time. Quotes from teachers, scientists or others relating to these points are presented below.

> *Yearly in state/region:* The benefits of a symposium such as this were numerous but the audience limited. If CSIRO has a presence in each state/territory then why not have a state-based conference, inviting scientists who work locally, to be the presenters. This would reach a larger audience and perhaps allow for offsite visits or interactive activities. There would probably be cost-savings as a result. [T32]

> *Case studies:* I would like to know about the progress/outcomes from the collaborative work. What was achieved? What did the teachers and scientists learn? Difficulties? How did the kids respond? [S42]

> *More teacher-scientist time:* Focus of the symposium could be more on scientists-schools interactions rather than the science itself. [S36]

Reasons for not holding the symposium in 2008

Those participants who said not to have the symposium again in 2008 stated similar reasons to those who wanted a symposium in 2008, subject to certain conditions. These reasons included holding the symposium at the state or regional level instead of a national level, providing detailed case studies of the partnerships rather than lectures, and providing more teacher-scientist time rather than lectures. In addition, there were two other suggestions: Hold a national conference biennially, and make sure a different but yet contemporary theme is selected for each conference.

Findings from the Case Studies

Transcriptions of the 13 case study interviews, together with notes made during the interviews, were analysed by identifying themes in the responses. Often these themes cut across the responses to more than one question, so the findings from the case studies are reported in terms of the themes identified in participants' responses to the interview questions.

Context for the Partnerships

A wide range of contexts for the partnerships was discovered in the interviews. The Year levels involved ranged from Prep through to Year 12 and there were mixed classes of various year levels. One remote school was involved in the case studies. Scientists were not only used in face-to-face teaching in classrooms, but also with gifted students, whole school science clubs, CREST programs, science fairs, and a mini-school of excellence. Topics taught through the partnerships were wide ranging, including climate change, biotechnology, forensics, water cycle, environmental science, human biology, working scientifically, as well as some scientists covering a variety of topics with the students in their school.

Progress of the Partnerships

The progress of the partnerships was very diverse, ranging from well-established professional partnerships that had existed for many years (but were now formalised through SiS) to partnerships where the partners met each other for the first time at the symposium.

How the scientist was involved in the partnership was also wide ranging, and was not limited to contact with the partner teacher and their class. Various types of communication with teachers and students included face-to-face contact, email, teleconference, excursions, whole school assembly, professional development for teachers, and a planned "scientist in residence" for the remote school. Specifically, scientists were described as involved in lectures, question and answer sessions, careers information, implementing experiments in the classroom, assisting students in designing experiments, assisting students and teachers in finding information, curriculum design and development for teachers, planning and implementing excursions/field trips, providing a role model for women in science, and providing access to resources (including ideas for experiments, materials for experiments, and access to other scientists).

Six of the partnerships had extended their partnership from the classroom to the school, whilst five of these had moved their partnership beyond the school to the community. Many of the partnerships that had reached out to the community had active parental involvement and/or community involvement, thus enhancing scientific literacy within the community. An example of this is the project called the "Esperance Energisers", where Year 6 and 7 students were learning about climate change and what members of the community can do to reduce their environmental footprint. The students not only educated the rest of the school, but also approached local businesses to support them in the production of professional flyers to distribute to the community. A detailed case study of the "Esperance Energisers" can be found in Appendix 8.

Benefits to the Students

Benefits to the students from the partnerships were perceived to occur in three main areas.

Knowledge and understanding of the real world, contemporary science

Specific benefits to students that were mentioned included increased knowledge of the content and the process of science, how to find information, more hands-on work, empowerment of students, increased enthusiasm/engagement in science, and greater relevance of science to the students.

> The children wanted to initiate change in our school and in the community and in their homes. And by chance we had Brian, who is the partnered scientist in town. And so basically he was a bit of the expert to start and actually sort of inspired the kids, because the fact that he came in they were drawing on … their background knowledge. But they asked him just about anything and he could totally explain anything to them and they just got totally empowered. Because they realised where they had to go first was to educate the whole school community and so they had to learn about climate change. So he was their mentor, if you like, for the learning process of what climate change was about. [Interview 1, teacher, p. 1]

> It was mainly to find a context that was relevant and exciting for kids and it's the whole notion of scientific literacy so they've been reading newspaper articles about stem cells – do we actually understand what we're talking about? [Interview 6, teacher, p. 2]

Opportunities to experience scientists as role models/mentors

Both teachers and scientists talked about the opportunity provided to the students to see both real science and real scientists.

> Definitely they have a much better idea of how chemistry fits into the real world in terms of food science. There was quite a few examples that Dean gave in his talk, you know, they had no idea about. And definitely real world, you know, this is the real science out there rather than the theory that they get taught in class all the time. Opportunity to see what a real scientist does. [Interview 4, teacher, p. 4]

> I think they're probably carrying a set of misconceptions out there as to what scientists are like and in the ways they behave and so on. And seeing a scientist come to the school and having them work with a scientist as I'm tutoring them, that must bring with it, you know, a sense of "This person is just doing a job like my parents are doing." So, it's bringing the position of a scientist closer to the students. [Interview 8, teacher, p. 12]

> The real face of science can be young and exciting and innovative. [Interview 12, teacher, p. 2]

Awareness of the types and variety of careers available in the sciences

Both scientists and teachers perceived an increased awareness of careers in science.

> Because all of a sudden their world, which was a little tunnel, has now turned into a bigger tunnel. [Interview 7, teacher, p. 14]

> ..giving them further choices, careers for the future for themselves. And, out here in central Queensland, find the scientist who would be very active here that they could quite readily get involved in because of, a lot of the type of scientific work they can do, and still stay and live in their same region and locality they are now. [Interview 13, teacher, p. 4]

Benefits to the Teachers

Teachers perceived that there were four main benefits to them from their involvement in the partnership.

Knowledge and understanding of the real world, contemporary science

Most teachers commented on their increased content knowledge as a consequence of being involved in the partnership.

> For me I was absolutely on a full learning curve with him [the scientist] and I have learnt a lot and also where to go, where to get the information. [Interview 1, teacher, p. 8]

> Personal professional knowledge has grown from talking with Line. She has a very good understanding of things that I don't. .. And it's giving me that, it's just reinforcing what I know is the right thing to be teaching the kids. [Interview 3, teacher, p. 12]

> I'm not just a teacher now, I'm the link to real science. [Interview 4, teacher, p. 6]

Opportunities for professional learning through communication with scientists and other teachers

Most teachers commented on how the partnership had provided them with access to resources that they would not normally have. Such resources included equipment, activities, scientists (other than their partner) and information. Some teachers commented on how they now felt more capable of assisting other teachers in teaching science, as a consequence of having been through the process themselves.

> And I'm sure if I've got a question or whatever I email Line and she, you know, emails me back or if she says "I don't know but I've asked such and such at university and they know and this is the answer" all that sort of thing. So in terms of my own personal professional development it's been very good as having a sounding board around, you know, an answering machine, somewhere along the line for that. [Interview 3, teacher, p. 12]

> So, it's sort of two-fold. I'd answer directly if I'm able to the questions or concerns or whatever of the kid and teacher, but also be a facilitator in my network of friends or colleagues or professional organisation to help her [the teacher] do what she has to do in class" [Interview 5, scientist, p. 16]

> We're [teachers and scientists] treated as partners now. The other day Joe came and grabbed a flask [from university] because he couldn't get one [at school] [Interview 6, scientist, p. 12]

> I am the deputy at the primary school so I am able to assist teachers with, you know, lead them through it as well so it worked really well as a bit of a 'down the line' job. [Interview 1, teacher, p. 9]

Awareness of the types and variety of careers available in the sciences

Many teachers commented on their increased knowledge of the types and varieties of careers that are available in science as a consequence of partnerships.

> I've always been aware that science is a really big, broad sort of field in as such, but I didn't know the extent of how specific you could get with certain careers. [Interview 3, teacher, p. 14]

> And actually talking to Dean, he's been telling me a lot of the food industries that are around the place that I didn't know existed. [Interview 4, teacher, p. 7]

Benefits in the affective domain

Many teachers made comments relating to improved attitudes, confidence or motivation as a consequence of being involved in the partnership. In particular, the teacher continually referred to the scientists as "my scientist", highlighting the strong connection they made with the scientist.

> What I'm observing from my three teachers is that they're feeling more confident in teaching science. They're feeling that little tap on the back of yes, I am on the right track, I'm not teaching the wrong thing. .. They're feeling very much empowered by the partnership. [Interview 13, teacher, p. 9]

> Updating my own knowledge and getting excited and seeing the kids excited. [Interview 6, teacher, p. 11]

> I feel like, you know, she's [the scientist's] mine. [Interview 5, teacher, p. 4]

> But seeing them so engaged with something that I know that I don't have the skills to do. [Interview 10, teacher, p. 11]

> It's really been a motivational tool ... it's been too valuable this to actually just go away and do nothing. [Interview 11, teacher, p. 9]

Benefits to the Scientists

Perceived benefits to the scientists from their participation in a SiS partnership occurred in five areas.

Opportunities to communicate with teachers, students and other scientists about their work

Many scientists commented on the obligation they owed to the next generation of scientists (i.e., school children) and the importance of enthusing young children in science.

> So I think this program is an important means of putting across concepts that often we, as scientists and policy makers, use as our day-to-day activities. But it is time for us to go out and stimulate the next generation of scientists and policy makers. [Interview 1, scientist, p. 15]

> I really enjoy the opportunity to impart that to the kids and try and share my enthusiasm for my science and how I love it. And I think … it's a great opportunity to get enthusiastic at the age of 9 and 10 rather than seeing them later on when their interests are already set. It is much harder to get them fired up if they're not [enthusiastic], if that seed has never been planted. [Interview 2, scientist, p. 15]

> I sort of have a bit of a view that if we want a new generation of scientists to come through, then we do sort of have a bit of an obligation to pass on, to help in the broader context of passing on our knowledge. And you know, so there's a bit of an altruistic thing there. [Interview 13, scientist, p. 6]

Methods of communication with students and their work

Scientists made various comments about how their communication techniques were challenged as a consequence of communicating with school children. Other comments were also made relating to the teaching strategies that the scientists were picking up from observing the teachers.

> And I'm very interested in teaching and trying to get my students enthusiastic and inspired and I think I'm going to learn a lot from this because I can get more information or tap into more of the educational approaches and different things that you can do so that, so certainly I'm learning a lot. [Interview 2, scientist, p. 17]

> We need to actually engage with primary school students to get them interested in science. [Interview 3, scientist, p. 6]

> I've had just as much trouble putting a talk together about the origin of life for the Grade 5 class as I had for a third year university class. It was very different and the concepts, although the material was more or less the same, the explanation and the presentation was very different. [Interview 3, scientist, p. 15]

> I think my teaching's improved because of the better understanding of where to start and where to pitch it. [Interview 6, scientist, p. 11]

> I asked the question "Is there salty water on land?" [to a Year 1 class] and that was interesting because I didn't know how that would go. And some of them said "No!" Yeah, so I had to then go "Okay, we need to explain this a little bit more." [Interview 9, scientist, p. 11]

Benefits in the affective domain

Many scientists made comments relating to improved motivation and enthusiasm in their job as a consequence of being involved with school children.

> But for me as a professional to go in there and to see the ability to stimulate these children and how quickly they can pick up these things was just inspirational to me. [Interview 1, scientist, p.14]

> It was just the curiosity of a scientist because the teacher said, "Look we've got a scientist in the class." They sat down and they had to do a session on "What do you think a scientist is?" What is associated with a scientist? The ideas that came out, look, I'm starting to get shivers up my spine, because it was just a satisfactory thing to know that there are potential scientists there. In those 30 kids there were potential scientists. [Interview 5, scientist, p. 12]

> Well, it gives me a lot of enthusiasm to go on. Because you see the children really opening up towards them and being quite enthusiastic about what you're telling them. So it can bring that enthusiasm back to your work. [Interview 9, scientist, p. 9]

Legitimisation of the partnership

By being involved in the Scientists in School project, many scientists felt that they could "officially" work with the schools, and consider it a legitimate part of their work.

> The partnership has legitimised it as a thing for me to do, this is engaging with the end users of my research and that's really nice, because I was doing it anyway. So it's really nice that I can go and justify it and as you know, to put it on as my performance indicator. [Interview 3, scientist, p. 4]

> I've always been interested in science education anyway so Scientists in Schools just allows me to formalise that, I guess. And instead of saying to my boss "I'm off to a primary school tomorrow afternoon", I can say, "Well, as part of Scientists in Schools I'm doing this". You know, it makes it sound much more official and supported. [Interview 8, scientist, p. 10]

Understanding of the community's awareness and perceptions of science, scientists and their work

Only a few scientists mentioned this aspect, and it appeared to be less important than the other identified themes.

> But also in terms of family, it makes me really aware that it's important that we do go on and tell our children what's happening out there. Otherwise we're in a sort of microcosm and we don't know what's actually happening and who's doing what. [Interview 9, scientist, p. 9]

> Scientists are traditionally very poor at being able to communicate their science to ordinary normal people, and I think that's critical. [Interview 8, scientist, p. 23]

How the Project Could Be Improved

Scientists and teachers made suggestions about how the SiS project could be improved for 2008 in four main areas.

1. Finding ways to bring the teachers and scientists closer together. Scientists made various comments under this heading relating to being provided with appropriate teaching strategies for the classroom. These included information on appropriate language to use in schools (particularly primary school), hints on effectively teaching in schools, suggestions on how scientists can be more involved with the planning process, appropriate concepts to use in primary school, and using student's questions as a base for inquiry. Teachers wanted more information on how to embed the SiS project into the school curriculum, and curriculum design and development from the information that had already been presented at the symposium. The importance of effective and timely communication between teachers and scientists was also mentioned.
2. Develop a website that contains centralised resources providing information on activities, ideas, or experiments that have been tried and tested. The website could also have detailed case studies to show case what other partnerships have accomplished. Information on, or links to, appropriate funding could also be made available on the website.
3. Develop a network of partnerships in each state starting with those that had attended the symposium. Use current partnerships as the regional contact in order to develop a regional network.
4. Allow more time to develop partnerships and programs during the symposium.

Benefits from the Symposium

As the last question in the interview was "What was obtained from the symposium?", most respondents quickly listed a few points as to what they had obtained from the symposium. The main points were a repetition of those obtained from the symposium evaluation: networking, cutting edge science, partnership, and enthusiasm/motivation/passion. As these are similar to what has already been reported in the Findings from the Symposium section, no additional detail or quotes will be provided here.

Findings from the Student Surveys

Primary School Students

Three primary schools returned surveys from their students. Table 7 shows the numbers of students and location of their schools. Most of the data came from upper primary students in a metropolitan school who had a lesson with a geologist. A small remote school returned data from all of its students after the teacher implemented various lessons based on ideas emailed by a biological scientist, and a regional school returned data from its Primary Extension and Challenge (PEAC) group of Year 6 and 7 students who had completed a project on global warming.

Table 7. Number of Students and Location of Primary Schools Submitting Surveys

Primary School	Sex	Year Level						Total
		Prep & 1	2 & 3	4	5	6	7	
NSW Metropolitan	Boy	-	-	-	16	10	-	26
	Girl	-	-	-	18	24	-	42
QLD Remote	Boy	3	2	1	1	-	2	9
	Girl	3	2	1	2	-	-	8
WA Regional	Boy	-	-	-	-	1	4	5
	Girl	-	-	-	-	3	1	4
	Total	6	4	2	37	38	7	94

Lower primary students

The six very young children at one school were asked to do a drawing of something they had done in their science activities and their teacher scribed the child's description of the drawing. An example is shown in Figure 1. All but one child drew a recognisable picture and all were able to describe what it was about.

There were four children in Year 2 or 3. The teacher provided them with a Y-chart with descriptors for each of the three sections. In one section, all children were able to write something that they had learned. In another section, two children indicated that the experience was fun, one wrote "good, happy" and one drew a smile. The third section asked what science careers students learned about. Three wrote something about what they had studied, and one wrote "forensic science". As the scientist was unable to visit the school due to its remoteness, it is perhaps not surprising that students wrote about the activity they did rather than the career of the scientist.

The results for these young children indicated that they had enjoyed their experience and, within their capabilities, had indicated some learning and a generally positive outcome.

Figure 1. Example of a child's drawing following their science activities

Upper primary students

In total there were 84 students in Years 4 to 7 and their data were analysed together. It was noticeable that the responses were more complete from the PEAC class who had spent two terms on their global warming project, whereas the other two schools had experienced only a single presentation from their scientist, or communicated remotely with their scientist.

Students were first asked "what did you learn from the scientist?" All but 4 of the 84 students were able to write about at least one thing they had learned, and more than half wrote a reasonably comprehensive paragraph.

The second question asked students "What was it like working with a real scientist?" Students replied with a variety of comments, some making two or three separate points. These were coded and the results are summarised in Table 8 in order of frequency.

Table 8. Students' Views about Working with a Scientist

Responses	Number of comments	% of students	Example Response
Interesting, good	31	36.9	It was great working with a real scientist [3632 4]
Fun, exciting	30	35.7	Fun because you get to do what a scientist does. [1511 38]
Learned new things	25	29.8	It was great! They knew everything I wanted to know! [1611 65]
Positive comment about scientist	20	23.8	He was very good making all the information easy to understand and not too complex. [3731 3]
Different to normal lessons	7	8.3	It was different to normal science at school[1612 8]
Ordinary person, like teacher	6	7.1	It was just like meeting a man in the street, it didn't really feel special. [1512 3]
OK, not special	6	7.1	Not very good but it was alright [1512 31]
Science, scientists important	5	5.9	It was good seeing a real scientist being so interested in her job. [1612 14]
Boring	3	3.6	Pretty boring [1612 9]
Confusing, big words	2	2.4	It got confusing with all the big words. [1611 51]
Total	135	100.0	

Note. There were 135 comments from 84 students.

The most common views expressed by students related to enjoyment, having fun and learning things. Nearly a quarter of the students made positive comments about their scientist,

usually in terms of how much they knew, or how kind they were. One student was particularly impressed, and wrote

> It was really good to hear about global warming and I thought was very fascinating not only to hear the facts but to think of how he can fit all of these facts into one brain without parts of the facts leaking out or getting mixed up with each other. [3632 7]

Students were asked "What different science careers did you learn about?" The most common response, from 64 (78%) students, was to name the career of their visiting scientist. Another 14 (17%) mentioned that career and some related ones. Two students did not reply and four responded "none".

The final question asked "Did the scientist make you more interested in becoming a scientist? Yes/No Why/Why not?" Four students responded that they were not sure, and explained that they had only had one lesson so that they didn't have enough information to decide. Of the remaining 80 students, 35 responded "yes" and 45 responded "no". Students gave at least one reason for their answer and these are summarised in Tables 9 and 10.

Table 9. Primary Students' Reasons for Increased Interest in Science as a Career

Reasons	Number of reasons	% of students	Example Response
Interesting	15	42.9	It was interesting to find out so many things about rocks [1612 64]
Science, scientists important	12	34.3	There are so many problems facing us today and science holds the answers. [3731 5]
Fun, exciting	11	31.4	The scientist did tests and I enjoyed it. [2721 7]
Understand more about science	5	14.3	Because I know more about science [1511 27]
Scientists discover new things	5	14.3	They are forever discovering new things. [1512 16]
May now consider this as career	4	11.4	Because [before] I didn't entirely know what scientists do. [1511 45]
Lots of different jobs, opportunities	1	2.9	There's all types of science to learn and study it. [1612.63]
Total	53	100.0	

Note. There were 53 reasons from 35 students.

Table 9 shows that the main reasons for becoming more interested in science as a career related to finding their work with the scientist interesting, enjoyable and realising the importance of science and the variety of things scientists do. One PEAC student referred to the mentoring role of his scientist in his comment.

> The scientist sort of encouraged me to become a marine scientist or an environmentalist but not in words. He has helped us through what we have done. [3632 4]

Students' reasons for not becoming more interested in science were mixed. Some just didn't want to be a scientist, some mentioned they already had a career chosen, and some were already planning to consider science. Some were just not interested in the topic and some did not like science. This did not mean that they did not enjoy the scientist's visit however. One student who responded that he found working with the scientist "Coolishly awesome" was not interested in a science career "because I don't want to spend my day looking at rocks" [1611 53].

Table 10. Primary Students' Reasons for NOT Increasing Interest in Science as a Career

Reasons	Number of reasons	% of students	Example Response
Just don't want to be	13	28.9	Science doesn't really stand out to me as a career and probably never will. [1612 61]
Not interested in topic	13	28.9	Because I am not at all interested in rocks. [1611 53]
Don't like science	12	26.7	I don't like science. [2521 5]
Already chosen my career	10	22.2	I want to be a comic strip writer. [1512 32]
Already planning to be a scientist	3	6.7	I already have it on my top 5 jobs list. [1511 19]
I'm not good at science	3	6.7	Because it is a bit confusing and I don't think I'd really be good at it. [1612 60]
Totals	54	100.0	

Note. There were 54 reasons from 45 students.

Secondary School Students

One school provided data from 16 boys whose partnership involved working in marine science. The survey for secondary students was a little different to that for upper primary students (see Appendices 4 and 5), but it collected similar data. All but one of the 16 boys responded that working with the scientist increased his knowledge of science and these boys provided specific example(s) of something they had learned. When asked to describe how the scientist worked with them, the boys mainly described the activities, which included being taken on an excursion and having a presentation from the scientist.

Students were asked "Did working with the scientist increase your interest in having a career in science?" Eleven responded yes, and their reasons mainly referred to their experience being fun, interesting and/or exciting (5), that there were lots of opportunities in science (4) that science was important (1) or that the scientist made the topic easy to understand (1). Five students replied "no" to this question. Two were already planning to be a scientist, one had chosen another career, one did not want to be a scientist, and one gave no reason. Twelve students agreed that working with the scientist had increased their awareness of the variety of careers available in science (the other four said no), but although only six mentioned more than the career of their scientist, several had been surprised by the large number of science-related jobs. One said "I didn't even know about climatology or oceanography." [4841 13].

Findings from the Online Surveys

Demographic Information

Tables 11 to 14 provide an overview of the numbers of respondents and the location and sector of the schools with which they were involved. Although the patterns are seen to be reasonably similar between scientists and teachers, and it is certain that both halves of some partnerships responded, it is not possible to match the responses of any scientist to the corresponding teacher.

The national figures in the final columns of these tables provide data as at December 19, 2007, and allow comparison with the survey sample in terms of its proportional representation. It can be seen that the sample, although voluntary, is proportionally representative of the national population in terms of the numbers of partnerships in each state or territory, and the sector and geographic location of schools involved in partnerships. The Tables show that, in total, 562 partnerships had been formed in 500 schools. The response rate to the survey is approximately 36%.

Table 11. Respondents in Schools Involved in Partnerships by State/Territory

State/Territory	Scientists		Teachers		Total Partnerships	
	Number	%	Number	%	Number	%
ACT	8	4.1	7	3.4	25	4.4
NSW	38	19.6	44	21.4	129	22.9
NT	1	0.5	5	2.4	9	1.6
Qld	52	26.8	64	31.1	179	31.8
SA	14	7.2	17	8.3	34	6.0
Tas	12	6.2	13	6.3	30	5.3
Vic	45	23.2	38	18.4	90	16.0
WA	24	12.4	16	7.8	66	11.7
Total	194	100.0	204*	99.0	562	100.0

* Two teachers did not respond.

The distribution of scientists and teachers compares well with the overall distribution of partnerships, suggesting that even though the survey sample is voluntary, it is representative of the national distribution of schools involved in partnerships. About 60% of schools are located in capital cities, about 20% in regional cities and only 2-3% in remote areas.

Table 12. Schools Involved in Partnerships by Sector

Sector	Scientists		Teachers		Total Schools	
	Number	%	Number	%	Number	%
Government	127	65.5	138	67.0	345	69.0
Independent	26	13.4	31	15.0	65	13.0
Catholic	37	19.1	33	16.0	90	18.0
Total	190*	97.9	202*	98.1	500	100.0

* Four scientists and four teachers did not respond.

Table 13. Schools Involved in Partnerships by Geographic Location

Geographic Location	Scientists		Teachers		Total Schools	
	Number	%	Number	%	Number	%
Capital city	122	62.9	123	59.7	295	59.0
Regional city	42	21.6	39	18.9	}	
Rural area	26	13.4	36	17.5	} 205	41.0
Remote area	4	2.1	6	2.9	}	
Total	194	100.0	204*	99.0	515	100.0

* Two teachers did not respond.

Teachers were asked to report the youngest and oldest year levels catered for within their school and their responses were used to categorise schools as primary (K or P or R to Year 6 or 7), secondary school (Years 6 or 7 to Year 12), junior high (K or P or R to Year 9 or 10), senior college (Years 10 or 11 and 12), or all year levels. A cross tabulation of teachers' responses is shown in Table 14, and it can be seen that about 40% of schools are primary, about 40% are secondary or senior colleges, and about 12% cater for all years.

Table 14. Type of School by Location

Location	Primary School	K to Year 9 or 10	Secondary School	Senior College	All Years	Total
Capital city	54	4	40	6	18	122
Regional city	13	2	15	2	4	36
Rural area	12	2	18	0	2	34
Remote area	4	0	0	1	1	6
Total	83	8	72	9	25	198*

* Six teachers had missing data.

Table 13 shows that between 15.5% and 20.4% of schools were classified as rural or remote by scientists and teachers respectively, and Table 14 shows that 40 schools were classified as rural or remote by the responding teachers. As they represent about one-third of teachers who were partnered, it is reasonable to assume that more than 100 rural and remote schools were involved in partnerships. This demonstrates that the SiS project can be of significant benefit to these geographically isolated schools which, in comparison with metropolitan schools, are often precluded from opportunities to participate in such enrichment programs.

The data in Table 14 also suggest that there are almost as many secondary schools as primary schools involved in SiS partnerships. In fact, the SiS pilot project records indicate 56% of partnerships involved primary schools, and 44% involved secondary schools. The responding sample is consistent with these data. National data[1] indicate that the ratio of primary to secondary schools in Australia is approximately 4.5:1, suggesting that a greater proportion of secondary schools, compared to primary schools, have taken up partnerships.

Scientists were asked to report how long it took to travel to their partnership school. The results in Table 15 indicate that three-quarters of scientists were partnered with a school that was within one hour travel time.

Table 15. Time Required for Scientist to Travel to School or Venue

Sector	Scientists	
	Number	%
Less than 1 hour	144	74.2
1-2 hours	17	8.8
More than 2 hours	11	5.7
Did not travel	19	9.8
Total	191*	98.5

* Three scientists did not respond.

Attendance at the Symposium

The Symposium was attended by 31 of the responding scientists and 35 of the responding teachers. Because there were no evident patterns in the responses attributable to attendance at the symposium, this matter was not considered in further data analysis.

[1] National Report on Schooling in Australia 2004, Schools, Table 3. See www.mceetya.edu.au/mceetya/anr.

Information Relating to Partnerships

Length of Partnership

Respondents were asked several questions about their partnerships and their expectations of continuation. First, respondents were asked how long their partnership had been running, and whether or not activities related to the partnership had begun. The results are shown in Tables 16 and 17. It can be seen that most of the partnerships had been formed during the SiS pilot project which began about 4 months before the survey was opened, catering for approximately 90% of respondents. This means that the partnerships that had been in progress for more than 4 months (approximately 10% of them) must have begun before the start of the SiS pilot project.

Only one third of partnerships had been able to begin the activities of their partnership, and of those, some (possibly up to 20 of the 60+) would be partnerships which had formed prior to the beginning of the partnership. These data indicate clearly the long time frame required for schools to begin a new, externally-prompted program, even if support for it is immediately available.

Table 16. Length of Partnerships

Length	Scientists		Teachers	
	Number	%	Number	%
No contact made	2	1.0	9	4.4
Less than 1 month	88	45.4	84	40.8
1 - 2 months	40	20.6	42	20.4
2 - 3 months	31	16.0	31	15.0
3 - 4 months	16	8.2	18	8.7
More than 4 months	17	8.8	22	10.7
Total	194	100.0	206	100.0

Table 17. Number of Partnerships That Had Started Activities

Started Activities?	Scientists		Teachers	
	Number	%	Number	%
Yes	64	33	66	32
No	130	67	140	68
Total	194	100.0	206	100

Content Areas of Partnerships

Another way of describing the kinds of partnerships that have begun or are being developed is to consider the year levels of students involved and the content area of science that is being considered. Tables 18 and 19 provide this information.

Table 18. Subject Areas and Year Levels for Scientists Involved in Partnerships (%)

Content Area	Lower Primary	Middle Primary	Upper Primary	Junior Secondary	Upper secondary	Total (%)
Earth and Space	13	18	20	11	8	70
Living Things	18	30	33	21	21	123
Energy and Force	11	15	18	10	8	62
Matter	10	13	14	9	9	55
Mathematics	6	10	11	8	4	39
Engineering and Technology	9	12	15	12	12	60
Total (%)	67	98	111	71	62	409

Note. Percentage based on 194 scientists.

Table 19. Subject Areas and Year Levels for Teachers Involved in Partnerships (%)

Content Area	Lower Primary	Middle Primary	Upper Primary	Junior Secondary	Upper secondary	Total (%)
Earth and Space	9	11	16	11	9	56
Living Things	15	20	22	19	24	100
Energy and Force	10	13	18	11	8	60
Matter	4	7	11	13	10	45
Mathematics	3	4	8	5	4	24
Engineering and Technology	5	7	13	13	12	50
Total (%)	46	62	88	72	67	335

Note. Percentage based on 206 teachers.

Because most partnerships involved students at more than one year level, and topics such as sustainability or water management cover more than one content area, scientists and teachers frequently indicated more than one year level and/or content area, so the percentages in the tables add to much more than 100%. Tables 18 and 19 reveal that the most common year levels involved in the partnerships are those of upper primary, the most common content area is Living Things, and the least common is Mathematics. Nevertheless, all content areas and all year levels are covered in at least three partnerships.

Means of Communication between Scientists and Teachers

Respondents were asked how they communicated with their partner to organise the activities in their partnership. The results in Table 20 show that the most common method of communication is email, the advent of which clearly facilitates programs such as SiS, because both scientists, and especially teachers, are frequently unavailable by telephone due to the nature of their work. Face-to-face contact occurred fairly often and communication by fax was rare.

Table 20. Communication Between Scientists and Teachers (%)

Method of Communication	Scientists			Teachers		
	Rarely	Sometimes	Usually	Rarely	Sometimes	Usually
Email	19	27	44	10	27	52
Telephone	28	28	7	28	28	8
Face-to-Face	21	34	14	24	34	9
Fax	40	4	-	41	3	-

Note. Missing data on all items. Percentages based on 194 scientists and 206 teachers.

Reasons for Participation in the SiS Pilot Project

Respondents were asked to provide a reason for their participation in the SiS Pilot Project. Nearly all participants responded and most gave several reasons. A number of themes were identified among the reasons given and these themes were used to code the data for analysis to look for any patterns. Although there was some commonality between the responses given by scientists and teachers, there were also some very different reasons given. For this reason, the data for scientists and teachers are reported separately. In the following tables, the results are reported according to the frequency of reasons given.

Table 21. Reasons Given by Scientists for Participation in the SiS Pilot Project

Reasons for Participation	Scientists		Example Response
	Number	%	
Alerting students to career opportunities in science	44	22.7	Because the SIS program is an effective way of recruiting future scientists. [S28]
Make science interesting, relevant, exciting for students	36	18.6	To use the expertise available to us and help make science more interesting and exciting for the students. [S1]
Enjoy helping young people in science	24	12.4	I enjoy working with young students who may know little about science - it is very satisfying when students' eyes light up when they finally understand how something in nature works! [S113]
Raising the profile of science in school	21	10.8	A good way to introduce science into Primary Schools, where science is generally not a strong focus. [S126]
Increasing science awareness in the community	18	9.3	See this as a valuable tool for promoting environmental/ environmental health issues in the community. [S115]
Wanted to contribute to promoting science in school	17	8.8	To raise the awareness of science and also to give something back to the education system. [S103]
Approached to be involved	14	7.2	Received an email with an expressed need (unmatched schools), and I've been considering involvement in teaching/education for some time. [S98]
Conveying the importance of science to students	13	6.7	Promoting science and recognition of the importance of science understandings for daily life and future careers. [S81]
Improve the teaching of science in schools	9	4.6	I am keen to promote good chemistry teaching to attract good students to university chemistry. [S179]
Wanted to share my love/passion for science	9	4.6	I want to tell students how good it is to be a scientist. [S40]

Table 21 (cont'd). Reasons Given by Scientists for Participation in the SiS Pilot Project.

Reasons for Participation	Scientists		Example Response
	Number	%	
Scientists have a role to play in promoting science education	9	4.6	I think scientists need to get out and help in science education in schools. [S53]
Formalised previous involvement	9	4.6	Evolved from an ongoing collaboration to assist teachers better understand the ecology of coral reefs. [S181]
Love to teach	7	3.6	Like to teach/impart knowledge. [S27]
Concern about poor state of science education	7	3.6	I was unhappy with quality of science teaching that I observed in schools currently. [S69]
Increase links with local institutions	6	3.1	Better links with University, students can benefit from better understanding of research technicalities. [S47]
For fun	6	3.1	I though it would be good fun. [S178]
Seemed like a good idea	6	3.1	Sounded like a good idea- I had dreadful high school science teachers, and it doesn't have to be that way! [S93]
Offer access to resources and skills	5	2.6	Provide additional resources to teachers in the program in remote/rural areas. [S157]
Good PR for scientists and their institutions	5	2.6	I believe scientists have a rather ordinary profile in the general public, and this is a chance to change that image. [S150]
Improve my communication skills	4	2.1	To help develop my abilities as a communicator. [S65]
Blank, no match, or no contact yet	11	5.7	We haven't started to do any work yet but I have sent the information about me to the school. Will try to start in 2008. [S102]
Total scientists	194	100.0	

Note. Most scientists' responses contained more than one reason.

The results in Tables 21 and 22 indicate concern among both scientists and teachers about the need for students to participate in an exciting, interesting and relevant science education and for more of them to consider a science-related career. Nearly one quarter of scientists and a fifth of teachers made a comment about careers in science and there were strong themes in both sets of responses relating to making links between science at school, scientists and science in the community. Although the term "scientific literacy" was not often used, it was clear that the promotion of scientific literacy, beyond just learning about science in the school

curriculum, was of considerable importance to participants. Students having access to real scientists, and through them access to real-world science, was a strong theme in teachers' reasons for participation in the SiS pilot program.

Another theme much more prevalent in the teachers' responses was the opportunity for them to up-date their own knowledge of contemporary science, to have access to current ideas and to enjoy opportunities for professional learning.

Table 22. Reasons Given by Teachers for Participation in the SiS Pilot Project

Reasons for Participation	Teachers		Example Response
	Number	%	
Access to a scientist, science in the real world	73	35.4	To get a real-life scientist involved with the school so students get a realistic view of the world.[T38]
Alert students to possible careers in science	39	18.9	Break down barriers and inform students that doing science is a very positive and rewarding way of life. [T25]
Professional development for teachers	35	17.0	To enhance staff knowledge of current scientific research. [T161]
Raise the profile of science	33	16.0	School Staff felt that such a partnership would lift the profile of science in the student population. [T138]
Heard about program, seemed a good idea	28	13.6	Sounded interesting - something to stimulate the children. [T178]
Links between science and society	28	13.6	To give students 'real life' exposure to science in the community. [T77]
Approached to form partnership, or formalized one already	25	12.1	I was asked - we already had contacts but we made them official. [T158]
Increase interest and engagement of students	22	10.7	Believed that the students would be more involved in science later on in life. See Science as fun and relevant. [T198]
Increase student understanding of up-to-date science	19	9.2	Saw it as an opportunity to expose students to the knowledge and skills possessed by a scientist who is an expert in their field. [T103]
Making connections with local institutions	16	7.8	This project assisted in the development of industry links for my Agricultural Science Classes. [T189]
General statement of benefit	8	3.9	Thought it would be a great opportunity for the students at our school. [T2]
Access to material resources	6	2.9	This is a new school and we were looking for ways to get access to equipment. [T119]

Table 22 (cont'd). Reasons Given by Teachers for Participation in the SiS Pilot Project.

Reasons for Participation	Teachers		Example Response
	Number	%	
Deal with scientist section of curriculum	6	2.9	It matched part of the Science and Society curriculum which needed to be covered in Year 1. [T136]
Had been looking for this kind of program	4	1.9	I wanted to form an ongoing partnership with a scientist. I have been part of several pilot programs and needed a more sustained relationship. [T191]
Contact made, no progress	3	1.5	Contact has been made - but due to busy school programs, student meeting has not yet happened. [T138]
Value to scientists knowing what is happening in schools	1	0.5	Scientists also benefit from finding out what is going on in schools. [T 159]
Blank, not matched or don't know why school involved	9	4.4	Unfortunately despite registration and follow up request nothing eventuated. [T90]
Total teachers	206	100.0	

Note. Most teachers' responses contained more than one reason.

Contributions of the Scientist to the SiS Partnership

Both teachers and scientists were asked to describe the nature of the contributions made by the scientist to the partnership. These data were analysed only for those respondents for whom the activities of the partnership had begun. This means that the responses are informed by what actually happened in the partnerships rather than what participants thought would happen when the partnership began. The data in the following tables report the numbers of participants responding "yes" to the item, and because some participants did not respond either yes or no to some items, the percentages are calculated based on the number of participants who reported that their partnership had commenced. Contributions are ranked according to the frequency with which scientists responded "yes".

Table 23. Nature of Contribution Made by Scientist in the Partnership

Nature of Contribution	Scientists		Teachers	
	Number	%	Number	%
Make presentation to students in classroom about science topic	47	73.4	42	63.6
Make presentation to students in classroom about careers in science	35	54.7	30	45.4
Assist teacher in classroom	18	28.1	21	31.8
Supervise student(s) in a project	17	26.6	15	22.7
Mentor teacher in discipline	15	23.4	20	30.3
Presentation to parents or teacher about science	13	20.3	12	18.2
Answer students' email questions	10	15.6	15	22.7
Lead students in tour of facility	8	12.5	9	13.6
Lead students in field trip	8	12.5	11	16.7
Assist teacher on field trip	8	12.5	9	13.6
Judge a science competition	4	6.3	3	4.5
Support a science club	2	3.1	3	4.5
Participate in teleconference with students	-	-	-	-
Other contribution	15	23.4	19	28.8

Note. Analysis based on responses from 64 scientists and 66 teachers.

Table 23 shows that the most common activities were related to scientists visiting the school to make presentations to students about their particular science topic and to also talk about careers in science. Other common contributions were supervising students' projects, generally assisting teachers and communicating with students. A few participants made clarifying comments about the activities and some mentioned that some activities were still to take place. Scientists who made a comment in the "other contribution" category usually referred to giving teachers information, ideas and activities , providing access to facilities or making further plans. Teachers' additional comments mainly referred to previously mentioned contributions or explained the lack of progress in partnership. This latter point is taken up in a later section.

Benefits of the Partnership to Students

Scientists and teachers were both asked about the benefits they perceived for students from the SiS partnership. A number of possible benefits had been suggested in the survey and agreement with these benefits is recorded in Table 24. Perceived benefits are ranked according to the frequency with which scientists responded "yes".

Table 24. Perceived Benefits of Partnership to Students

Perceived Benefit	Scientists' View		Teachers' View	
	Number	%	Number	%
Opportunity to see scientists as real people	61	95.3	63	95.5
Increased knowledge of contemporary science	54	84.4	57	86.4
Having fun	53	82.8	55	83.3
Increased awareness of science-related careers	52	81.3	52	78.8
Increased ability to ask questions about the world around them	51	79.7	47	71.2
Increased awareness of the nature of scientific investigation	49	76.6	49	74.2
Opportunity to experience science with practicing scientists	48	75.0	51	77.3
Increased ability to recognize and discuss science-related issues	36	56.3	41	62.1
Increased recognition of the importance of evidence on which to base decisions	33	51.6	32	48.5
Understanding the importance of science for decision-making in society	32	50.0	35	53.0
Increased willingness to question unsupported claims about health and the environment	31	48.4	22	33.3
Access to science equipment and/or facilities	29	45.3	35	53.0
Willingness to look to science to make decisions about their own health and well-being	28	43.7	27	40.9
Unsure of benefit to students	3	4.7	NA	
Other contribution	10	15.6	15	22.7

Note. Analysis based on responses from 64 scientists and 66 teachers.

It can be seen that there is considerable agreement between scientists and teachers about the benefit of the project to students. The percentage of agreement is high, over 70%, on most of the suggested benefits. The few suggested benefits with agreement less than 50% generally refer to the ability to take action or make decisions about matters which are more relevant to older students. Although these are important skills to develop, it is likely respondents recognised that such skills take a long time to develop. Nevertheless, some respondents made comments relating to their endeavours to put the science content into environmental and social contexts.

A few respondents added other contributions, but mostly these simply expanded on the benefits already suggested in the survey. A few remarked on increased confidence of students in asking questions and their enjoyment of the process.

Benefits of the Partnership to Partners Themselves

Scientists and teachers were asked what benefits they perceived for themselves through their participation in the SiS pilot project. As before, some potential benefits were suggested, and as these varied between scientist and teachers, the results are reported in separate tables. In the following tables, perceived benefits are ranked according to the frequency with which participants responded "yes".

Table 25. Scientists' Perceptions of the Benefits of Partnership to Themselves

Perceived Benefit to Scientist	Number	%
Opportunity to communicate with students	57	89.1
Enjoyment in working with students	57	89.1
Opportunity to communicate with teachers	56	87.5
Opportunity to promote science-related careers	51	79.7
Opportunity to promote public awareness of science	50	78.1
Enjoyment in working with teachers	49	76.6
Increased understanding of the community's awareness of science	47	73.4
Improved skills in communicating with students	46	71.9
Increased understanding of the community's perceptions of scientists and their work	45	70.3
Improved skills in communicating with teachers	41	64.1
Other benefit	9	14.1

Note. Analysis based on responses from 64 scientists.

Table 25 indicates high (70%) levels of agreement about the perceived benefits for participating scientists. In particular, scientists enjoyed working with teachers and with students, a benefit that figured largely in their reasons for joining the program. Further, they believed they were able to promote awareness of science and science-related careers.

Table 26 reports teachers' perceptions of the benefits to them of participating in the program. As might be expected by teachers volunteering to become part of SiS, the opportunities to communicate with and work with scientists, and the engagement of their students in science, were the greatest perceived benefits.

Table 26. Teachers' Perceptions of the Benefits of Partnership to Themselves

Perceived Benefit to Teacher	Number	%
Opportunity to increase engagement of students in science	60	90.9
Opportunity to communicate with scientists	58	87.9
Enjoyment in working with scientist	58	87.9
Ability to update current scientific knowledge	53	80.3
Ability to update knowledge of scientific practices/methods	51	77.3
Increased motivation/confidence to teach science	51	77.3
Increased awareness of science-related careers	46	69.7
Opportunities to communicate with other teachers about the project	45	68.2
Other benefit	13	20.3

Note. Analysis based on responses from 66 teachers.

Usefulness of the Website and Resources

Four questions on the survey asked respondents to rate the contents of the website and the support materials. A 4-point scale was provided for each question and the results are reported in Table 27.

Table 27. Scientists' Ratings of the Website and Resources (%)

Question	Negative end point	1	2	3	4	Positive end point	No response
Ease of registration	unfriendly	0.5	5.2	29.9	52.1	friendly	12.4
Adequacy of information	inadequate	0.5	6.7	35.1	44.8	adequate	12.9
FAQs on website	not useful	2.1	9.3	45.9	24.7	useful	18.0
Support materials	not useful	3.1	11.9	39.2	28.4	useful	17.5

Inspection of Table 27 shows a positive response to the website and resource materials, however there was a relatively high percentage of non respondents. Responses to the following question, which requested improvements for the website, suggested that most of the scientists not responding had not looked at the website, and consequently chose not to rate its contents.

The ratings of teachers, reported in Table 28, are rather more positive than those of the scientists, partly because the "no response" percentage was lower. It seemed that teachers were more likely to look at the website for resources than were the scientists.

Table 28. Teachers' Ratings of the Website and Resources (%)

Question	Negative end point	1	2	3	4	Positive end point	No response
Ease of registration	unfriendly	0.5	3.4	26.2	61.2	friendly	8.7
Adequacy of information	inadequate	0.5	3.4	29.6	57.8	adequate	8.7
FAQs on website	not useful	2.9	8.3	42.7	35.4	useful	10.7
Support materials	not useful	3.9	8.7	43.7	33.0	useful	10.7

The next question, asking "What additional information would you like to see on the website?", attracted responses from only about 20% of respondents. The suggestions made are reported in Table 29 for both scientists and teachers. This suggests general satisfaction with the website and its materials, although it was clear that some respondents had not given it close attention.

Table 29. Additions to the Website Suggested by Scientists and Teachers (%)

Suggested Addition to Website	Scientists' View		Teachers' View	
	Number	%	Number	%
Examples of activities for classroom	6	3.1	1	1.0
Examples of what other partnerships have done	5	2.6	12	5.8
General comment	5	2.6	11	5.3
Links to other resources	4	2.1	1	0.5
Message board for inter-partnership contact	4	2.1	2	1.0
Program aims, mission statement	2	1.0	-	-
Information about curriculum	2	1.0	-	-
Haven't looked at it	14	7.2	12	5.8
No response	152	78.4	166	80.6
Total participants	194	100.0	206	100.0

The most common suggested additions referred to examples of activities that could be done in the classroom (more common for scientists) and examples of what kinds of thing had been done in other partnerships (the most common suggestion from teachers). Some general comments of satisfaction with the project were offered, and requests for links to other resources and as means to contact other partnerships.

Satisfaction with Partnership

Several questions were asked about participants' satisfaction with their partnership and the likelihood of its continuation. First, respondents were asked "Were you happy with the way you were partnered?" and to make a comment about this. Table 30 shows the results for this question for scientists and teachers.

Table 30. Participants' Satisfaction With the Way They Were Partnered (%)

	Satisfied with the way partnered?			
Participants	No response	Yes	No	Partly
Scientists (n=194)	10.8	79.4	1.0	8.8
Teachers (n=206)	8.7	73.8	1.5	16.0

As Table 30 shows, three-quarters of participants were happy with the way they were partnered. Only 2 scientists and 3 teachers were not. Most scientists (150 of 194, or 77%) and teachers (131 of 206, or 64%) did not make a comment, presumably because they were satisfied with the process. More teachers than scientists were cautious, responding partly. Of this group, those that made comments usually referred to the need to have more consultation about the process, or more information about their potential partner. Others who responded "partly"referred to a long process or partnering too late in the year to get started. Some example responses follow.

> Not sure yet as we are yet to begin. We did ask for someone involved in sustainability and got a vet! [T107]
>
> I was partnered at the beginning of December and school finishes in 4 days. There was no point beginning something so late in the school year. [T93]
>
> My partner was changed - which seemed a bit awkward at first i.e. why after receiving my contact details did they want to change? [S113]
>
> It might have been better to have a list of teachers/scientists with rough idea of location and interests on the website, and contact SiS and indicate that you would like to be partnered with X teacher/scientist. [S190]

The next question on the survey asked respondents "In your view and overall, do you regard your partnership as satisfactory?" They were asked to provide a rating and an explanatory comment. Table 31 shows that teachers were more positive about the success of their partnership than were scientists, less than 10% of participants rated it as unsuccessful, and scientists were more likely to respond "partly" successful than were teachers. However, over a quarter of scientists and teachers did not rate the success of their partnership.

Participants were asked to make a comment to explain their response, but only about half (104 scientists and 106 teachers) did so. The usual reasons given by those who did not rate the success of their partnership were that it was too early in the partnership to comment, no progress had been made, or the partnership would start in 2008. The main reason given for choosing the

rating “unsuccessful” or “partly” also seemed to be that no progress had been made. Usually this was described as lack of follow-up by the partner, or progress being interrupted by other commitments. Many scientists who responded “partly” noted that it was too early to make a judgement.

Table 31. Participants’ Perceptions of the Success of Their Partnership (%).

	Is your partnership successful?			
Participants	No response	Yes	No	Partly
Scientists (n=194)	28.4	40.7	7.7	23.2
Teachers (n=206)	25.7	51.5	5.8	17.0

Most of those scientists and teachers who responded that their partnership was successful made no comment, a few said it was too early to say much, or that they would start in 2008, or simply made a general, positive comment about the project. Two scientists who responded that the partnership was successful but had not started were frustrated over delays in obtaining a police clearance.

Looking to the Future

Respondents were asked if they thought that their partnership would continue into 2008 and why, or why not. The results reported in Tables 32 and 33 for scientists and teachers, respectively, are generally positive, with the most common reason being that the activities of the partnership were planned to begin in 2008. In addition, some teachers and scientists made generally positive comments about the benefits of the partnership.

Table 32. Scientists' Perceptions of the Likelihood of Partnership Continuing into 2008

Reason for continuing or not	Partnership likely to continue?			
	No response	Yes	No	Perhaps
Circumstances will be different next year	0	0	2	7
No arrangements made	0	3	0	7
No progress made in 2007	1	2	0	5
Plan to start in 2008	1	20	0	1
Positive comment about continuing	0	26	0	2
No response	4	103	1	9
Total Responses	6 (3.1%)	154 (79.2%)	3 (1.5%)	31 (16.0%)

Table 33. Teachers' Perceptions of the Likelihood of Partnership Continuing into 2008.

Reason for continuing or not	Partnership likely to continue?			
	No response	Yes	No	Perhaps
Circumstances will be different next year	1	0	3	5
No arrangements made	0	1	0	2
No progress made in 2007	3	0	0	2
Plan to start in 2008	0	33	0	5
Positive comment about continuing	0	28	0	2
Not sure what could be achieved	0	0	0	1
Will continue with another partner	0	1	0	0
No response	6	104	1	10
Total Responses	10 (4.9%)	167 (81.1%)	4 (1.9%)	25 (12.1%)

Suggested Improvements to the SiS Pilot Project

The final question on the online survey asked, "How could the Scientists in Schools project be improved? For example, what could be done differently?" Around 40% of scientists and teachers made suggestions, and some made several. The results are summarised in Table 34, ranked in the order of frequency suggested by scientists.

Table 34. Scientists' and Teachers' Suggested Improvements for the SiS Pilot Project

Suggested Improvements	Scientists		Teachers	
	Number of suggestions	% of Scientists	Number of suggestions	% of Teachers
Funding to support program	17	8.8	7	3.4
Too early to make comment	14	7.2	19	9.2
Positive comment	10	5.2	11	5.3
More advertising of program to schools and scientists	9	4.6	3	1.5
Formal recognition (e.g. in workload) by employer of effort required	7	3.6	4	1.9
Provide updates on how the project is going, case studies, wiki	6	3.1	4	1.9
Publicize outcomes of the project	6	3.1	-	-
Have more than one partnership	4	2.1	5	2.4
Provide a register to enable short term contacts	3	1.5	3	1.5%
Need more information about what partner is willing to do	3	1.5	4	1.9
More consultation in matching	3	1.5	8	3.9
Would appreciate advice on how to present, activities	3	1.5	-	-
Need to start earlier, or at beginning of year	2	1.0	8	3.9
Face-to-face forums/networking organised by CSIRO	2	1.0	7	3.4
Too much paperwork, material	2	1.0	2	1.0
More follow-up to ensure partnerships are working	2	1.0	3	1.5
Need more time	2	1.0	3	1.5

Table 34 (cont'd). Scientists' and Teachers' Suggested Improvements for the SiS Pilot Project

Suggested Improvements	Scientists		Teachers	
	Number of suggestions	% of Scientists	Number of suggestions	% of Teachers
CSIRO have a webpage for students to post questions	1	0.5	3	1.5
Public secondary school participation	1	0.5	-	-
Can't force people to participate/scientists need to be motivated	1	0.5	1	0.5
Link with people close by	-	-	5	2.4
Pleased with materials	-	-	1	0.5
Difficulty fitting program to young children	-	-	3	1.5
No response	119	61.3	120	58.3
Total	217	111.9	228	110.7

Table 34 reports a range of comments, but the most common response related to it being too early to make suggestions of improvement. Some participants simply said that they hadn't started yet; one teacher said "I reserve my comments until we see how things develop" [T43]. A scientist pointed out that

> Giving the program more time to evolve and the participants more time to do things together before evaluating it would be crucial. The timing of this evaluation is unfortunate as I doubt whether many partnerships, particularly those that involve travel (thus regional ones) will be up and running to any great extent. [S85]

Related comments referred to the need to start earlier in the year:

> If I had arranged the partnership earlier in the year, then we would have been able to use the partnership more effectively. [T88]

Interestingly, more scientists than teachers requested funding to assist the project. Some example comments follow.

> Money is always going to be an issue especially when dealing with remote schools. I would be interested in visiting the remote school that I've been partnered with and I'm willing to donate my time but I don't think it is fair that scientists should be out of pocket for travel costs as well. [S34]

> The program is a good idea, some funding associated to provide resources would be great. The school I am working with doesn't have a science budget; they don't even have a beaker. [S92]

> Financial support. At the moment it is just charity work. I like to help children to learn, but it is an immediate cost to my own career and family time. Scraping about for funds to help support the endeavour is just one more complication that is a barrier in the way of actually reaching out to schools. [S174]

> Staff at school are extremely busy. I'm not sure how this project is funded. Is there release time for the staff member and scientist to get together and develop a plan? Good will alone will not get this project up and running. [T197]

Advertising was a common theme in the responses. Reference was made not only to the need to spread word about the project to encourage greater participation, but also reference to promoting the positive outcomes from participation and the achievements.

> Formal letters to managers/supervisors giving them some information about the project that their scientists are involved with, including the results of this poll, the extent of the project, etc. might be useful to lift the status of the project in the eyes of management. This could lead to them sending out requests for volunteers to join the project – far more effective than you or I asking for support. [S95]

> Obviously, it is a major imposition on scientists to invest time and energy in this project, and so this needs full recognition from SiS program. I suggest a photo and brief blurb for each scientist to be put on the website for public viewing. [S181]

> Formal partnerships between schools and scientists should be recognised and supported by the employers of these scientists. This should be allowed for in their work load and not rely on their good will and sacrifice as is the case with many activities that teachers do outside their teaching responsibilities. [T112]

Another theme related to improved access to information about other partnerships and opportunities for networking.

> It was not particularly clear what was involved, or the level of commitment required. In fact, I'm still not too sure what I have to do. But I'm sure I will find out early next year once the school year commences again. It would be nice to see some examples of how others have participated. Maybe this is available, but an executive summary is needed for those that have a busy schedule. [S29]

> A wiki for teachers and scientists to communicate and share their experiences may be useful. Also, teachers and scientists could put resources there for others to use, e.g. links to educational material. [S90]

> The symposium was a great opportunity. The cost limits opportunities. Possibly a State based symposium to exchange ideas. [T117]

Overall, the positive comments for this question, and the responses on many other questions in the online survey, indicate that the project had almost universal support from participants. Clearly there is opportunity to extend it. One teacher suggested

> Can we have one scientist per class? I work in a very big school and would love to see the project expanded so that every class had a scientist. [T191]

Summary, Conclusions and Recommendations

The Scientists in Schools pilot project has been in place for a single semester. In broad terms, its aims were to

1. bring the practice of real world science to students and teachers,
2. inspire and motivate teachers and students in the teaching and learning of science,
3. provide teachers with the opportunity to strengthen their knowledge of current scientific practices,
4. enable scientists to act as mentors or role models for students,
5. broaden awareness of the types and variety of careers available in the sciences,
6. enable teachers and scientists to share ideas and practices with other teachers and scientists, and
7. increase scientists' engagement with the broader community, thus raising public awareness of their work and its social and economic importance.

To achieve these aims, the project endeavoured to establish 500 scientist-teacher partnerships during that semester and organised a symposium to bring together members of 50 partnerships to network and to experience cutting edge science.

To the extent that such ambitions might be achieved in a very short period (in terms of the time frame required for educational change), the project was successful. This was due to the skills and expertise of the Project Team, including the IT skills needed to build the website and the database, and the enthusiasm and willingness of over 1000 Australian scientists and teachers.

A large amount of data about the project was collected by the evaluation team. These data included information gathered by interviews and close liaison with the Project Team; detailed interviews with 13 partnership pairs as case studies; a thorough evaluation of the outcomes of the symposium using a survey competed by 96 of the 102 scientists and teachers who attended; feedback from 110 primary and secondary students from metropolitan, regional and remote areas in four states; and a comprehensive online survey completed by a proportionally representative national sample of about one-third of registered participants. The findings from the analyses of these data were presented in the preceding pages. From them the following conclusions are drawn and recommendations made.

Conclusions

Number and Nature of Partnerships Established

The target of 100 scientists partnered with 100 schools by National Science Week (18-26 August 2007) was achieved, although not all partnerships were able to hold an event or meeting during National Science Week due to the short lead time.

The target of 500 scientist-teacher partnerships established in 500 schools by December 2007 was achieved. This in itself is an outstanding achievement. The predominant school level involved was upper primary and the most common curriculum area was Living Things, but there were partnerships in every discipline considered and at every school level. In those partnerships that had started, the most common type of contribution made by the scientists involved visits to the school to make presentations to students but, as revealed in the data from the case studies and the online survey, there was a large variety of interactions that had occurred and were planned to occur between scientists, teachers and students.

A major conclusion must be that there is no one, typical kind of partnership. The nature of the partnership depends on context, which is determined not only by the level of the students and the discipline area, but geographic factors, community issues, the structure of the school and the flexibility allowed by its timetable, facilities and willingness of staff, and the employment context of the scientists. In fact, the ability of the SiS pilot project to allow this kind of flexibility and variation in interaction is a major strength, because it allows both the scientist and the teacher to take ownership and control of their partnership.

Although 500 schools had partnerships in place by the end of 2007, only about one third had actually begun their activities. Many had made plans to begin in 2008, some simply had not had time to do much planning at all, and some were prevented by external factors such as delays in obtaining a police clearance for the scientists. This demonstrates the difficulty of making rapid change in schools. Teachers plan their program of work at least one term ahead, many plan a semester ahead and often a year ahead, and they simply do not have time to rework their lesson planning at short notice. For this reason alone, outcomes of the project should become more evident by the middle of 2008.

Contribution of the Symposium

The symposium was hailed as an outstanding success by all who attended. From the symposium evaluation form and the case studies, it was clear that both teachers and scientists found that attendance at the symposium increased their self knowledge, provided resources/ideas for teaching, provided excellent networking opportunities, inspired and enthused the participants, allowed the participants to find out about other partnerships, provided information on how to engage students and make science more accessible, demonstrated the types of research that CSIRO was doing, illustrated the importance and necessity of community scientific literacy, and provided an ideal opportunity to become more familiar with their partner.

The symposium had been designed to achieve three outcomes, first to inform and inspire teachers about contemporary scientific research, second, to inform and inspire scientists about contemporary school science education, and third, to better integrate contemporary scientific research into classrooms. In terms of these outcomes, the first two were successfully achieved. However, the achievement of the third outcome could not easily be addressed because many teachers had not started their SiS program of work. In the longer term it is likely this outcome will be achieved because the attending teachers had plans to integrate contemporary science into their classroom in the future.

The importance of the symposium in providing face-to-face contact between the teacher and the scientist cannot be over-emphasised. It illustrated the advantage of bringing the partners together, enabling them to “kick-start’ their partnership and building the relationship between them.

Effectiveness of the Website and Database

The attractive, uncluttered appearance of the SiS website and its user-friendliness drew high levels of satisfaction from the respondents to the online survey. Although there was also strong endorsement for the support materials, it is likely that they have not yet been well-used, due to lack of time. Obviously there is potential for further development, and suggestions were made by scientists and teachers during the case studies and in the online survey. These suggestions form part of the recommendations.

The effectiveness of any database is dependent upon its flexibility in interrogation, simplicity in recording and updating information, flagging activities for follow-up, and allowing merged correspondence to facilitate communication between the Project Team and project participants. Operationally the database worked extremely well, helping the project to run on time, and interviews with the Project Team indicated satisfaction with its performance.

The registration and matching process was effective in terms of its procedures and was generally endorsed by respondents to the online survey. The monitoring process was limited due to the short time frame of the pilot program and the limited number of staff involved in the project, but also received support from respondents. Of course, the database is invisible to the participants, and only a very few participants felt they had been left uninformed. Sometimes this could be attributed to failure to notice communications sent to them, and the team increased their surveillance of communication and implemented speedy follow-ups.

Challenges Experienced and Steps Taken to Overcome Them

The major challenge was to get partnerships up and running in the short time frame provided. In fact, the target number of partnerships formed was achieved, and the great majority are operational, in the sense that planning is in place. However, the time frame, particularly for those participants who were matched late in the year, precluded the start of activities in many partnerships. This is simply a matter of time required.

In terms of getting partnerships set up, the process was described fully in a flowchart presented in Table 3. A major challenge was finding sufficient registrants in the appropriate locations and discipline areas that would allow all registrants to be matched. A particular issue was finding scientists for teachers in (some) regional and outer metropolitan areas. Efforts made to overcome this challenge included cold-calling local sources of scientists (including businesses and local government) and general promotion of the project to professional associations and national science organisations to encourage more registrants. A further challenge was finding teachers for scientists in (some) inner-metro areas. Here efforts were made by contacting appropriate schools directly and by contacting education offices for all sectors to seek their support in publicising the project and its needs.

A significant challenge was finding time to follow up partnerships after creation. To a large extent this was a matter of staff time, because the database was efficient in keeping track of registrants and the matching process. Despite the pressures of time however, all partnered scientists and teachers were contacted in 2007, and all unmatched registrants were informed of progress by the end of the school year.

The police check process was also a challenge, with logistical arrangements and time involved being more challenging than anticipated. This was exacerbated by a change of policy within the Australian Federal Police (AFP) Criminal Records section in November, which resulted in delays in processing while the AFP determined whether or not to charge a fee for their (previously complimentary) services. The resultant policy decision to charge for police checks will need to be factored in to future budgets.

A final challenge was to encourage the involvement from some large science organisations, because these are major sources of scientists. The Project Team continued to follow-up and use different contact points for the organisation to increase opportunities for their participation. Australia's Chief Scientist, Dr Jim Peacock, used every opportunity to promote the project and to encourage participation in it. This involvement of the Chief Scientist as champion of the project was influential in obtaining the support of decision makers in science

organisations. Where organisations actively supported and promoted staff involvement in SiS, the level of participation was significantly higher.

Another avenue exploited was to ask existing scientist partners to use their own SiS experiences to encourage colleagues to join. This was particularly effective in professional associations.

In general terms, projects such as the SiS pilot project are limited by staff time available and resources such as the database and means for publicising to encourage and support project participation. Given the resources available and the effective database, the Project Team were able to overcome most challenges except for that of time.

Significant Outcomes and Achievements

As noted above, the SiS pilot project had seven specific aims concerning the promotion of science, science education and interest in science careers through partnerships of scientists and teachers. There was a convergence of data obtained from all sources to support the following conclusions.

All participants in working partnerships benefited from the project. Teachers benefited by increased knowledge and understanding of real-world, contemporary science; increased opportunities for professional learning through communication with scientists and other teachers; increased access to resources; increased awareness of the types and variety of careers available in the sciences; and increased motivation. Scientists benefited through communication with teachers and other scientists about their work; improved methods of communication with students; increased motivation and enthusiasm in their job; legitimisation of the partnership in their workplace; and better understanding of the community's awareness and perceptions of science, scientists and their work. Students benefited by increased knowledge and understanding of real-world, contemporary science; opportunities to experience real science with real scientists; and an increased awareness of the types and variety of careers available in the sciences.

These achievements cover the first six aims of the SiS pilot project. The seventh aim, to increase scientists' engagement with the broader community, thus raising public awareness of their work and its social and economic importance, could be only partly achieved in the short time frame. Although the activities of a few partnerships had moved beyond the school to involve the community, it is difficult to measure the effect on the public in such a short period.

The caveat that must be placed on the description of these positive outcomes is that these benefits could only be achieved in functioning partnerships. Many partnerships had not begun, and although planning was bringing some benefits to fruition, many outcomes will need to be determined at some future date when partnerships have had time to mature.

Recommendations

Continuation of the SiS Project

There is strong support from all data sources for the continuation of the SiS project. In fact it will continue at least into 2008 because many of the partnership activities will not begin until the new school year gets underway. However, without continued support from the Project Team, a proportion of these partnerships would be expected to wilt and fail to realise their potential. It was clear from the suggested improvements from the respondents to the online survey that some external support of the project is valuable, even if it is as little as having a project to legitimise the interactions that spontaneously take place between some schools and

local scientists. A small amount of funding to cover costs presently borne by the scientists and teachers themselves was a legitimate suggestion from a number of respondents.

The major recommendations are presented below in three major areas.

Maintaining and Extending the Website

The website has served its purpose effectively in the short term but needs extension to include additional information and resources for both teachers and scientists. Important additions would include

1. Case studies of successful partnerships to provide ideas for teachers and scientists about what is possible. The Project Team is currently adding case studies to the website.
2. Testimonials from participants which can alert other participants to effective and less effective approaches and activities.
3. A means to allow communication between SiS participants to enhance the spread of information as well as encourage exchange of current information amongst participants and the Project Team.
4. Resources, such as examples of activities that have worked, or particular programs/approaches that have been tried and "debugged".
5. Concise guidelines to provide information for scientists about
    a. Developmental stages of children (lower primary, middle primary, upper primary, lower secondary, senior secondary) in relation to science so that scientists can understand at what stage certain aged children are likely to be.
    b. The place of abstract versus concrete examples to facilitate explanation.
    c. Information on an inquiry approach to teaching and learning (similar to the approach taken in the national science package *Primary Connections*[2] and the CREST program operated by CSIRO). The inquiry approach highlights the importance of taking children's questions and assisting them in answering those questions rather than the scientists just providing the answers. This approach emphasises both the product and the process of science.
    d. The place of children's prior knowledge and their alternative conceptions in understanding and constructing meaning from new information.
    e. Hints on how to communicate effectively with school students, particularly primary students.
    f. How to provide simple yet accurate answers to questions.

Supporting Partnerships

Increased Promotion of the Program

Providing support to partnerships requires promotion of the program to ensure that there are sufficient partners in appropriate areas to ensure that those scientists and teachers who wish to join a partnership are able to do so. It also requires promotion of the outcomes of the project in terms of attaining publicity from various media outlets. Some partnerships during 2007 managed to obtain significant coverage of their activities from local press which gave kudos not only to the students, teachers and schools, but also to the scientist and his/her participating organisation.

[2] Australian Academy of Science. (2005). *Primary Connections: Linking science with literacy.* Canberra: Australian Academy of Science.

Providing Opportunities for Face-to-face Networking

The success of the symposium led to support for its continuation but its cost limits the number of national conferences that could be held. A symposium or other kind of formal gathering should be held on a regular basis. A possible model is to have a national symposium every two years, with state/regional symposiums every year.

The structure for formal gatherings could be similar to the 2007 symposium, where a topic is chosen that has national significance. Scientists could provide short presentations on 'hot' topics, with these being backed up with case studies on how such information was implemented in a classroom situation. The proportion of scientist/teacher presentations should be half and half. More time should be allocated during the gathering to planning between partners and discussion of (positive and negative) issues between partnerships.

Additional opportunities should be provided for face-to-face networking by promoting informal gatherings on a local basis. These might be relatively unstructured, but based around some significant activity, such as the visit of a scientist or significant person to provide a science-related focus, and then all partnerships (or aspiring partners) could attend and network over coffee.

This approach was trialled in a number of events in northern and central Queensland in November 2007. One event (at James Cook University in Townsville) had a networking focus, while others (in Rockhampton, Emerald, Bundaberg and Mackay) had a promotional focus. All were successful and are worthy of repeating in other areas.

Monitoring Partnerships

Because of school programs and scientists' work schedules, there are always downtimes, or lulls in partnership activities. To prolong partnerships some kind of regular communication needs to occur during these times to maintain the relationships. This may simply be a matter of "touching base". Alternatively, once the scientist has been introduced to the school (even if the activities are not yet due to start) a link has been made and students could, through their teacher, email their scientist for information and advice. Sufficient resources are needed by the Project Team to follow-up when partnerships are formed to ensure that early downtime does not lead to partnership failure through loss of communication.

Examples of Successful Partnerships

The provision of case studies and other material documenting partnerships has already been mentioned in terms of the website, as this is the easiest way to make them available. However their importance in supporting partnerships to give ideas to get started and avoid pitfalls is a very important means of providing support to maintain and develop partnerships.

Continued Evaluation

It has been established that in its short time of operation the SiS pilot project has had remarkable success in getting partnerships established and those that have begun activities have done so successfully. However, the majority of partnerships have yet to begin their interactions, and so a further evaluation should take place towards the end of 2008 to assess the success of the project on a wider base. In addition, the longevity of partnerships and the factors that influence longevity are as yet unknown. Longitudinal studies are required to provide information on these matters and hence to ensure that the project continues to operate in an effective and efficient manner.

List of Appendices

Appendix 1. Energy and Climate Change Symposium Program

Scientists in Schools: Energy and Climate Change Symposium

25 & 26 October 2007
CSIRO Energy Centre, Murray Dwyer Circuit, Mayfield West, Newcastle

Thursday 25 October 2007

8.30 onwards	**Registration** (coffee available from 9.00am)
9.00	**Building tour 1** (45 minutes)
10.00	**Opening address** Dr Jim Peacock AC Chief Scientist of Australia

Session 1 Chair: Dr Jim Peacock

10.15	**The energy-climate change nexus** Dr David Brockway Chief, CSIRO Energy Technology
10.45	Questions and discussion
11.00	**Morning tea**
11.30	**Climate change – the latest news** Paul Holper, CSIRO Marine and Atmospheric Research
12.00	Questions and discussion
12.15	**Panel: Low emissions electricity – solar/clean coal/nuclear** Tania Ritchie/Dr Jim Smitham/ Professor John O'Connor
12.45	Questions and discussion
1.15	**Lunch** **Building tour 2**

Session 2 Chair: Marian Heard

2.15	**CSIRO Energy Centre** James McGregor, CSIRO Energy Technology
2.35	Questions and discussion
	Education initiatives
2.45	**Alternate energy – a hydrogen fuel-cell vehicle** Bob Heath, Eastern Fleurieu School, South Australia
3.00	**Making a difference** Nola Smith, Esperance Primary School, Western Australia
3.15	**Breakout discussion 1** 10 groups of 10 (5 teacher-scientist pairs with a facilitator/recorder) Each pair has 10 minutes to discuss what they're doing in their Scientists in Schools partnership. Questions to cover could include: What's worked (or planned)? What hasn't worked? How will the partnership be sustained?
4.15	**Scientists in Schools overview and curriculum resources**
4.45	**Building tour 3**
5.00	First bus departs for accommodation
5.30	Second bus departs for accommodation
7.00	**Dinner at Newcastle City Hall** Guest speaker: Pete Dormand, Newcastle City Council

Friday 26 October 2007

8.15 Bus departs Travelodge for Energy Centre

Session 3 Chair: Peta Ashworth

9.00 **The heat is on : Impacts of climate change on Australia's biodiversity**
Linda Beaumont
Macquarie University
9.40 Questions and discussion

10.00 **Australian Sustainable Schools Initiative (AuSSI)**
Mark Caddey and Christine Prietto
Department of Education and Training, NSW
10.20 Questions and discussion

10.30 **Biofuels in Australia – issues and prospects**
Dr Deborah O'Connell
CSIRO Sustainable Ecosystems
10.50 Questions and discussion

11.00 **Morning tea**

Session 4 Chair: Steve Speer

11.30 **Intelligent energy management**
Dr Glenn Platt
CSIRO Energy Technology
11.50 Questions and discussion

12.00 **Waste heat and distributed energy**
Dr Stephen White
CSIRO Energy Technology
12.20 Questions and discussion

12.30 **Lunch**

Session 5 Chair: Ross Kingsland

1.30 **Energy futures research**
Paul Graham
CSIRO Energy Transformed Flagship
2.00 Questions and discussion

2.15 **Breakout discussion 2**
Discussion: How might we better integrate contemporary scientific research into our schools? What role can Scientists in Schools play in this?

3.15 **Closing remarks**
Dr Jim Smitham
Deputy Chief, CSIRO Energy Technology

3.30 **Close**

Appendix 2. Symposium Evaluation Questionnaire Form

Scientists in Schools (SiS)
Energy and Climate Change Symposium, October 25-26, 2007
Evaluation Form

I am a: registered SiS teacher / registered SiS scientist / other (please circle one)

1. Did you enjoy the symposium? Yes / No

2. What are the main points that you will take away from the symposium?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

3. Should SiS have a symposium next year? Yes / No

Why / Why not?

_____

_____

_____

_____

_____

_____

Appendix 3. Interview Schedule for Case Studies

1. Please describe your partnership/context for partnership.

2. How is your partnership progressing? Has the nature of it changed for the better/worse? Would you like the partnership to continue into next year?

3. How does this project benefit the school students?
    a. Knowledge and understanding of the real world, contemporary science
    b. Opportunities to experience scientists as role models/mentors
    c. Awareness of the types and variety of careers available in the sciences

4. How does this project benefit you the teacher?
    a. Knowledge of current science and scientific practices
    b. Opportunities for professional learning through communication with scientists and other teachers
    c. Awareness of the types and variety of careers available in the sciences

5. How does this project benefit you the scientist?
    a. Opportunities to communicate with teachers, students and other scientists about their work
    b. Understanding of the community's awareness and perceptions of science, scientists and their work
    c. Methods of communication with students and their work

6. How could we improve this project for next year?

7. What do you think you will get out of the symposium? OR What did you get out of the symposium?

Appendix 4. Student Survey Form – Primary Students

Upper primary students' evaluation of the Scientists in Schools Project

Year level: _____ Topic: _____ Sex: Male / Female

1. What did you learn from the scientist?

_____

_____

_____

_____

2. What was it like working with a real scientist?

_____

_____

_____

_____

3. What different science careers did you learn about?

_____

_____

_____

_____

4. Did the scientist make you more interested in becoming a scientist? Yes / No

Why / Why not?

_____

_____

_____

Lower primary students' evaluation of the Scientists in Schools Project

We would like to collect some data about young children's experiences with the scientist. This can be difficult for children with limited writing skills. For your own interest you might like to try one of the following techniques. If you do, we would be delighted to receive a copy of the results. If you do send us any information, please also include the year level, topic studied, and the number of boys and girls in your class.

Method 1: Y-chart
Please complete a Y-chart with your class (i.e., divide your recording sheet into three sections). Ask the students to respond to the following three questions, and write answers directly onto the chart. Please feel free to modify these questions to suit your class.

1. What did you learn from the scientist?
2. What was it like working with a real scientist?
3. What different science careers did you learn about?

Method 2: Class brainstorm
Using a class brainstorm, please ask the students this question, and record all answers on a chart.

Do you want to be a scientist? Why / Why not?

Method 3: Students draw a picture
Please ask the children to draw a picture of their favourite part of working with a scientist. Also ask them to describe what they have drawn. If necessary, please annotate the picture accordingly. Please indicate the student's age and boy/girl on the picture. Please send photocopies of the pictures to us.

Appendix 5. Student Survey Form – Secondary Students

Secondary Students' views of the Scientists in Schools Project

Year level: _____ Topic: _____ Sex: Male / Female

1. Did working with the scientist increase your knowledge or understanding of science?
Yes / No

If yes, please give specific examples of something that you learnt.

_____

_____

_____

_____

2. Please give an example of how the scientist worked with you and your classmates.

_____

_____

_____

_____

3. Did working with the scientist increase your interest in having a career in science?
Yes / No

Why was this?
_____

_____

_____

4. Did working with the scientist increase your awareness of the variety of careers available in science? Yes / No

If yes, please give an example of a science-related career that you learnt about.

_____

_____

Appendix 6. Online Survey for Scientists

Scientists in Schools

Home
Contacts

Information for scientists

Online survey for scientists

Please use this form to complete our online survey. If you are involved in more than one partnership, and you consider these partnerships to have worked in different ways, please fill in a survey for each partnership. For more details about Scientists in Schools, read the information for scientists.

Note: If you are a **teacher**, please use the teacher survey.

A. Description of school involved in partnership

State: select...

Location: select...

Type of school: select...

How much travel is involved to reach the school or venue?: select...

B. Describing partnership

Why did you decide to participate in this project?

Please indicate the subject area(s) and level(s) that are involved in the partnership:

	Year level(s) of interest				
Subject area(s) of interest	Lower Primary	Middle Primary	Upper Primary	Junior Secondary	Senior Secondary
Earth & Space	☐	☐	☐	☐	☐
Living Things	☐	☐	☐	☐	☐
Energy & Force	☐	☐	☐	☐	☐
Matter	☐	☐	☐	☐	☐
Mathematics	☐	☐	☐	☐	☐
Engineering & Technology	☐	☐	☐	☐	☐

How long has your partnership been in operation?: select...

What are the means of communication between scientist and teacher?

Email	○ rarely	○ sometimes	○ usually
Telephone	○ rarely	○ sometimes	○ usually
Face-to-Face	○ rarely	○ sometimes	○ usually

Fax	○ rarely	○ sometimes	○ usually
Did you attend an event related to the Scientists in Schools Project?	☐ Newcastle symposium ☐ Queensland workshops		
Have you started running activities with your partner teacher yet?	○ Yes ○ **No — If no, please skip ahead to Section E**		

Which of the following activities have been used during the partnership?

Contribution of scientist			Comments/Explanation
(1) Presentation to parents or teachers about science	○ Yes	○ No	
(2) Judge a science competition	○ Yes	○ No	
(3) Make presentation to students in class room about careers in science	○ Yes	○ No	
(4) Visit classroom to interact with students	○ Yes	○ No	
(5) Lead students in tour of facility	○ Yes	○ No	
(6) Lead students in field trip	○ Yes	○ No	

(7) Participate in teleconference with students	○ Yes	○ No	
(8) Answer students' email questions	○ Yes	○ No	
(9) Supervise student(s) in a project	○ Yes	○ No	
(10) Mentor teacher in discipline	○ Yes	○ No	
(11) Assist teacher in classroom	○ Yes	○ No	
(12) Assist teacher on field trip	○ Yes	○ No	
(13) Support a science club	○ Yes	○ No	
(14) Other activity: please describe			

C. Benefits of the partnership for students

Based on your observations of the students, what do you think are the main benefits for the students?

Benefit to student			Comments/Explanation
(1) Increased knowledge of contemporary science	○ Yes	○ No	
(2) Opportunity to see scientists as real people	○ Yes	○ No	
(3) Opportunity to experience science with practising scientists	○ Yes	○ No	
(4) Increased awareness of science-related careers	○ Yes	○ No	
(5) Understanding the importance of science for decision-making in society	○ Yes	○ No	
(6) Increased ability to recognize and discuss science-related issues	○ Yes	○ No	
(7) Increased ability to ask questions about the world around them	○ Yes	○ No	
(8) Increased willingness to question unsupported claims about health and the	○ Yes	○ No	

environment			
(9) Willingness to look to science to make decisions about their own health and well-being	○ Yes	○ No	
(10) Increased recognition of the importance of evidence on which to base decisions	○ Yes	○ No	
(11) Access to science equipment and/or facilities	○ Yes	○ No	
(12) Increased awareness of the nature of scientific investigation	○ Yes	○ No	
(13) Having fun	○ Yes	○ No	
(14) Unsure of benefit to students	○ Yes	○ No	
(15) Other benefit: please describe			

Please give a specific example to illustrate any of the above.

D. Benefits to you as the scientist in the partnership

Are any of the following of benefit to you?

Benefit to you			Comments/Explanation
(1) Opportunity to communicate with teachers	○ Yes	○ No	
(2) Improved skills in communicating with teachers	○ Yes	○ No	
(3) Opportunity to communicate with students	○ Yes	○ No	
(4) Improved skills in communicating with students	○ Yes	○ No	
(5) Increased understanding of the community's awareness of science	○ Yes	○ No	
(6) Increased understanding of the community's perceptions of scientists and their work	○ Yes	○ No	

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(7) Opportunity to promote science-related careers	○ Yes	○ No	
(8) Opportunity to promote public awareness of science	○ Yes	○ No	
(9) Enjoyment in working with teachers	○ Yes	○ No	
(10) Enjoyment in working with students	○ Yes	○ No	
(11) Were there any other benefits to you? Please describe.			

Please give a specific example(s) of something that is working really well in the partnership.

Please give a specific example(s) of something that is not working well in the partnership. Please say how you think it could be improved.

file://C:\DOCUME~1\yun008\LOCALS~1\Temp\KYLJRC7H.htm 25/01/2008

E. Usefulness of website and resources

Please rate the website and support materials.

Ease of registration	unfriendly	○ 1	○ 2	○ 3	○ 4	friendly
Adequacy of information to decide whether or not to participate	inadequate	○ 1	○ 2	○ 3	○ 4	adequate
FAQs on website	not useful	○ 1	○ 2	○ 3	○ 4	useful
Support materials	not useful	○ 1	○ 2	○ 3	○ 4	useful

What additional information would you like to see on the website?

Were you happy with the way you were partnered with a teacher?	○ Yes	○ No	○ Partly	comments...
In your view and overall, do you regard your partnership as successful?	○ Yes	○ No	○ Partly	comments...

F. Looking to the future

Is your partnership likely to continue next year?	○ Yes	○ No	○ Perhaps	why or why not?
If not, would you be willing to be involved in another partnership?	○ Yes	○ No	○ Perhaps	why or why not?
How could the Scientists in Schools project be improved? For example, what could be done differently?	comments...			
Please make any additional comments you would like.	comments...			

Submit Form Reset

Appendix 7. Online Survey for Teachers

Scientists in Schools

Home
Contacts

Information for teachers

Online survey for teachers

Please use this form to complete our online survey. If you are involved in more than one partnership, and you consider these partnerships to have worked in different ways, please fill in a survey for each partnership. For more details about Scientists in Schools, read the information for teachers.

Note: if you are a **scientist**, please use the scientist survey.

A. Description of school involved in partnership

State: select...

Location: select...

Type of school: select...

Year levels at school: select Lowest level... / select Highest level...

B. Describing partnership

Why did you decide to participate in this project?

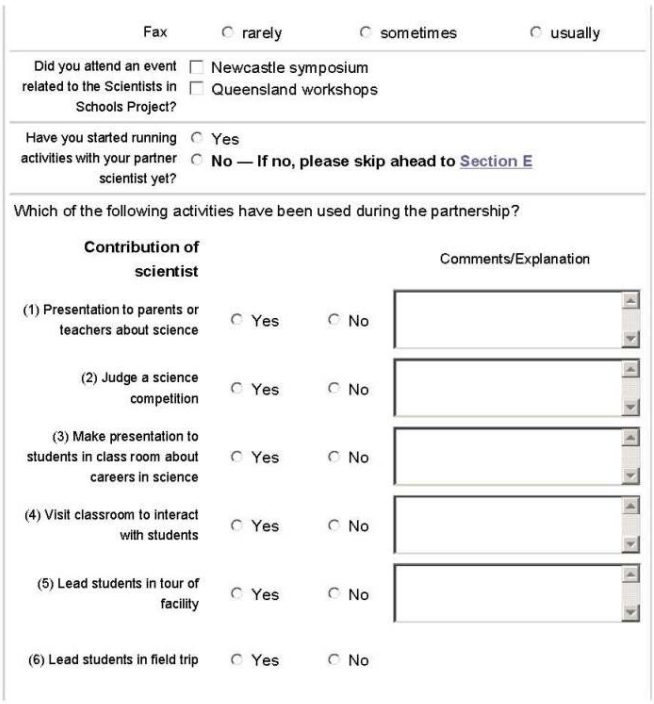
Please indicate the subject area(s) and level(s) that are involved in the partnership:

	Year level(s) of interest				
Subject area(s) of interest	Lower Primary	Middle Primary	Upper Primary	Junior Secondary	Senior Secondary
Earth & Space	☐	☐	☐	☐	☐
Living Things	☐	☐	☐	☐	☐
Energy & Force	☐	☐	☐	☐	☐
Matter	☐	☐	☐	☐	☐
Mathematics	☐	☐	☐	☐	☐
Engineering & Technology	☐	☐	☐	☐	☐

How long has your partnership been in operation? select...

What are the means of communication between scientist and teacher?

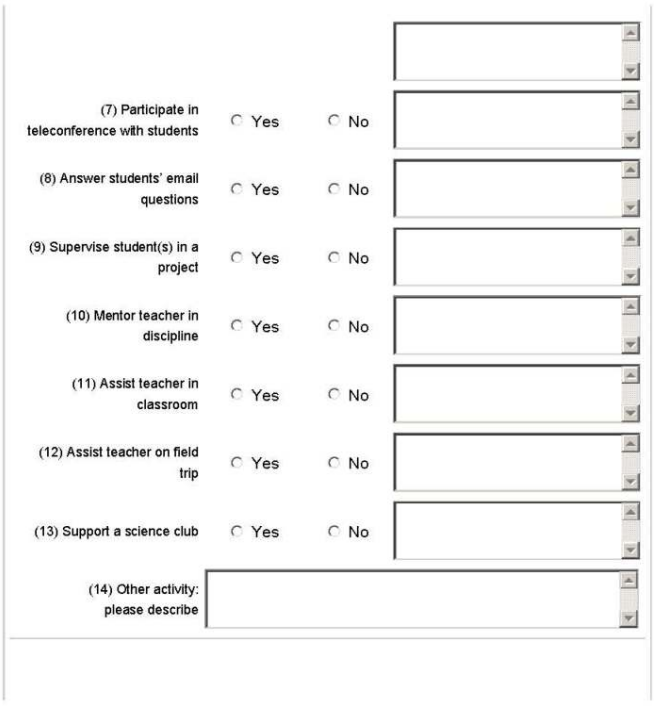
Email	○ rarely	○ sometimes	○ usually
Telephone	○ rarely	○ sometimes	○ usually
Face-to-Face	○ rarely	○ sometimes	○ usually



Fax	○ rarely	○ sometimes	○ usually
Did you attend an event related to the Scientists in Schools Project?	☐ Newcastle symposium ☐ Queensland workshops		
Have you started running activities with your partner scientist yet?	○ Yes ○ **No — If no, please skip ahead to Section E**		

Which of the following activities have been used during the partnership?

Contribution of scientist			Comments/Explanation
(1) Presentation to parents or teachers about science	○ Yes	○ No	
(2) Judge a science competition	○ Yes	○ No	
(3) Make presentation to students in class room about careers in science	○ Yes	○ No	
(4) Visit classroom to interact with students	○ Yes	○ No	
(5) Lead students in tour of facility	○ Yes	○ No	
(6) Lead students in field trip	○ Yes	○ No	



(7) Participate in teleconference with students	○ Yes	○ No	
(8) Answer students' email questions	○ Yes	○ No	
(9) Supervise student(s) in a project	○ Yes	○ No	
(10) Mentor teacher in discipline	○ Yes	○ No	
(11) Assist teacher in classroom	○ Yes	○ No	
(12) Assist teacher on field trip	○ Yes	○ No	
(13) Support a science club	○ Yes	○ No	
(14) Other activity: please describe			

C. Benefits of the partnership for students

Based on your observations of the students, what do you think are the main benefits for the students?

Benefit to student			Comments/Explanation
(1) Increased knowledge of contemporary science	Yes	No	
(2) Opportunity to see scientists as real people	Yes	No	
(3) Opportunity to experience science with practising scientists	Yes	No	
(4) Increased awareness of science-related careers	Yes	No	
(5) Understanding the importance of science for decision-making in society	Yes	No	
(6) Increased ability to recognize and discuss science-related issues	Yes	No	
(7) Increased ability to ask questions about the world around them	Yes	No	
(8) Increased willingness to question unsupported claims about health and the environment	Yes	No	

(9) Willingness to look to science to make decisions about their own health and well-being	Yes	No	
(10) Increased recognition of the importance of evidence on which to base decisions	Yes	No	
(11) Access to science equipment and/or facilities	Yes	No	
(12) Increased awareness of the nature of scientific investigation	Yes	No	
(13) Having fun	Yes	No	
(14) Other benefit: please describe			

Please give a specific example to illustrate any of the above.

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D. Benefits to you as the teacher in the partnership

Are any of the following of benefit to you?

Possible benefit to you			Comments/Explanation
(1) Opportunity to communicate with scientists	○ Yes	○ No	
(2) Ability to update current scientific knowledge	○ Yes	○ No	
(3) Ability to update knowledge of scientific practices/methods	○ Yes	○ No	
(4) Opportunities to communicate with other teachers about the project	○ Yes	○ No	
(5) Increased awareness of science-related careers	○ Yes	○ No	
(6) Opportunity to increase engagement of students in science	○ Yes	○ No	
(7) Increased motivation/confidence to teach science	○ Yes	○ No	
(8) Enjoyment in working with the scientist	○ Yes	○ No	

(9) Were there any other benefits to you? Please describe.

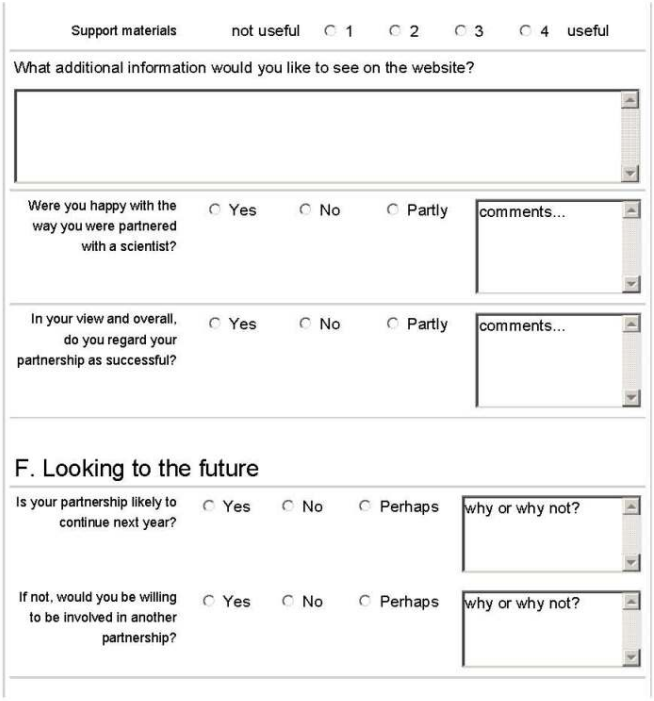
Please give a specific example(s) of something that is working really well in the partnership.

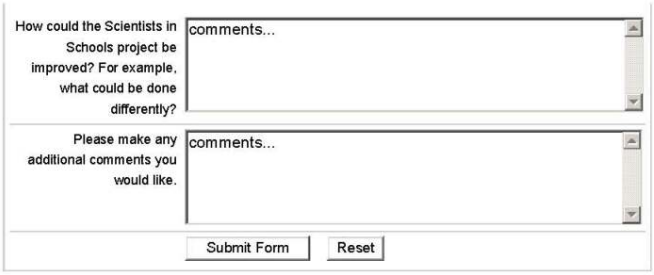
Please give a specific example(s) of something that is not working well in the partnership. Please say how you think it could be improved.

E. Usefulness of website and resources

Please rate the website and support materials.

Ease of registration	unfriendly	○ 1	○ 2	○ 3	○ 4	friendly
Adequacy of information to decide whether or not to participate	inadequate	○ 1	○ 2	○ 3	○ 4	adequate
FAQs on website	not useful	○ 1	○ 2	○ 3	○ 4	useful





Appendix 8. Detailed Case Study of "Esperance Energisers"

Note. This article has been submitted to SCIOS (Journal of the Science Teachers' Association of Western Australia) for publication. It is used below with consent from the Editor.

'Esperance Energisers' – Empowering your students!

By Nola Smith (Deputy Principal, Esperance Primary School)

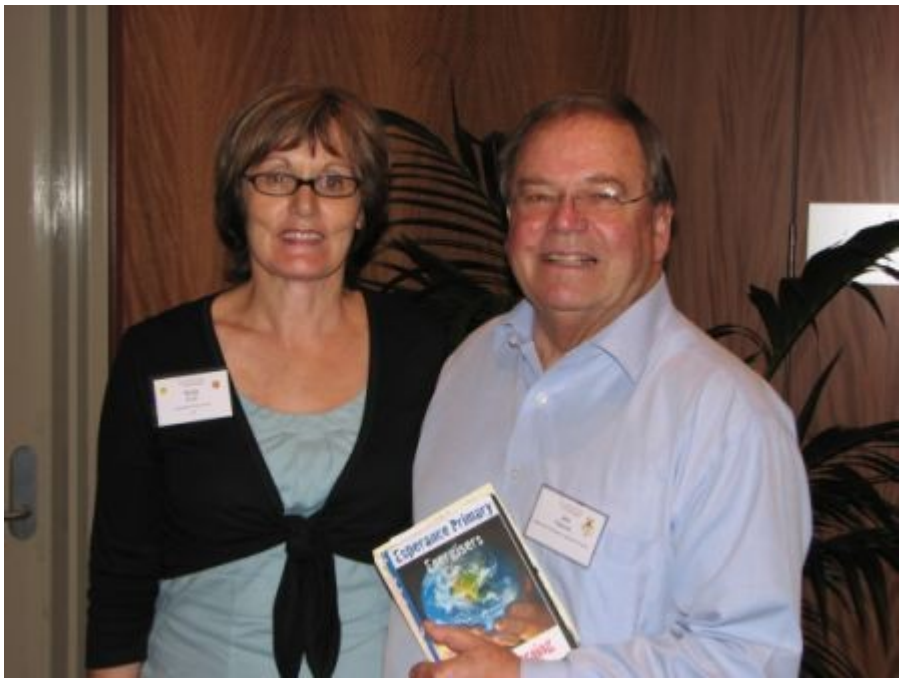


Figure 1: Nola Smith with Australia's Chief Scientist, Dr Jim Peacock holding the "Esperance Energisers" DVD

Background

This article presents a case study from the Scientists in Schools (SiS) project. The thrn Australian Government Department of Education, Science and Training provided funding to the CSIRO for a national pilot SiS project during Semester 2, 2007. This project allows scientists to develop ongoing partnerships with school communities in a flexible manner that suits both partners. The aims of the project are to promote science education in primary and secondary school, help to engage and motivate students in their learning of science, and broaden the awareness of the types and variety of careers available in science. To date, there are over 560 partnerships across Australia. Additional information on SiS can be found at www.scientistsinschools.edu.au

Esperance Energisers

I am the Deputy Principal at Esperance Primary School. The school has 450 students and is quite isolated, being 700 km away from Perth on the South East Coast. I believe I am lucky to live in one of the most beautiful places in Australia. Esperance is a small coastal town of 12,500

people, with pristine beaches and the coldest water anywhere in Australia. Maybe because of this we are very protective and proactive with the environment. We are very supportive and proud that the town's electricity is supplied by a new gas fired power station and supplemented by a wind farm.

I would like to introduce you to 10 very astute and passionate Year 6 and 7 students, and share with you their climate change journey. I hope that this journey will inspire and encourage other teachers and their schools to become proactive about climate change within their schools, homes and community, and in so doing develop scientific literacy across the entire community.

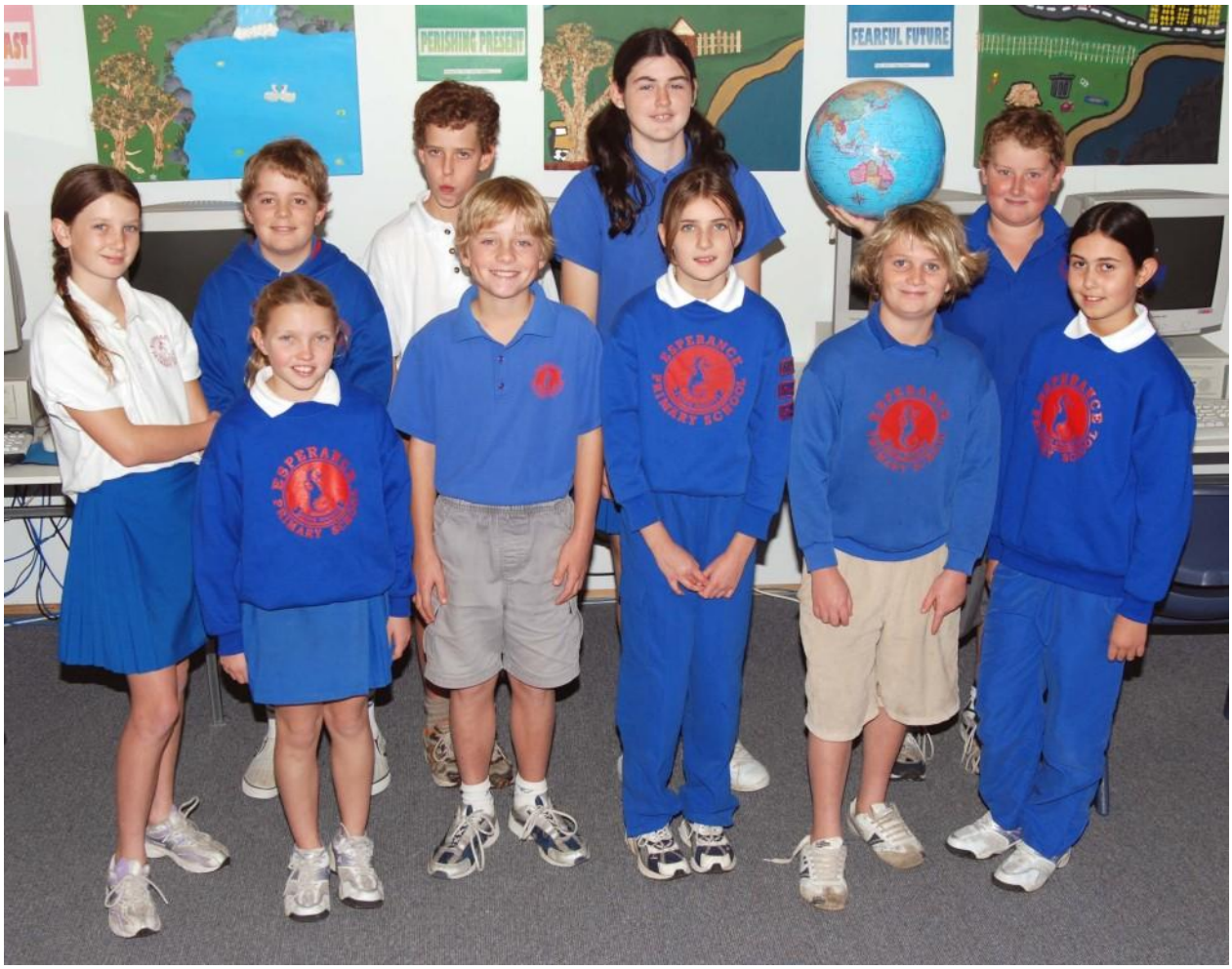


Figure 2: The students who took part in "Esperance Energisers".

The student's journey started in April, 2007 when, as Gifted and Talented students, they chose to participate in a year long course called "Esperance Energisers". The fact that this topic was their first choice illustrated that they had a keen interest in the environment right from the start. I had decided to offer this course after watching 'An Inconvenient Truth' and wanting to find out more about the topic. I realised this topic could provide an area of work where the students could do some exciting and relevant investigations, allowing them to be totally involved in the work.

By coincidence, a teacher at the school suggested her brother should come and talk to the children. His name is Brian Dawson, and he was an advisor to the United Nations on climate change. Brian now works for the Australian Greenhouse Office in Canberra. He just happened to be in Esperance for a visit, so I decided to take advantage of the situation. Brian visited the

students on our very first session of Energisers. Drawing only on their background knowledge, the students asked Brian some very relevant and pertinent questions about climate change and how to conduct research into the area. Whatever they asked, Brian gave them a fully explained answer as well as pointing out how best to structure their research. By the time he finished the session the students were inspired and motivated to make a real difference to the environment. Their civic responsibility was off and racing!

It was at this stage that the students took ownership of the structure of the course. First, they decided it was essential to educate the whole school community about climate change in order to motivate everyone to see a need for change. They split into groups in order to address the different year levels at the school. Some of the students developed a play for the Pre Primary to Year 3 age group. They kept their message simple by demonstrating how the Earth's climate is changing with characters such as the Sun and Mother Earth acting out how the sun's rays are being trapped and heating up the atmosphere. Superman came to the rescue explaining what they can do to help Mother Earth. These younger students are now by far the most conscientious at school with turning off lights!

Figure 3: Students dressed up for the play presented to the early childhood students.

Some students created PowerPoint presentations for the older classes. These presentations included information on what climate change is, what causes it, and the effects of climate change on polar regions, oceans, extreme weather conditions and the plant and animal species on Earth.

The presentations also outlined solutions that could be implemented in our school and the students' homes.

Other students researched and devised a pamphlet that explained climate change. Titled 'Your planet needs you!' the pamphlet was sent home to all school families. Along with this the students produced a magnetised 'What you can do' poster for fridges. This poster contained many ideas on how to beat global warming.

What amazed me about the group were their ambitious goals with this course.
They had big plans – they wanted a top quality pamphlet. So they wrote letters to local businesses, such as insurance companies, white goods stores, and solar hot water suppliers, explaining their project and asking for money. Amazingly, all these local companies agreed to financially support the children so that they were able to work with a local graphic designer on their pamphlets.

Figure 4: The pamphlet, fridge poster and stickers the children produced.

The students also spoke at a Parent and Citizen meeting and held an open forum for the community after a school assembly.

Brian was invaluable in this process even though he was thousands of kilometres away in Canberra. The children wrote the text for the pamphlet and emailed it to him for critical feedback. He replied with a personal message to each child, and then edits with comments. These edits related to both scientific and grammatical correctness. This process helped the children immensely.

The following quotes are from Brian on his impression of the students and what he got out of the experience.

"It was astounding, their [the student's] ability to absorb information, the enthusiasm that they displayed when they were actually putting together the material, and the depth of the questions they asked. They seemed to be inspired by the whole approach."
"For me as a professional to go in there and … stimulate these children and [see] how quickly they can pick up these things was just inspirational."

The students could have stopped here but they were single minded in their pursuit to change how things happened at our school and in their homes.

One student took responsibility to put an insert in each weekly school newsletter and others wrote articles for magazines, such as Science Sparks, which has been published, and the CSIRO Helix magazine. They wanted to keep climate change at the forefront of everyone's mind.

Next, the students embarked on a full energy audit of the school. Again they divided up tasks to pursue their goal. They experimented for one week with lights left on all day and then the next week with everyone switching them off whenever they left the room. The students worked out that most of our energy was going into lighting our school, and that the school was wasting energy on security lighting which was coming on far too early in the day. They then sat as a group and devised a School Energy Plan to address any of the highlighted problems and to put in place across the school energy saving practices. Along with this the students designed and had professionally produced their own 'Switch off' stickers to be a visual reminder to everyone as they left the room. They returned to all classes to get the School Energy Plan approved and to share the results of the audit. They also placed the Switch off stickers on doors in the rooms and on all the electrical equipment around the school.

The students assisted me in putting together a submission to the WA Government for Solar Panels to be placed on our library (a stand alone building). Our plan is for this building to be sustainable in being powered by solar energy. The students are thrilled with the idea that any extra power generated – after school hours, on weekends and summer holidays - will turn our meter backwards, giving us credit for the power used in other parts of the school.

By now I thought the students might leave their journey, as they had done so much. However, they wanted to reach all the schools in our town and district. So they decided the best way to do this was to produce a DVD about Climate Change and their journey, and providing suggestions for other schools. More research, storyboards and emails were sent to Brian, who patiently guided them through this project. While the DVD is not a polished, fully edited film it has been scripted, filmed and edited by primary school students for primary school students. It contains some excellent information that others may be able to use.

Brian and our group were officially partnered up in the 'Scientists in Schools' project during Term 3, 2007. Brian was a great asset to the school, with his expert knowledge and understanding of the topic and his fantastic rapport with the students.

The Esperance Energisers have taken their DVD, pamphlets, and stickers to other schools hoping to spark other students into action. They have placed the DVD and the written script on the school's Web Page www.esperanceprimaryschool.com.au/ .

This journey, jam packed with many different projects, has been quite brief. It has happened in just two terms with one short session a week. The students are clever and realise that those people in power using legislation have the greatest ability to combat climate change. However,

the students are not prepared to sit back and do nothing. They firmly believe we all need, and can, change our habits.

The students are optimists. They debated long and hard about the design of the DVD cover. It could have been a flaming planet, or a forlorn polar bear struggling to make it onto some floating ice. But they wanted an image of the Earth cupped in hands to show people holding and protecting it. They wanted to reflect how the future is in our hands, and how each and every one of us can make a difference.

Where to from here?

As this article was being written (December, 2007) Australia's Chief Scientist, Dr Jim Peacock, was promoting the SiS project and using the Esperance Energisers DVD as an example of what can be achieved. Nola Smith was trying to organise an extension of SiS in the Esperance Region, called 'Scientists in the Community'. The Esperance Energisers had written to Prime Minister Kevin Rudd asking for positive action at the upcoming United Nations Climate Change Bali Conference. And Brian Dawson had been approached by UNICEF to assist in producing a movie about climate change and how it affects children. Brain raved so much about the Esperance Energisers project that there is talk of Hollywood producers coming to Esperance in 2008 with Cameron Diaz to talk to and film some of the children.

Figure 5: The Esperance Energisers DVD.

ESPERANCE PRIMARY SCHOOL
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Department of Education and Training

Dear Prime Minister Kevin Rudd

We, the Esperance Primary School Energisers, are students who care about the future of our planet. Our planet, Earth, is very fragile. We love it just the way it is. With all its natural beauties and everything about it makes it special and unique. Climate Change could ruin all this. Everyone is affected by climate change: every nation, every state, every region, every city or town and every human being. Everyone! But it's not just us. Plants and animals are dying because of our actions. They did nothing towards the problem but they suffer the consequences. The United Nations Climate Change Bali Conference is a way to change this. Australia leads the world in many things so why not in fighting Climate Change. We are students and we care about Climate Change.

We congratulate you on becoming Prime Minister and we thank you on your first action as our leader, signing the Kyoto agreement.

We are a group of 10 year sixes and sevens from Esperance Primary School, Western Australia who are very passionate about this topic. We have educated our school and community about climate change. We created and presented PowerPoint presentations to educate students from years 4-7 and interested parents. For our years 1-3 we created a play that we performed to them. We then made a DVD which has been given to interested community members and schools throughout Australia. Please check it out by following our link on: www.esperanceprimaryschool.com.au Our work was also showcased at the Newcastle CSIRO Scientist in Schools Symposium in October. Dr Jim Peacock has been using our work as an example of what can be achieved. We have all put 100% into this work.

We have done everything we can to overcome climate change. It is our job as members of a powerful country to stand up for what is right and to make a difference. As students we are limited in what we can do to help our planet, but as leaders you can do more than the imagination allows some people to believe. Please have the courage to do what is needed to combat our climate change crisis, the perseverance to go through with what needs to be done and the passion to see it through. So, Mr Rudd, be the king of the castle, the cherry in the fruitcake and please make a difference at the United Nations Climate Change Conference in Bali. We will all have our fingers crossed that the worlds' leaders will make the tough decisions to secure our world's future.

Yours faithfully,

The Esperance Primary Energizers
5th December 2007

Figure 6: Electronic version of the letter to Prime Minister Kevin Rudd.