

CSIRO Scientists in Schools Program: Future Directions

Report on outcomes of an Independent Assessment 26 July 2011

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Disclaimer

This report has been produced independently by Langdale Consulting Pty Ltd on the request of the Scientists in Schools Program within CSIRO, and with funds provided by the Australian Government through the Department of Education, Employment and Workplace Relations. The views expressed in this report are not necessarily the views of CSIRO or the Department.

The information, statements, statistics and commentary contained in this report have been prepared by Langdale Consulting from material provided by the Program and from discussions held with stakeholders on the basis that such information is accurate and, where it is represented to Langdale Consulting as such, complete. The Information contained in this report has not been subject to an audit.

1. Executive summary and recommendations

Langdale Consulting conducted an independent assessment of the effectiveness, efficiency and financial viability of the Scientists in Schools Program (SiS) under the terms of the funding agreement between the Department of Education, Employment and Workplace Relations (DEEWR) on behalf of the Australian Government and CSIRO as managers of the program.

The assessment was grounded in a documentation review, quantitative analysis and a range of internal and external stakeholder consultations. The consultants presented fully detailed outcomes of both these processes to the client and also in a discussion paper covering the strengths and weaknesses of the program, the outcomes of the assessment and suggestions for improving aspects of the program examined.

Following a description of background, scope and methodology, this report presents detailed outcomes on the:

- efficiency and effectiveness of the business structure
- cost-effectiveness of the current program
- continuing viability and sustainability of the Program
- place of the Program in the Australian school science and mathematics education landscape
- opportunities to align more closely to the Government's priorities for school education and the Australian Curriculum.

The brief sought recommendations on optimal governance and administrative arrangements, the budget necessary for the same level or sustainable expansion of operation beyond 2012 and ways to access longer term funding.

The assessment concluded that:

- SiS does not have a range of options open to it due to the ever-tightening fiscal context and the possibility that there will be a reduction in, or withdrawal of, Australian Government funding in mid 2012
- SiS is anchored in an elegantly simple, but strong concept which is providing a measurable benefit for teachers, students and the community
- there was general agreement on the challenges facing the program in balancing the supply/demand continuum, particularly in the face of an uncertain revenue stream
- stakeholders generally prefer a focus on quality of student impact and experience rather than on meeting ever increasing partnership targets
- the current governance, administrative and financial frameworks and systems are adequate but would benefit from a risk based approach to setting strategic directions
- SiS documentation is professionally written and presented but program data could be more comprehensible and relevant by adding trend analyses and additional figures
- cumulative penetration rates across states and territories and into regional/remote areas are
 relatively consistent and on target, however, it is not cost-effective to pursue additional
 Indigenous and very remote partnerships except where funded outside the current funding
 agreement
- there are no realizable economies of scale with the current model meaning that major growth in numbers is dependent on a major, and seemingly unlikely, increase in funding
- further urgent work is required to identify additional sources of revenue to guard against a drop in Australian Government funding

- if the program is to remain viable and/or continue to grow in breadth and effectiveness, the funding mix must grow to include state/territory, philanthropic and corporate funding
- the most efficient way to grow the program assuming no additional funding is to cleanse the database and register, then focus on increasing the conversion from 'assigned' to 'active', thereby minimizing the number of partnerships withdrawing
- if ongoing funding at the current or higher level is confirmed, the priority should be on funding additional SiSPO hours, professional development for SiSPOs and regional workshops/symposia
- if funding is removed, SiS would need to take steps to have CSIRO education absorb administration of the program during a wind down phase
- more work is required to link SiS with the Australian Curriculum
- there are a number of national programs with similar aims, but SiS is the only program that seeks to create partnerships between scientists and teachers and mathematicians and teachers
- the complementarity of the program to other initiatives is a strength and should be used to assist with shoring up all funding positions.

The Implementation Plan at Section 5 aims to:

- 1. maximise the outputs and outcomes from the current DEEWR Funding Agreement in time to strengthen the case for a further funding period; and
- 2. at the same time equip staff and stakeholders to transition to alternative funding streams at the conclusion of that agreement on 30 June 2012 should DEEWR choose not to renew.

It prioritises actions as Essential, Desirable and Recommended through 2 stages:

- 1. Stocktake and Planning July August 2011
- 2. Consolidation September 2011 May 2012

The timing of the component actions and allocation of responsibility are left as a matter for SiS program staff, including SiSPOs once the plan has been approved for implementation by the Steering Committee. From June 2012 the funding situation should be well understood and further initiatives should become part of a business as usual planning process.

However, there is one other aspect which must be determined to enable effective planning for the future. Currently, there are three possible scenarios which SiS must plan for from mid 2012:

- 1. DEEWR renews current funding levels and the program can continue in the current model with some increased efficiencies but without major growth
- 2. SiS builds on point 1 by broadening the revenue mix so that SiS can better fulfil its potential of being a strong value-add to the introduction of the Australian Curriculum and influencing the numbers of students selecting science/maths career paths
- 3. DEEWR reduces or removes current funding with no alternative revenue streams identified and the program will gradually fail as existing partnerships cease and are not replaced with new ones.

It is difficult for SiS to be effective without knowing which of these scenarios is realistic. Seeking an urgent commitment from the Australian Government as to its intentions regarding the future funding is essential to enable SiS to plan effectively for the future.

In summary, the assessment found an effective program working well within the current funding and governance structures, but with a need to focus more keenly on an evidence and

risk based approach to strategic direction. Broadening of the program funding mix is also essential to lock in future viability.

Recommendations

- 1 The Steering Committee take into account the strengths and weaknesses highlighted by stakeholders in determining future strategic directions for SiS.
- 2 Develop a detailed risk management plan in line with the International Standard on Risk Management (ISO 31000:2009) for consideration by the Steering Committee.
- 3 Develop trend analysis reporting to track the cost-effectiveness and key performance metrics to assist the Steering Committee in setting strategic direction.
- 4 From 1 July 2011, focus on increasing the conversion rate from 'assigned' to 'active' to stem the leakage into the 'withdrawn' category and ultimately grow the program.
- 5 Immediately introduce a simple, centralised, web-based questionnaire for all partners to report level of activity, numbers of students reached and future intentions. Use this to filter inactive partnerships.
- 6 Introduce more opportunities for SiSPOs to work together remotely or face to face to develop collective responses to issues and find ways to capitalise on opportunities.
- 7 Report on the number of schools with active partnerships in each state/territory and in the different regions rather than the number of partnerships.
- 8 Continue to explore the potential for alternative/additional funding and/or in kind resources (eg corporate sector, state industry departments) for specific purposes including regional symposia, Indigenous and very remote partnership generation and support, and the technology to make downloadable records of current SiS activities for much broader use.
- 9 Streamline procedures and work practices and, where possible, work allocation, to enable SiSPOs to spend the maximum possible time in face to face support of new, establishing and continuing partnerships.
- 10 Carry out a stocktake of the database and combine this with the results of the proposed web-based questionnaire to determine a more accurate basis for measuring cost-effectiveness. Once a solid benchmark is established, analyse the trend over time to inform procedural and financial decision-making.
- 11 Actively encourage scientists to explain the maths behind the science in everything they do.
- 12 Only initiate major Indigenous partnership programs with funding sourced outside the current funding agreement.
- 13 Ensure that the next evaluation of SiS measures both tangible and intangible benefits.
- 14 Develop additional, detailed data analysis for presentation to the Steering Committee to ensure there is clarity concerning the status of current partnerships.
- 15 Seek a definite position from the Australian Government on future funding to enable realistic planning for ongoing program viability.
- 16 In the event of no repeat Australian Government funding <u>and no alternative sources of</u> <u>funding</u>, CSIRO Education to absorb administration of SiS with:
- minimal business structure
- a focus on zero growth in partnerships
- a gradual wind down of regionalised resources
- web-based delivery of resources, advice on how to establish partnerships, showcases and best practice

- 17 Continue working with other complementary programs and, if funding is to be withdrawn after mid 2012, consider joint approaches to government for further assistance.
- 18 Develop a Future Funding Strategy for SiS which includes state/territory governments as a potential source.
- 19 Use the ESA Curriculum Connect tool to promote the SiS model to teachers when the database has been refined.

2. Background and scope

CSIRO is a service provider to DEEWR charged with effective management of the Scientists in Schools Program, including the Mathematicians in Schools Program. SiS is a national program that creates and supports long-term partnerships between teachers and scientists or mathematicians. Partnerships are flexible to allow for a style and level of involvement that suits each participant. Over 2200 partnerships have been established cumulatively since the program began, initially as a pilot, in 2007.

The independent assessment of SiS by Langdale Consulting aimed to:

- 1. identify any opportunities to improve the efficiency and effectiveness of the Program through enhancements to its operation and management
- 2. review the financial and other resources needed to continue and grow the Program beyond June 2012.

The assessment is required under the SiS funding agreement in the lead up to its expiry in mid 2012.

This report builds on a discussion paper prepared following the documentation review and stakeholder consultation stages of the assessment. The discussion paper was originally conceived as an options paper in the project plan. However, the consultants reached a firm view that SiS does not have a range of options open to it due to the ever-tightening fiscal context and the very real possibility, made clear in stakeholder consultations, that there will be a reduction in, or possibly even a withdrawal of, Australian Government funding at the end of the current agreement in mid 2012.

So rather than options, the discussion paper clearly articulated a suite of strategies for the future that were designed to:

- 1. maximise the outputs and outcomes from the current Funding Agreement in time to strengthen the case for a further funding period
- 2. at the same time, equip staff and stakeholders to transition to alternative funding streams at the conclusion of that agreement on 30 June 2012 should the Australian Government choose not to renew.

This report covers the same ground as the discussion paper, but providing more depth on outcomes and adding a detailed implementation plan and recommendations. Carried forward together, the plan and recommendations should enable CSIRO to optimise the efficiency, cost effectiveness and reach of SiS while maintaining the quality of educational outcomes.

The assessment was carried out for Langdale Consulting by Margaret Coaldrake, Managing Director and Principal Consultant and Dr Hugh Watson, Education and Curriculum Specialist. Margaret has held executive management roles, both in government and within a commercial consulting environment, for over 25 years. She has carried out extensive review and advisory projects across all aspects of governance, organisational strengthening, project management, risk analysis and business and strategic planning for a range of Federal, State and Territory Departments since leaving the public sector in 1997. Hugh has postgraduate qualifications and a significant background in education: as a former senior advisor to a Cabinet Minister, teacher, academic, curriculum developer and evaluator of major Government education initiatives. As Chair of the Education Advisory Committee on the Radford Board he has reviewed the science and mathematics curriculum with the new Australian Curriculum.

3. Methodology

3.1 The brief

The brief for the assessment is at **Attachment A**. It calls for an examination and report on the:

- efficiency and effectiveness of the business structure (current management, administrative and financial structure) of the Program
- cost-effectiveness of the current Program, with consideration of: the spread of partnerships across sectors and regions; and the maths and Indigenous foci
- continuing viability and sustainability of the Program under the current structure and funding
- place of the Program in the Australian school science and mathematics education landscape, with regard to comparable initiatives and any opportunities for connecting and collaborating with other initiatives
- opportunities to align more closely the operation of the Program to the Government's priorities for school education and, especially, the implementation of the Australian Curriculum

The assessment was to include recommendations about:

- optimal governance and administrative arrangements, and such other changes to the operation and delivery of the Program as seem appropriate
- the budget necessary to see the Program continued at the same level or expanded sustainably beyond 2012, based on the recommended business structure identified above
- ways to access longer term funding that will assist the Program to be more sustainable.

The assessment methodology followed a straightforward 3 stage process leading into this Report:

- 1. Project Initiation and Documentation Review
- 2. Stakeholder Consultation
- 3. Analysis, Options Development and Testing

3.2 Documentation review

The documentation review was to:

- gain a full understanding of the existing governance, financial, control, assurance and operational frameworks and delivery requirements underpinning SiS
- identify opportunities for strengthening and streamlining those frameworks
- consider comparative models applied successfully elsewhere both in Australia, particularly those intended to meet Australian Curriculum requirements
- identify alternative mechanisms which might meet the requirements
- begin the process of identifying cost-effective and sustainable strategies applicable in this context.

Attachment B lists all documents reviewed. In carrying out the documentation review the consultants endeavoured not to duplicate the work of the two evaluation reports prepared by Curtin University of Technology and which are expected to be covered again in the third evaluation in late 2011.

No corporate CSIRO documentation was reviewed although all financial recording, reporting and monitoring, HR, procurement, audit, performance management, recruitment and other core

business functions are managed using these systems. SiS management advised that the use of CSIRO systems and policies provide effective and efficient frameworks to operate the program. The consultants and management therefore agreed that there was no room for altering or influencing these systems and insufficient resources to seek to replace them.

As well as internal management documents and formal reports, the consultants reviewed a number of websites and printouts from the Program's management system. While the SiS database was viewed briefly, the consultants did not spend time reviewing the detail, but sought reports on specific partnership related parameters such as number of active partnerships.

3.3 Stakeholder consultation

Stakeholder consultation was through a mix of face to face meetings, teleconferences and focus groups with those on the list at **Attachment C**. Discussions were wide-ranging with the focus on:

- strengths and weaknesses of the current program especially around:
 - o governance
 - o scope
 - o targets
 - geographic spread
 - o supply and demand
 - \circ funding
- risks and challenges
- opportunities for change and growth.

A confidential record of the outcomes of all stakeholder consultation was handed to the client. Comments given to the consultants in confidence were excluded.

The collective outcomes of the documentation review and stakeholder consultation are summarised in Section 4 of this report. Many of the strategies in the Implementation Plan at Section 5 derive directly from suggestions for improvement emerging from the consultations. Readers who would like to review the detailed outcomes of the documentation review and/or stakeholder consultation should apply to the Manager of the Program for access.

3.4 Assumptions

The consultants worked on the basis of the following assumptions:

Educational value: Based on briefings from CSIRO, interviews with Program stakeholders and the two evaluation reports previously undertaken by Curtin University of Technology, the consultants were informed about the benefits of the program to students, teachers, scientists and mathematicians.

Current funding: Based on advice from the client that funding for the 2011-12 financial year will be paid in June of 2011, it is assumed that sufficient funding will be in place to maintain the program at least at its current level through to 30 June 2012.

Administrative framework: As stated above, the consultants accepted management's view that the administrative frameworks provided by CSIRO (including financial, HR, procurement, audit and risk management) are effective and efficient.

Data accuracy: The consultants analysed multiple reports provided by management which have been accepted as accurate. Comments are confined to the depth and nature of the analysis of that data and its presentation, and to areas for future data collection and trend analysis.

4. Outcomes

4.1 General

This section summarises the strengths and weaknesses of the program highlighted by those consulted and then provides detailed outcomes on all the aspects of the operation of the program required by the brief. Conclusions in relation to the two key aims of the assessment, opportunities to improve the efficiency/effectiveness and a review of financial and other resources, appear in Section 6 below. Suggestions for improvement in each area are contained in the implementation plan at Section 5.

The consultants' firm view as a result of the assessment is that SiS is anchored in an elegantly simple, but strong concept which is providing a benefit for teachers, students and the community.

The consultants found SiS documentation is professionally written and presented. Any deficiencies were around lack of particular documents rather than the content of the documents (eg the lack of a risk management plan and a stakeholder engagement plan including a media plan as well as the current communications strategy). The exception to this is program data which could be made more easily comprehensible and relevant for the Steering Group and other stakeholders by including trend analyses and additional figures in both tabular and graphic format.

All stakeholders consulted, strongly support the concept of the program and agree on the benefits to students and teachers. There was also general agreement on the challenges facing the program in balancing the supply/demand continuum, particularly in the face of an uncertain revenue stream. The desirability of building on the early development years with further growth in partnerships numbers was not so well supported, with stakeholders generally preferring a focus on quality of student impact and experience rather than on the straight quantity of partnership/meeting of targets.

The proposed implementation plan at Section 5 has been drawn up to address these findings. It is intended to underpin the program's survival beyond the end of the current funding period.

4.2 Strengths and weaknesses

Each consultation session with stakeholders began with identification of strengths and weaknesses across key aspects of the program. These are collated under key headings as follows:

- Business structure, administration and governance
- Partnerships
- Outcomes.

Business structure/administration/governance

		_	
S	trengths	W	eaknesses
•	Skills and experience of the SiSPOs - HQ attitude to supporting them – very positive Individualised matching and effort to set people up and match expectations	•	Information sharing (wiki will improve this) Under utilisation of technology eg training of SiSPOs in technologies to support partnerships could be stronger
•	Strong support from CSIRO – eg CEO is one of the scientists	•	Isolation of SiSPOs – not much communication between them – tends to be
•	Being able to put CSIRO logo on material in a soft way – reputation is a good thing	•	one on one with HQ No career path for SiSPOs - salary not equal to
•	CSIRO's education centres around the country – valuable infrastructure - paid for by the		teachers or scientists – pay rate does not reflect requirement
	program as a % of managers time, office, infrastructure eg photocopy/phone	•	Isolation of SiSPOs can be an issue – would like to hear more about how states manage

S	trengths	Weaknesses
•	Emphasis newsletter	their partnerships – valuable to get together and swap stories and ideas and experiences
•	Flexibility of relationship between HQ team and SiSPOs – set of standard operating procedures but SiSPOs must use judgment	 Lack of publicity about the program and good partnerships in the science community
•	National reach	 Financial and time constraints limit visits, networking and support to remote and
•	Critical mass of teachers and word of mouth	regional communities
•	Patrons and Ambassadors	Response times can be slow from HQ on
•	Program is not a hard sellthere is a lot of goodwill	particular issues which doesn't work with part time SiSPOs- reflects badly on program
•	Local project officers – know what is happening in schools, know the area, know the partnership, know where to find scientists	 Some SiSPOs not encouraged by State based staff to do things with other CSIRO programs lack of cohesion with other state/national programs – can be criticised by other CSIRO
•	Follow up is a strength – program wouldn't be successful without this	Education people for having separate source of funding – this varies from state to state – most are well integrated

Partnerships

St	rengths	Weaknesses	
•	Program is fantastic when it works well	 In theory the partnership idea sounds good but in pracit may be too hard for people to figure out how to about it – need to start gently and then build 	tice go
•	hard to do the administration etc so partnerships wouldn't happen –	 There are few if any economies of scale in developing r partnerships 	າew
	"coordinating glue"	 Busy – no one has time to do what they'd like to do the days – interferes with scientists' ability to participate 	iese
•	Changes to education system – hands on, experience based learning more meaningful –	• Sharing of activity resources from partnerships – could done more	l be
	program supports this	• Difficult to source enough scientists quickly enough teacher demand	for
•	Long term partnerships – teachers appreciate the SiSPO support	 Teachers need more support in understanding curricu don't want them to see program as an add on – but t often can't see how to incorporate the scientists 	lum hey
•	Scientists like meeting the other scientists at networking events	 Need to look at how workplaces value the time that being given – it's good for kids, community, future s ots is an investment by organizations in their future. 	nt is staff
•	they want to do - including existing	in general public awareness of what science is	anu
	level of flexibility is beyond people's comprehension – uses this as a big selling point	 Program depends on willing volunteer scientists - t need support from the leadership of their organisation more could be done here eg CSIRO leading by example 	hey ns –
•	Is national – implies success and	• High proportion of partnerships may be inactive difficult to determine	and
•	CSIRO reputation - Brand strength	Scientists may have very narrow focus	
	– half way there	 Lack of communication between scientists and schools nature of curriculum 	s on
	Free Variaty of colontists	Teachers can have lack of enthusiasm	
-			

Outcomes

St	rengths	Weaknesses
•	Can get general scientific method/skills as well as specialist knowledge	• Difficult to manage
•	Common altruism of all concernedmaking a real difference	expectations of what is achievable by
•	Teaching kids that scientists are approachable human beings	partnerships
•	Up to date science available to students – does the filtering for teachers	

Recommendation

1 The Steering Committee take into account the strengths and weaknesses highlighted by stakeholders in determining future strategic directions for SiS.

4.3 Efficiency and effectiveness of the business structure (current management, administrative and financial structure) of the Program

The business structure was examined to determine the potential for improving both efficiency and effectiveness. It took some time to gather sufficient documentation to assess the efficiency and effectiveness of the program and the assistance of program staff in collating tailored figures from the database is appreciated. The consultants consider it is imperative that the program continues to evolve to ensure that it can address all strategic and operational risks.

The outcomes of this aspect of the assessment were as follows:

- The program has considerable in-kind support from CSIRO which is not accounted for in any way. This includes office accommodation in Canberra and the regions, the business systems and frameworks discussed below, Chair of Steering Committee's time, contribution of scientists' time (including CEO). If the program were ever to move away from CSIRO, overheads would increase substantially.
- The program also depends on CSIRO frameworks (policies, procedures, systems etc) for all core business operations other than those specifically related to partnership establishment and management. These were not examined in detail as mentioned in the assumptions in Section 3. The consultants initially thought this may be too restrictive for SiS which cannot tailor these core systems to enhance their operation. However, management has the firm view that these systems are robust and straightforward, and is more than happy to continue accessing them. Where SiS requires a more tailored approach it has developed and supports its own systems eg the database. We see no reason for change in this area.
- Governance, financial, delivery, assurance and operational matters specific to the elements of the program are comprehensively set out in Schedule 1 to the Funding Agreement. This has the advantage of making accountabilities clear, but would appear to restrict the flexibility for ensuring the quality and longevity of the program.
- Targets are clearly articulated in the funding agreement to the point of dominating quality outcomes requirements. The consultants spent considerable time discussing this quality vs. quantity conundrum with stakeholders and decided that:
 - there are no realisable economies of scale with the existing partnership model as it doesn't get any less time consuming to establish additional partnerships or to nurture them over time
 - if funding doesn't grow and the model doesn't change, the program cannot grow. Indeed, as numbers continue to grow with only the present team in place, follow up will reduce and the program will become less effective

- all stakeholders believe quality is the more important measure of success of the program than quantity. In particular, those on the ground running the program would prefer to concentrate on quality in their limited time per partnership rather than having to focus on promoting the program. This is a particular issue at this time where registered teachers still outnumber available scientists/mathematicians.
- waiting teachers become frustrated as they register then sit and wait. SiSPOs are addressing this by making suggestions for how they might find scientists themselves but the onus is not on the schools. While e-matching software programs might be available that could mechanise the selection of a partner, all the anecdotal evidence points to the success of SiS being built on personal support. This was referred to in focus groups as the "glue" that holds partnerships together. SiS management advised that similar tools have been tried in other science related programs in the past without success. The investment required for such a system does not seem justified for a relatively small number of matches a day.
- Following on from this, the fixed funding arrangements do not allow for growth in resources as the number of partnerships grows to meet targets. This has resulted in the gradual reduction of value adding activities for partnerships, such as national symposia, as more and more resources have been directed to service the increasing number of partnerships. The program will not have the capacity to deal with the expansion if it does fill the gap between waiting teachers and suitable scientists– already SiSPOs are "skimming" across the top, particularly in Southern Queensland, Vic and NSW.
- Progress reports on meeting targets required under the funding agreement are very specific, but omit key aspects required to enable fully effective strategic direction of the program by the Steering Committee eg risk management planning, trend analyses, more detailed statistics etc
- Risk assessment and management are not top of mind for management or the Steering Committee. This is surprising given the uncertainty of funding in a little over twelve months. Stakeholder consultation resulted in articulation of more risks to the continued success of the program than those identified in the work plan. Those risks included:
 - funding/support reduces. There is doubt about whether there will be renewed funding for 2012-13 onwards
 - quality vs. quantity imbalance results in a diminution of services and a loss of staff and interest by potential partners
 - pressure to meet targets may cause a loss of staff because they feel so overwhelmed
 - inability to maintain the momentum and excitement of new partnerships
 - insufficient succession planning at all levels, leading to loss of corporate knowledge
 - partners' work schedules mitigate against successful partnerships eg partnerships can fade away between one year and the next due to holiday period and busy term 1; difficult for scientists who have to meet milestones for grants/publications etc – not core business
 - program staff are so caught up in the day to day operations that it is difficult to plan for longer term outcomes
 - scientists are not adequately supported by employers, making it difficult to recruit sufficient numbers and retain existing partnerships
 - communications are not effective in meeting expectations and supporting successful partnerships – eg scientists knowing school term dates, have to deal with parents' expectations as well

- virtual partnerships may become more common, but are not as effective, resulting in a diminution of effectiveness of the program
- SiS is not seen as an important adjunct to the curriculum with many stakeholders preferring to see closer links to the Australian curriculum and use of SiS as a way of teaching.

2 Develop a detailed risk management plan in line with the International Standard on Risk Management (ISO 31000:2009) for consideration by the Steering Committee.

Management has already accepted this recommendation and is working with the consultants to identify the sources and consequences of all risks, current controls, risk ratings and additional risk treatments required. This will be an essential ingredient in enabling the Steering Committee to fulfil its function of guiding and monitoring the program.

4.4 Cost-effectiveness of the current Program, with consideration of: the spread of partnerships across sectors and regions; and the maths and Indigenous foci

4.4.1 Quantitative analysis

In order to gain an understanding of the current operations of the program, the consultants analysed a variety of data provided by management. However, it proved difficult to assess the cost effectiveness of the current program due to factors such as:

- lack of data on what would normally be expected to be key indicators eg cost per partnership and hours spent per partnership each year
- conflicting data estimates eg the number of students seen by scientists in a year (between 33 and 125 depending on the state/territory)
- difficulty of determining precisely what is meant by existing reports eg upwards of 400 contributing organisations referred to as if they are currently contributing to active partnerships but the list is cumulative and therefore must include closed, and possibly withdrawn, partner employers.

The figures below represent the consultants' best estimate from data provided to illustrate current status and trends in partnerships. Brief commentary highlighting key points follows each figure.

- 1. National status of partnerships at progress report dates and currently
- 2. National active/assigned partnerships vs. closed/dormant and withdrawn at 16 March 2011
- 3. Partnership status at 16 March 2011 by region
- 4. a. National penetration rates cumulative to 16 March 2011
- 5. Average SiSPO hours per active or assigned partnership per week
- 6. Cost per active/assigned partnership and per student per annum

Unfortunately, despite extensive analysis, the consultants did not have sufficient data to make a reliable assessment of cost-effectiveness of the program. It is also too early to see the real and expected benefit of more students moving into science/maths specialties. To facilitate development of more reliable indicators of cost-effectiveness, we recommend that the consultants work with management to agree to these or other indicators, gathering additional data as necessary. Once a reliable benchmark of SiS cost-effectiveness is set, management can provide worthwhile, longitudinal trend analysis.

3 Develop trend analysis reporting to track the cost-effectiveness and key performance metrics to assist the steering committee in setting strategic direction.

Despite the shortcomings referred to above, the data analysis did point to a number of important measures that could improve the effectiveness of the program. These are explained in the commentary below each figure.



Figure 1 is remarkable for the consistency between status categories at progress report dates. It is also clear that the growth is more in the closed and withdrawn categories than in active and assigned.

This graph was crucial in pointing the consultants to the need to increase the conversion rate from assigned to active to halt the growth of the withdrawn category. Once a scientist and teacher are matched they are listed as "assigned". They remain in this category until they have planned their first activity. This can sometimes take a long time due to busy work schedules and communication issues generally caused by the very different work patterns between teachers and scientists. Even with extensive hands on "nursing" of the relationship in the early stages, a number of assigned partnerships never proceed to the active category. Instead they are "withdrawn". The consultants believe that it is more cost-efficient to convert more assigned to active partnerships than to recruit new partners and start the process again for another pair of teachers and scientists. When this principle was tested on stakeholders and management, there was universal agreement that it makes good sense to focus in this way as the assigned partnerships already have a degree of effort invested in them.

4 From 1 July 2011, focus on increasing the conversion rate from 'assigned' to 'active' to stem the leakage into the 'withdrawn' category and ultimately grow the program.



Figure 2 shows the proportion of active/assigned partnerships of all cumulative partnerships. Given anecdotal evidence that as many as a third of currently "active" partnerships could be inactive and should be closed, the pie should probably be more evenly "cut".

This figure generated another very important measure which the consultants suggest could be applied more rigorously to the program: an annual stocktake of all partnerships in every category aimed at identifying and removing those which are not active. At present an email is sent and then followed up as many times as necessary. This is often both time consuming and unrewarding.

Instead, the consultants have recommended that teachers and scientists be asked to complete a simple web-based questionnaire once a year (eg in February) which would determine their intentions for the year. This would assist in accurately recording the status of all partners and trigger an action in the database eg no response from a registered but waiting teacher or scientist would mean they are withdrawn from the program. We suggest this process be run from and by central office.

Combined with the cyclical approach to activities mentioned elsewhere in this report, this approach should streamline activity, allowing SiSPOs more face to face time with committed partners and facilitating a focus on the conversion of assigned to active partnerships.

Recommendation

5 Immediately introduce a simple, centralised, web-based questionnaire for all partners to report level of activity, numbers of students reached and future intentions. Use this to filter inactive partnerships.



Figure 3 is also remarkable for the consistency of proportions of partnerships in each status category across regions despite substantial regional differences in context and hours available. Tasmania has a notably higher proportion of active and assigned partnerships and Victoria has more dormant partnerships, but this may be a function of reporting rather than reflecting the actual situation.

The take out lesson here is that some states do better than others at tracking partnerships and at converting assigned partnerships to active. Collectively, the SiSPOs have all the knowledge necessary to be highly successful, but they have little time or opportunity for sharing. In the past there have been one on one professional development opportunities where SiSPOs spend a few days together comparing approaches and developing ideas. The Wiki being developed in central office will provide an excellent way of sharing information. Monthly, topic based teleconferences would also be valuable.

Recommendation

6 Introduce more opportunities for SiSPOs to work together remotely or face to face to develop collective responses to issues and find ways to capitalise on opportunities.





Figures 4a and 4b illustrate the current penetration rates of SiS. **Figure 4a** presents the number of partnerships against total school numbers. Note that this is different to the actual number of schools with partnerships which was difficult to determine as a number of schools have multiple partnerships. **Figure 4b** shows school penetration by state/territory. The variation here is not surprising with the greatest penetration occurring in the smaller geographic areas. The penetration rates across the other states are remarkably consistent.

These figures would be more useful if they reflected the actual number of schools with currently active partners.

Recommendation

7 Report on the number of schools with active partnerships in each state/territory and in the different regions rather than the number of partnerships.



Figure 5 is again interesting for the consistency of time spent on active and assigned partnerships across the jurisdictions, with the notable exception of the two territories which are able to spend more time as they have fewer partnerships. This suggests that the current FTE allocation is equitable between states despite anecdotal evidence to the contrary where NSW, VIC and QLD were mentioned as being short of time.

The consultants' view is that without increased resources, the program cannot grow far beyond its current size and scope due to the lack of any tangible economies of scale. It is this analysis which gives the clearest understanding of what might be achieved if, say, there were a doubling in funds available. Holding to the proportions shown here, more resources would mean more SiSPO hours and more time available to spend recruiting, assigning and supporting active partnerships.

In the absence of additional resources, the only way to continue to grow the program is introduce administrative efficiencies that will enable SiSPOs to spend more time on the critical tasks of recruiting scientists and supporting partnerships from assigned to active status as mentioned above at recommendation 4.

Recommendations

- 8 Continue to explore the potential for alternative/additional funding and/or in kind resources (eg corporate sector, state industry departments) for specific purposes including regional symposia, Indigenous and very remote partnership generation and support, and the technology to make downloadable records of current SiS activities for much broader use.
- 9 Streamline procedures and work practices and, where possible, work allocation, to enable SiSPOs to spend the maximum possible time in face to face support of new, establishing and continuing partnerships.

Calendar year	Active/assigned partnerships during the calendar year	\$ per cal year ¹	\$/partnership	No. of students estimated @ 125/ partnership/pa	\$/student/pa
2007(Jul-Dec)	562	235,000	418	70,250	3.35
2008	833	710,000	852	104,125	6.82
2009	1442	1,030,666	715	180,250	5.72
2010	1820	1,111,333	610	227,500	4.88
2011(Jan-Jun)	1472	555,666	377	184,000	3.02 ²

Figure 6 Cost per active/assigned partnership and per student per annum

Notes

1. Calendar year funding has been calculated by dividing financial year funding in half and adding the two relevant six month periods together.

Funding 2007-2008 = \$470,000 Funding 2008-2009 = \$950,000 Funding 2009-2010 = \$1,111,333 Funding 20010-2011 = \$1,111,333 Funding 2011-2012 = \$1,111,333

2. This figure will increase throughout the year as the dollars increase proportionately faster than the number of partnerships.

Figure 6 is as close to a figure on which to base a cost effective assessment as was possible with the data available. The number of active/assigned partnerships in Figure 6 was calculated by SiS management, taking the cumulative total of active, assigned, dormant and closed partnerships and subtracting the number of partnerships that became dormant and closed in the years previous to the given calendar.

It is difficult to reach an accurate cost per student due to the widely varying amount of time spent by different scientists and the very different ways partnerships work from school to school and class to class.

If the estimate of 125 students per partnership is accepted then the cost per student reached in any year is low. The consultants are inclined to calculate on a lower level of interaction with students, say 75 students per partnership. This results in a cost per student of \$10.26 and \$8.06 for 2009 and 2010 respectively. This is comparable in cost per student to Questacon's Science Circus with a per student cost of \$9 to \$10, noting that SiS can have many more student interactions with that cost (up to once a week for some students) compared with the Science Circus one off visit. However, if the reach is considerably lower than this, which may be the case, then the cost to student ratio becomes greater. It is important to support management decision-making by determining a more accurate figure for student interactions. The questionnaire proposed at Recommendation 5 will assist in compiling this figure.

Recommendation

10 Carry out a stocktake of the database and combine this with the results of the proposed web-based questionnaire to determine a more accurate basis for measuring cost-effectiveness. Once a solid benchmark is established, analyse the trend over time to inform procedural and financial decision-making.

4.4.2 Additional detailed analysis

Flowing from the quantitative analysis, the consultants reviewed three areas in further detail during the consultation process:

- supply and demand
- geographic spread
- penetration rates for schools, regions and the focus areas of mathematics and Indigenous students.

The outcomes in these three areas are as follows:

Supply and demand

- remote partnerships are a challenge as it's often not cost effective to find partners, is demanding on SiSPO time and demanding on partnerships. The anecdotal evidence is that the time required increases pro rata with remoteness.
- the supply of scientists is a general issue eg Queensland wrote to existing scientists to ask them to find others. This has worked well but Queensland still has 150 teachers waiting for scientists. The SiSPOs in Queensland find this difficult to understand with 18,000 scientists and engineers registered in that State.
- there is a risk in continuing to grow the number of registered teachers as they become very frustrated with the length of time they are waiting. SiSPOs feel they should run a tour or hold a workshop to keep them enthused and reduce the level of frustration but time constraints make this difficult.
- the more partnerships a SiSPO has responsibility for, the less time they have to spend ensuring stability. SiSPOs either don't want more partnerships than the target or see no reason to create more partnerships. They would rather work more thoroughly with those they already have. This dilemma is largely caused by strong teacher demand, an otherwise excellent outcome for the program.

Geographic

- 35% of partnerships are outside major cities. Not surprisingly, it is more resource intensive to support these regional and remote partners, both in money and time. This results in a lower return on investment in these areas offset by more cost-efficient urban partnerships.
- SiSPOs expressed a wish for more face to face meetings in the bush to encourage partnerships eg one in every region each year, at the same time noting that this would require additional resources.
- it can be time consuming to get conversations and relationships going in regional areas. One solution is to increase interaction with professional societies with regional committees/branches but more resources are required to enable this.
- the program needs continued, strong support from the executive of organisations such as banks to continue growth in regional and remote Australia.
- the consultants tested the idea of creating more virtual partnerships with stakeholders. However, it was pointed out that:
 - virtual partnerships are more difficult for scientists due to the nature of the activities they undertake
 - virtual partnerships can take as much time as face to face partnerships with less impact
 - virtual is not a substitute for face to face

 $\circ~$ lots of schools would block even Skype ~ and sometimes scientists don't want to do this.

Despite these negatives, it was agreed that:

- more electronic media such as Skype and interactive classrooms could be useful as an adjunct to build on face to face interactions
- $\circ\;$ there was one case study of using short video segments which has been very successful
- $\circ~$ even though virtual partnerships do not equal the power of the "real" they can still generate good engagement
- \circ ~ the CSIRO Education Centre in NSW has been unblocked for a chat room for DET
- other technologies and facilities are becoming available all the time.

Penetration rates for schools, regions and the focus areas of mathematics and Indigenous students.

- the program achieves strong school, geographic and regional penetration as shown in Figures 4a and 4b above
- the ACT has the highest school penetration rate, not surprising given the confined area. Tasmania does well for similar reasons with most schools clustered in the south east of the state.
- penetration into high schools is greater than for primary schools, although numbers are deceptive as there are many more primary schools.
- proportional penetration into each regional category varies between a high of 26.4% for major cities to 10.8% and 7.5% for remote and very remote locations respectively. Outer regional is at 17.1% and Inner at 15.5%. Given the greater cost of establishing and servicing remote and very remote locations, this is a noteworthy statistic.

Mathematics

- there are differences between maths and science as scientists are generally more engaging with what they can do. Engineers are a good cross over and some people can present as both mathematicians and scientists.
- the maths has a primary focus; primary school is easier than secondary as there is a single person in primary compared with two departments/two teacher associations etc. at secondary level.
- mathematicians are generally not happy being a sub-program.
- it is a challenge for SiSPOs to work on maths separately. Showcases have been good but SiSPOs, teachers and mathematicians have to do a lot of work to make mathematics exciting.
- it can be difficult to recruit mathematicians despite the very great number of engineers in most towns and cities.

Recommendation

11 Actively encourage scientists to explain the maths behind the science in everything they do.

Remote/Indigenous

• In rural/remote/Indigenous situations it is important to do the program well or not at all.

- The Indigenous focus is on numeracy and literacy so it is difficult (but not impossible) to organise SiS in these schools.
- Very remote area partnerships are very difficult to achieve. They are almost entirely Indigenous students and you can get as few as one third of students attending on any one day. There is not always a good reception in these areas.
- It can be difficult to get scientists or mathematicians who can spend the extra time necessary to break through the system and policies.
- Teachers in remote areas are often young and move on after 2 years, during which time they are overwhelmed by the whole situation and an extra program becomes too hard.
- Many things overshadow the simplicity of the program in very remote areas eg the nature of the school, disinterest and difficulty in bringing in white man's science, which means you need local knowledge to enable a combination of western science with Indigenous science and culture.

This anecdotal evidence, together with the expertise of the consultants, have led the team to a strong view that strong pursuit of building this focus area should not be funded under the SiS funding agreement. Standard registration and assignment of scientists to Indigenous schools and teachers should proceed as usual within the program and in line with the Australian Government Closing the Gap policy. However, we recommend that non-government funding (whether private or philanthropic) or other government funding be used to build specific indigenous programs. This approach is already underway, with the program recently receiving an initial commitment of \$50,000 for initiation of a specialist indigenous program from a philanthropic foundation with the potential for a rolling 5 year program. One of the key advantages of this approach is to quarantine this focus area from any downturn in Australian Government funding.

Recommendation

12 Only initiate major Indigenous partnership programs with funding sourced outside the current funding agreement.

4.5 Continuing viability and sustainability of the Program under the current structure and funding

The CSIRO executive consulted believes that all indications are that the program is going well: that it is well developed, well implemented and well resourced. Evaluations have already shown that it is having a tangible effect on the confidence of teachers in their science teaching.

To Dr Jim Peacock, Patron of the program, it is the continuity of face to face contact which has the biggest positive impact on the ground. His aim is to see all students in Australia have the experience of putting science curriculum into their everyday lives to see why and how science impacts on their lives. He sees the program not just about science, but about teaching students to be able to make rationally based decisions.

Dr Peacock was keen to point out the leveraging effect the program has not just in schools but into communities and back into the science and mathematics professions. It will be important for the next evaluation of the program in late 2011 to measure the long term benefits realisation of SiS through a range of both tangible and intangible indicators including: student take-up rates on science and mathematics electives; influence on environmental protection in schools and communities; and increasing investment by the corporate sector based on the awareness of the need to start influencing students as early as possible if they are to choose science careers in greater numbers.

13 Ensure that the next evaluation of SiS measures both tangible and intangible benefits.

CSIRO would like to see a broadening of the program rather than just an increase in size, but noted that the biggest blocker to continued growth is resources. Importantly, the quality of outcomes is more important to CSIRO and to DEEWR than quantity. DEEWR is aware that the targets specified in the funding agreement of equal numbers of scientists and teachers are not being met, and that reporting against targets is cumulative.

Dr Peacock was confident that the various authorities are all highly supportive with no evidence of risk to funding. This contrasts with other stakeholder comments, particularly from DEEWR and from CSIRO who made it clear that CSIRO Education could not match funding if the Australian Government pulled back support.

As the Australian Government signatory to the funding arrangement, DEEWR is "very pleased" with the program which it views as:

- very professionally managed
- managing to operationalise a difficult idea very well
- very supportive of partnerships
- effectively localising recruitment and support effort through the SiSPOs.

At the same time, DEEWR did comment that:

- SiS might be seen as an expensive program if outcomes are not well understood
- it does not have strong, high level visibility with the departmental executive
- realistically it is seen as an add on but they would like to see it contributing to curriculum
- further Indigenous partnerships will require a huge effort, noting the recruitment of a deputy and that there have already been considerable efforts at a senior level in this focus area (noting for the record that Dr Peacock's time was not paid for by SiS)
- there is very little discretionary funding with the Department pulling back from these sorts of programs eg *Primary Connections* and *Science by Doing*
- there is real doubt about whether there will be funding beyond the current agreement period, noting that the program could lose both funding and Australian Government endorsement.

It was clear that there was some lack of clarity about the actual figures (eg partnership status, costs per partnership and student reach per partnership) on the part of both the CSIRO executive and DEEWR. Even though all figures and reporting requested under the funding agreement have been provided, we would strongly urge SiS to provide additional detailed figures to the Steering Committee with the next progress report to be sure that all parties to the agreement are clear about the current performance of the program.

Recommendation

14 Develop additional, detailed data analysis for presentation to the Steering Committee to ensure there is clarity concerning the status of current partnerships.

Figure 7 below is an estimated value for the time spent by scientists and mathematicians in any year based on:

- 1. A very conservative average of 10 hours a year total in the classroom
- 2. A low per hour value of \$100 and a higher consulting type fee of \$200.

These indicative figures are offered to show the cost to government, schools and industry of providing a similar set of benefits if the program should close. Current government funding seems like an excellent value for money investment taken in this context. A diminution or phasing out of that funding will not only reduce the immediate and long term benefits to students and teachers, but will remove this and other value adds from the scientific community such as provision of specialist equipment to support activities.

Calendar year	Active/ assigned partnerships during the calendar year	Estimated average hours in the classroom @ 10 pa per scientist/ mathematician (conservative)	Estimated total contribution @ \$100 an hour (sitting fee equivalent)		Estimated total contribution @ \$200 an hour (mid range consulting fee)	
2007(Jul-Dec)	562	5620	\$	562,000	\$	1,124,000
2008	833	8330	\$	833,000	\$	1,666,000
2009	1442	14420	\$	1,442,000	\$	2,884,000
2010	1820	18200	\$	1,820,000	\$	3,640,000
2011(Jan-Jun)	1472	14720	\$	1,472,000	\$	2,944,000
Total	6129	61290	\$	6,129,000	\$	12,258,000

Figure	7 Estimated	value of	contribution	of scientists	/mathematicia	ns to SiS	per annum
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The conclusion in this area of the assessment is stunningly simple and intuitive: retain the existing funding level and the program can continue in the current model with some increased efficiencies but without major growth; expand current funding and SiS can better fulfil its potential of being a strong value add to the introduction of the Australian Curriculum and measurably influence the numbers of students selecting science/maths career paths; reduce or remove current funding and, unless alternative sources of revenue can be locked in, the program will gradually fail as existing partnerships cease and are not replaced with new ones.

Recommendations

- 15 Seek a definite position from the Australian Government on future funding to enable realistic planning for ongoing program viability.
- 16 In the event of no repeat Australian Government funding <u>and no alternative sources of</u> <u>funding</u>, CSIRO Education to absorb administration of SiS with:
- minimal business structure
- a focus on zero growth in partnerships
- a gradual wind down of regionalised resource
- web-based delivery of resources, advice on how to establish partnerships, showcases and best practice

4.6 The place of the Program in the Australian school science and mathematics education landscape, with regard to comparable initiatives and any opportunities for connecting and collaborating with other initiatives

4.6.1 National perspective

The Shape of the Australian Curriculum Version 2.0 provides the following insights into the organisation of initiatives under the Australian Curriculum:

- For each phase of Australian Curriculum development, the Australian Curriculum, Assessment and Reporting Authority (ACARA) will work with state and territory education authorities to map the extent of change and assist them in developing implementation plans. State and territory school and curriculum authorities are responsible for the implementation of the Australian Curriculum.
- At the national level, the Australian Institute for Teaching and School Leadership (AITSL) and Education Services Australia (ESA) will play a key role supporting state and territory authorities. Professional associations will also play a role in supporting the implementation of the Australian Curriculum. One of the benefits of a national curriculum is that national and state and territory resources can be pooled to support all teachers. At a local level, it is expected there will be extensive use of local and site-based professional learning.

Concomitantly teachers are feeling the pressure of introducing the new Australian Curriculum into their schools. There would therefore be a natural reluctance to embrace anything that did not sit squarely within the new framework. Fortunately SiS does; particularly the strand *Science as a Human Endeavour*.

Clearly the landscape has changed with the introduction of the national curriculum. However, it is also clear from interviews with key stakeholders that there is little funding for curriculum development and support at the national level; it is the states that will be responsible for this with coordinating assistance from national bodies such as ACARA, ESA and AITSL.

The demise of well-regarded programs perhaps indicates where the Australian Government's thinking is on national science programs. School Education Minister Peter Garrett has confirmed two programs designed and run by the Australian Academy of Science will no longer be funded. Primary Connections, which helped primary teachers with no background in science teach the subject, was moving towards being self-sustaining.

4.6.2 Comparable initiatives

There are a number of complementary initiatives that have been undertaken, or continue to be run, by different bodies with funding from diverse sources. The principal ones are described below. Funding for the first two of these was being withdrawn by the Australian Government during this assessment as mentioned above.

Primary Connections: Linking science with literacy

This is an innovative approach to teaching and learning which aims to enhance primary school teachers' confidence and competence for teaching science. A partnership between the Australian Academy of Science (the Academy) and DEEWR, Primary Connections focuses on developing students' knowledge, skills, understanding and capacities in both science and literacy. The Primary Connections model encompasses the stages of Engage, Explore, Explain, Elaborate and Evaluate in an inquiry model.

Current research highlights that successful science education requires teachers to be supported not only with curriculum resources but also with professional learning to boost their pedagogical content knowledge in the teaching of science and literacy. The Primary Connections program provides both components, which have undergone substantial trialing and will support the implementation of the Australian national curriculum.

The professional learning program gives teachers the tools to understand the Primary Connections approach, its philosophy and goals. Through interactive workshops, participants develop their pedagogical content knowledge. Teachers also explore how to effectively use, adapt and extend curriculum units to suit their students' needs, or write their own units using a unit planner.

Science by Doing

Science by Doing is a national initiative that aims to actively engage junior secondary school students in learning science through an inquiry-based approach. The project is managed by the Australian Academy of Science in partnership with CSIRO, the Australian Science Teachers Association and the education systems of the states and territories. The Australian Government through its Department of Education, Employment and Workplace Relations funds the project.

Science is a way of answering interesting questions about the world. Science by Doing provides opportunities by which students can find answers to questions about science phenomena. To accomplish this goal, the Science by Doing project developed three components trialed in Australian high schools during 2010:

- Professional learning approach that includes establishing professional learning communities with an emphasis on leadership;
- Curriculum resources that are inquiry-based and also use digital technology in innovative ways; and
- Professional learning resources that use digital technology in innovative and effective ways.

The Tall Poppy Campaign

The Campaign was created in 1998 by the Australian Institute of Policy and Science (AIPS) to recognise and celebrate Australian intellectual and scientific excellence and to encourage younger Australians to follow in the footsteps of our outstanding achievers. It has made significant achievements towards building a more publicly engaged scientific leadership in Australia.

The Tall Poppy Campaign currently recognises the achievements of Australian scientists through the prestigious annual Young Tall Poppy Science Awards and the biennial CSL Florey Medal.

The Campaign's Tall Poppies Reaching Students Program engages the winners of Young Tall Poppy Science Awards ('Tall Poppies') in activities to promote study and careers in science among school students and teachers as well as an understanding and appreciation of science in the broader community.

The Tall Poppy Campaign is funded nationally by the Department of Health and Ageing with the aim of achieving sustainability nationally and in each state and sphere of operation by 2011, and also has significant partners in each state of current operation.

The Young Scientists of Australia (YSA)

This is a group of young Australians dedicated to the promotion and awareness of science in a friendly social environment. YSA attracts a wide spectrum of people ranging from secondary school students to university graduates who share a common interest in science. Members meet regularly at social activities, staff science schools, perform science shows, receive the local YSA newsletter and attend science seminars and excursions.

The Science Schools Foundation, with the support of Rotary clubs around Australia, the Australian Science Teachers Association and the Young Scientists of Australia, makes arrangements with and assists universities and tertiary institutions to conduct more than thirty-five programs annually.

The program is supported by the Australian Science Teachers Association (ASTA), Rotary and universities and tertiary institutions. Its financial sponsors are BOEING, Siemens Ltd Communications and the Queensland Department of Education and Training.

Questacon Programs

Questacon is heavily engaged in science and maths outreach programs including:

- **Tenix Questacon Maths Squad** for students in years 3-8 hands-on mathematics workshops for teachers ensure that the excitement of hands-on maths remains in schools after the Squad has visited
- **Questacon Science Play** for children 2-5 years old and their caregivers a hands-on science session for children and a workshop for educators
- Questacon Science Squad with programs available for primary and secondary school students the Squad performs exciting and entertaining science shows for schools, holiday programs, shopping centres and special events all over the Sydney metropolitan area. The shows feature spectacular science demonstrations and are presented by professional science communicators.
- **Questacon Smart Moves** for students in years 9-12 a multi-media touring show covering science, technology and innovation
- Invention Convention for 30 Secondary students
- Shell Questacon Science Circus for students 5-17 years old. The program is funded until the end of 2013 by Shell. It is on the road for 12-18 weeks visiting 3-4 regions annually and each state is visited every two years. They see 60,000-80,000 a year face-to-face for up to 4 hours each. The overall cost is \$800,000 \$1,000,000 with a per student cost of \$9-\$10. Those on the road as part of the Circus are ANU students. It is a service to primary school and high school students with young role models. However they are not there for sustained contact as with the SiS program.

The Australian Academy of Technological Sciences and Engineering's (ATSE) Science and Technology Education Leveraging Relevance (STELR) Project

The STELR Project is a national secondary school science education initiative of the Australian Academy of Technological Sciences and Engineering (ATSE). This is an association of professional men and women who are elected as Fellows of the Academy on the basis of their achievement in the application of science, technology and engineering to Australian life. STELR is the acronym for 'Science and Technology Education Leveraging Relevance'. The main theme of this secondary science education program for Year 9 or Year 10 students is renewable energy.

The STELR Project was developed to address the decreasing number of students choosing to further their studies in the enabling sciences and mathematics. It achieves this by focusing on one of the key issues of our time, an issue that most students are very concerned about - that of global warming and climate change – and showing them that science and mathematics are crucial to solving this issue.

The STELR project also aims to:

- Improve the level of science literacy and understanding in the community
- Raise awareness of opportunities in technology-related careers
- Prepare students to engage with science ideas and be knowledgeable about the way science and scientists work
- Increase the number of students choosing science and engineering careers to address the shortage of science and engineering graduates
- Improve the quality of science classroom teaching practice.

4.6.3 Conclusion

There are a number of national programs with aims that include:

improving the level of science literacy and understanding in the community

- the promotion and awareness of science
- recognising and celebrating Australian intellectual and scientific excellence
- actively engaging junior secondary school students in learning science
- enhancing primary school teachers' confidence and competence for teaching science.

The SiS Program shares these aims but is the only program that creates and maintains partnerships between scientists and teachers, and mathematicians and teachers.

It is worth noting that a 2008 Review of Questacon recommended that Questacon, CSIRO and the ABC cooperate in identifying new structures for improving national coordination, including cooperation with state and regional science centres, to ensure:

- more effective science communication, awareness and education
- more efficient use of science awareness and education resources
- more equitable access to these activities and resources across Australia.

Recommendation

17 Continue working with other complementary programs and, if funding is to be withdrawn after mid 2012, consider joint approaches to government for further assistance.

4.7 Opportunities to align more closely the operation of the Program to the Government's priorities for school education and, especially, the implementation of the Australian Curriculum

4.7.1 Relationship to the Australian Curriculum

The Australian Curriculum: Science online¹ makes the point in its Rationale that:

Science is a dynamic, collaborative and creative human endeavour arising from our desire to make sense of our world through exploring the unknown, investigating universal mysteries, making predictions and solving problems.

Among other things, it aims to develop:

- an interest in science as a means of expanding curiosity and willingness to explore, ask questions about and speculate on the changing world in which students live
- an understanding of the nature of scientific inquiry and the ability to use a range of scientific inquiry methods, including questioning; planning and conducting experiments and investigations based on ethical principles; collecting and analysing data; evaluating results; and drawing critical, evidence-based conclusions
- an ability to communicate scientific understanding and findings to a range of audiences, to justify ideas on the basis of evidence, and to evaluate and debate scientific arguments and claims.

These aims sit well with the SiS program which promotes science education in primary and secondary schools, helps to engage and motivate students in their learning of science, and broadens awareness of the types and variety of exciting careers available in the sciences.

¹ http://www.australiancurriculum.edu.au/Science/Rationale

The Australian Curriculum: Science has three interrelated strands: *Science Understanding, Science as a Human Endeavour* and *Science Inquiry Skills*.

- Science understanding: Science understanding is evident when a person selects and integrates appropriate science knowledge to explain and predict phenomena, and applies that knowledge to new situations. Science knowledge refers to facts, concepts, principles, laws, theories and models that have been established by scientists over time.
- Science as a human endeavour: Through science, humans seek to improve their understanding and explanations of the natural world. Science involves the construction of explanations based on evidence and science knowledge can be changed as new evidence becomes available. Science influences society by posing, and responding to, social and ethical questions, and scientific research is itself influenced by the needs and priorities of society. This strand highlights the development of science as a unique way of knowing and doing, and the role of science in contemporary decision making and problem solving. It acknowledges that in making decisions about science practices and applications, ethical and social implications must be taken into account. This strand also recognises that science advances through the contributions of many different people from different cultures and that there are many rewarding science-based career paths.
- Science inquiry skills: Science inquiry involves identifying and posing questions; planning, conducting and reflecting on investigations; processing, analysing and interpreting evidence; and communicating findings. This strand is concerned with evaluating claims, investigating ideas, solving problems, drawing valid conclusions and developing evidence-based arguments.

Teachers consulted during the assessment observed that:

- the link between SiS and the curriculum will improve with the Australian Curriculum, but they are having to teach things they have never taught before so time is an issue
- SiS inclusion in the secondary classroom has to be largely opportunistic as the ability to align curriculum/teaching needs with scientist's expertise and availability is minimal
- for primary teachers, maths can be tied into a craft activity and can get "lost" in the primary curriculum
- for most, SiS is an add on to the curriculum rather than an integral teaching tool more of an aid to understanding science than having specific educational outcomes.

Interviews with representatives from national curriculum bodies, national teacher associations and other organisations receiving funding for the promotion of science and maths agreed that the SiS Program aims fit well with the Australian Curriculum strands *Science as a Human Endeavour* as well as *Science Understanding* and *Science Inquiry Skills*.

Furthermore, the point was made that CSIRO's Education Centres constitute a national network that gives SiS a national capability. According to the Academy of Science, the literature says that the most successful initiatives are based around curriculum development, professional learning resources and a professional learning community. Teacher partnerships with science can contribute to all three as already demonstrated by SiS partnerships.

4.7.2 Conclusion

As the states and territories are going to have major responsibility for implementing the Australian curriculum, it may be that SiS has to look to the States for any future funding; the State industry departments (particularly Western Australia and Queensland) may well be a source of funding given their needs for skilled scientist and engineers.

At the same time opportunities exist for greater dissemination of best practice and the SiS model through Education Services Australia's Curriculum Connect tool which provides access to discoverable resources on line.

As time and resources permit, it would be useful to build on current partnerships where there is a 'Teachers to Scientists' aspect, where teachers visit scientists and mathematicians in their workplaces; an initiative that is helping to re-invigorate the love of science and maths in those teachers.

Recommendations

- 18 Develop a Future Funding Strategy for SiS which includes state/territory governments as a potential source.
- 19 Use the ESA Curriculum Connect tool to promote the SiS model to teachers when the database has been refined.

5. Strategies for the future: Proposed Implementation Plan

The partially completed Proposed Implementation Plan on the following pages prioritises actions as Essential, Desirable and Recommended through 2 stages:

- 1. Stocktake and Planning July August 2011
- 2. Consolidation September 2011 May 2012

From June 2012 the funding situation should be well understood and further initiatives should become part of a business as usual planning process.

It should be read on the basis of the following notes:

- 1. This plan is intended to be integrated with the SiS work plan. It does not replace existing activities unless where the proposed task requires that an existing activity cease. It is also not comprehensive. Responsible staff will need to flesh out the tasks required to complete each activity.
- 2. It is intended to be conducted as a project with a nominated project manager.
- 3. The project team must start by completing the plan, allocating all tasks to a person with timeframes for completion and reporting.
- 4. Activities are broken down into Essential, Desirable and Recommended. The allocation of activities to categories is a matter for finalisation within SiS based on cost and other resource requirements.
- 5. The precise tasks within each activity and the outcomes sought are, again, a matter for SiS staff based on experience and capacity.
- 6. Activities under the Essential, Desirable and Recommended categories are intended to be undertaken concurrently as resources allow in each stage, not consecutively.
- 7. The activities are not in any particular order within each category. Once the completion date is agreed the activities should be reordered into chronological delivery order.

Key result areas (KRAs)	What?	Who?	By when?	How measured?	Cost / FTEs	Comments/ status at [date]
Stage 1 Stock	take and Planning July to August 2011 Essential					
Senior management	Consider reallocation of duties at Director/Deputy Director level eg Director to focus on new revenue streams and work more with Ambassadors, Deputy to manage program with focus on implementation of outcomes of this assessment			Both executives fully occupied and contributing to a viable future		
	 Finalise this implementation plan as a project plan and allocate tasks/additional resources as necessary/available Establish as a project within normal project management framework – Deputy Director to be Project Manager? 			Project Plan complete and team in place		
	Conduct a debrief on the assessment outcomes and implementation plan for SiSPOs and HQ staff			All staff support implementation plan		
Partnership promotion	 Stop all promotions of the program to teachers until funding situation is clear Announcement on web site to explain why Continue to promote to scientists 			More control over teacher registrations Narrowing of the gap		
Progress reports	 Improve monthly and progress reports by making them more transparent across all categories of partnerships (active, assigned, dormant, withdrawn, closed) to underpin anecdotal evidence re partnership status, better inform strategic planning, better focus day to day activities and improve the ability of the steering committee to assist management in directing effort including: develop a new set of indicators and trend analyses to track the cost-effectiveness and key performance metrics to assist the steering committee in setting strategic direction more clearly draw the distinction between active/assigned partnerships and dormant/closed in reporting consider how best to acknowledge/incorporate the effort used in withdrawn partnerships (not currently included in reporting figures) develop more accurate \$/student, total student reach, \$/partnership figures eg as used in Catalyst program, to avoid being held accountable to unrealistic figures report on the number of schools with active partnerships. 			Steering Committee crystal clear on current status Steering Committee able to take evidence and risk based decisions based on data and trend analyses provided		
Risk management	Develop a detailed risk management plan in line with the International Standard on Risk Management (ISO 31000:2009) for consideration by the Steering Committee			Improved risk management		
Funding agreement	 Hold discussions with DEEWR re ongoing funding – endeavour to get a commitment one way or the other 			Clarity around Australian Government funding position enables effective planning		
	Review the funding agreement for 2011-12 and for the following funding period if relevant to allow for more flexibility in approach to how the program is run			Funding agreement reflects reality of the program eg targets reflect reality		
	 Steering Committee to clarify whether it expects current targets (with equal numbers of scientists and teachers) to be met even if at the expense of quality of support for active / assigned partnerships. In doing this members should weigh up focusing on improved conversion rate of 			Targets reviewed with DEEWR, altered as agreed		

Key result areas (KRAs)	What?	Who?	By when?	How measured?	Cost / FTEs	Comments/ status at [date]
	 assigned to active vs. recruiting new partners. Seek formal variation on targets in funding agreement to "unhook" teacher and scientist figures and accept cumulative figures as above- or amend reporting Review funding agreement as necessary 					
Additional funding	 Continue to explore the potential for alternative/additional funding and/or in kind resources (eg corporate sector, industry departments, other DEEWR programs) for specific purposes including regional symposia, Indigenous and very remote partnership generation and support, and the technology to make downloadable records of current SiS activities for much broader use 			Additional funding sources identified/ negotiations underway		
Communications strategy	 Augment the existing communications strategy to include an internal communications plan, aimed principally at reducing isolation of SiSPOs and increasing sharing and generation of ideas and an evaluation and monitoring plan Expand stakeholders addressed to ensure this is a fully effective stakeholder management strategy– eg Primary audience does not include Minister for Education, staff not included etc. Put in place proposed media plan to ensure more proactive control of media coverage. 			Review, update and add to current comms strategy Improved comms at every level		
Database	 Develop a more detailed understanding of the current partnership pattern, time spent moving partnerships through different categories, time spent recruiting vs. supporting, active and assigned by partnerships by regional penetration etc to focus constrained SiSPO time Collect additional data as necessary to achieve this 			Data collection more adequately and accurately informs management decisions Reports are clearer and more useful		
	 Increase conversion and retention rates to grow the number of active partnerships rather than aiming for overall continued increases in numbers 			Rate of withdrawals drops – increase in active partnerships		
	Gather more/better baseline data and then measure key indicators over time to fully assess the impact of the program			Key indicators trackable over time		
Web based questionnaire	 Introduce a web based questionnaire for teachers and scientists: 1 minute poll to include: Did you work with your teacher/scientist/mathematician in the past year? If no, do you intend to do so this year or would you prefer to be removed from our database? How many students participated in those activities? Were they face to face? Virtual? How many hours did you/your scientist work with your students? Will you work with your teacher/scientist again in the next twelve months? Do you need any help? 			Increased knowledge of what is happening with partnerships Reduction in number of teachers not responding to follow ups Gap between teachers and scientists is narrowed		
Partnerships	 HQ to work with SiSPOs to conduct a 30 June stocktake of status of all partnerships to remove all those no longer active and seek DEEWR agreement to reduction/removal of current targets - draw on outcomes of questionnaire Focus on converting assigned to active partnerships rather than recruiting new partnerships with the aim of halting the increase in withdrawals (i.e. never active despite input of SiSPO and HQ effort) partnerships (556 at 16 March 2011) 			Database reviewed and refined Clarity about the number of partnerships in each state Higher quality support of active partnerships		

Key result areas (KRAs)	What?	Who?	By when?	How measured?	Cost / FTEs	Comments/ status at [date]
				Reduction in withdrawals over time		
				Increase in numbers of active partnerships		
Project	 Evaluate outcomes to date Review and amend Stage 2 plan as necessary 			Project on track		
management				Ready to implement Stage 2		
Stage 1 Stock	take and Planning July to August 2011 Desirable	T	T		1	
Indigenous and remote partnerships	 Alter the focus of upcoming partnership growth so that more expensive partnerships (Indigenous and remote) rely on obtaining additional/alternative sources of recurrent funding – In other words – do them, but as a separate program 			Additional sources of funding found for "expensive" partnerships		
State/Territory virtual platforms	 Research exactly what virtual connections/platforms are possible in each state/territory (not clear at present) and make this information available to SiSPOs so they can use the technology to the greatest extent 			Potential virtual platforms better utilised		
Business plan	 Develop an annual HQ business plan starting with 2011-12 to include performance indicators and targets for each program aim to drive operational activity 			Business plan in place and effective		
Stage 1 Stockt	ake and Planning July to August 2011 Recommended	1			T	
Staff conference	 Funding permitting, bring forward annual staff conference to kick start implementation of this plan. 			Annual staff conference engenders enthusiasm for streamlining and improving service		
Stage 2 Consol	lidation September 2011 to May 2012 Essential					
Funding	 Further investigate alternative/additional funding sources Prepare a Future Funding Strategy for Steering Committee consideration at its first meeting after the start of this stage and then implement In the event of no repeat Australian Government funding and no alternative sources of funding, CSIRO Education to absorb administration of SiS: with minimal business structure 			Future Funding Strategy agreed by Steering Committee		
	 focused on zero growth in partnerships gradual wind down of regionalised resource web-based delivery of resources, advice on how to establish partnerships, showcases and best practice 					
Streamlining	 Increase the number of procedures (already identified) to improve handovers, moving to a standardised system wherever possible to minimise reinventing the wheel 			Procedures complete		
procedures	 Reallocate resources to HQ/refine work practices and identify other administrative efficiencies to enable additional SiSPO face to face time with partnerships for moving assigned to active partnerships 			SiSPOs have more time for face to face contact		
				More rapid move from assigned to		

Key result areas (KRAs)	What?	Who?	By when?	How measured?	Cost / FTEs	Comments/ status at [date]
				active		
				Fewer withdrawals		
	 Work with HQ staff and SiSPOs to explore how this might work including: considering HQ handling of more of the demand side of partnerships– currently HQ staff log the request, handle police checks etc investigating whether more of the email traffic to/from SiSPOs could be handled centrally to free up SiSPO time for nurturing partnerships and converting assigned to active. Eg could all follow up emails/phone calls be handled from HQ? 			Gradual shift of administrative load to HQ staff from SiSPOs		
	Ensure a balance between agreed and effective administrative structures and procedures and local autonomy to achieve agreed goals			Policies and procedures work for both HQ and regional staff		
	 Focus processes on conversion from assigned to active Establish new processes where required 			More rapid move from assigned to active		
				Fewer withdrawals		
	 Where practical, extend the current partnership recruitment, assignment and support processes to a full cyclical activity approach for all stages of the partnership process – eg with particular times set for face to face recruiting/establishing/ supporting partnerships 			More cost-efficient processes allowing more face to face time for SiSPOs		
Succession Plan	Develop a succession plan including for Patrons, Ambassadors and Program Manager			Succession Plan agreed by Steering Committee and reviewed annually		
Focus areas	Encourage scientists to cover maths aspects of their work			More students exposed to maths through science partnerships		
	Minimise promotions to remote/Indigenous areas unless separate funding is available			Indigenous partnerships focused and paid for separately from other partnerships		
	 Ensure that the participating organisations list is crystal clear about what it represents to avoid any legal issues around misrepresentation of organisations (not a big risk but best avoided) 			Participating organisations list clearly shows current participating organisations, either without or distinct from inactive organisations		
	More clearly articulate the business case for senior effort being put into Indigenous schools and achievability of targets – consolidate spin off as separate program to operate only with a different source of funding			Steering Committee formalises alternative funding approach to Indigenous partnerships		
Reference Group	Alter membership, meeting frequency and remit of reference group to include ambassadors and key corporate to add real value to the program or disband			Reference Group more strategic and productive		
Collaboration	 In the context of limited (and reducing) funding for science programs with complementary aims, explore the potential for a collaborative approach to the Government to support continued funding 			Stronger collaboration with		

Key result areas (KRAs)	What?	Who?	By when?	How measured?	Cost / FTEs	Comments/ status at [date]
	of the very best elements of the current programs.			complementary programs esp around pressing for additional government funds		
NPP	 Depending on outcomes of discussions with the Australian Government and alternative funding sources, prepare a New Policy Proposal for the 2012-13 budget process 			NPP goes forward if relevant		
Australian Curriculum	Need to put links to the Australian Curriculum on the website – current links out of date – need to develop materials that can show how SiS can be embedded			Australian Curriculum has more visibility on SiS website		
	 As a matter of urgency include resources for assisting teachers and scientists to adapt and take advantage of the close links to all three strands of the Australian Curriculum including: links to the Australian Curriculum an FAQ on working with the new curriculum conducting regional workshops or a national symposium on working with the new curriculum. 			Partners can access variety of materials to assist with shift to Australian Curriculum - particularly in those states already using the AC		
	 As the states and territories carry the primary responsibility for implementing the new Australian Curriculum, explore potential future funding from the jurisdictions eg State industry departments (particularly Western Australia and Queensland) which may well be a source of funding given their needs for skilled scientists and engineers. Take care not to jeopardise current funding 			Future Funding Strategy to include initiatives for exploring potential support from state/territory education, resource and industry departments		
	 Increase dissemination of best practice and the SiS model through Education Services Australia's Curriculum Connect Program which provides access to discoverable resources on line. 			Utilise ESA Program to promote SiS model		
Policy framework	 Develop key policies specific to SiS eg sponsorship, prioritisation of activity, basis for exceptions to eligibility criteria etc to minimise time spent negotiating between SiSPOs and HQ. Consider quarantining someone's time to finalise these so that actions are more consistent/efficient across the decentralised administration of the Program 			Policy framework refreshed and relevant		
Recruiting	Ensure regions understand they can approach local branches of national organisations			Regions clear on protocols for approaching national organisations in their state/territory		
Stage 2 Consolidation September 2011 to May 2012 Desirable						
Partnerships	 Funding permitting, expand the range of services currently offered as part of the program to maximise outcomes including: greater use of internet to spread the impact eg through blogs, vodcasts, etc available for download from SiS site – eg start with showcases as these have already been researched and permissions received, then move onto others – short 5-10 minutes only - for use with classes more use of emails/blogs to follow up face to face sessions with scientists encourage schools to develop greater multiplier effect by taping sessions online and reusing for different classes/clubs etc 			Services expanded to maximise the reach and relevance of SiS to more schools		
	 encourage partnerships between schools/classes in same area to make best 					

Key result areas (KRAs)	What?	Who?	By when?	How measured?	Cost / FTEs	Comments/ status at [date]
	 advantage of scientists establish register of scientists happy to do one off presentations for schools which are considering longer term partnershipstry before you buythen back up with "how to set up a partnership" virtual session considering a reverse 'Teachers to Scientists' emphasis where teachers visit scientists and mathematicians in their workplaces; an initiative that could help to re-invigorate the love of science and maths in those teachers. 					
	Expand virtual SiS programs/mechanisms to increase the return on investment - consider this as a separate project and seek sponsorship/in-kind support			Project team in place to progress this Project funded and implemented		
	Capitalise on EBA changes to recruit more CSIRO scientists and mathematicians and encourage involvement at all levels			Increase pressure on CSIRO for more support on individual and organisational level		
	Consider allocating more days to SiSPOs eg by reducing the admin load in HQ (ensuring this does not adversely affect SiSPOs' ability to operate) or by obtaining additional funding from states/territories to support the program			SiSPO hours increased over time Increasing active partnerships/ reduced withdrawals		
	Seek external funding for regional symposia to revitalise and reward longstanding partnerships			Funding obtained Regional symposia held twice a year		
Funding	 As appropriate, focus ambassadors on identifying new funding streams from various sources including state/territory governments (noting that this was not the original intent of the ambassadors and not all may be comfortable with this) 			Ambassadors assist with identifying funding sources/ obtaining funding where appropriate		
Stage 2 Consolidation September 2011 to May 2012 Recommended						
DIY partnerships	 Establish tools for technologically assisted/DIY partnerships by the teachers themselves, backed up by the SiSPOs, rather than the other way around by: minimising time spent checking/reloading data and so on giving teachers a set of guidelines for proceeding through the SiS process themselves incl locating, recruiting, police checking, supporting etc their own scientist/mathematician 			DIY guidelines and tools available and promoted Teachers able to establish own partnerships SiSPOs spend more time on value add		
				support rather than basic admin		

6. Conclusion

Langdale Consulting was asked to take SiS as it exists now and make recommendations on ways to strengthen and tailor it to ensure viability and sustainability in the lead up to the end of the current funding agreement with the Australian Government.

Work to date has built a strong foundation, included sound procedures and practices and impressive inroads into the potential reach of the program and the consultants found marked consistency in support for the program across educational and scientific communities consulted.

This report has already outlined many outcomes and recommendations in relation to the two key aims of the assessment. The underlying conclusions for each of these areas appear below.

6.1 Identify any opportunities to improve the efficiency and effectiveness of the Program through enhancements to its operation and management

There are many ways in which the governance and management of SiS can be fine tuned to work more effectively and efficiently over time as detailed in the Implementation Plan. These include:

- the Steering Committee to have access to a risk management plan and more detailed trend reporting to underpin a clearer understanding of the current status of all partnerships and the risks around ongoing funding
- developing other planning tools to bolster the efficiency and effectiveness of the program including a succession plan, a media plan, an internal communications plan
- streamlining procedures and work practices and, where possible, work allocation, to enable SiSPOs to spend the maximum possible time in face to face support of new, establishing and continuing partnerships
- maximizing the use of ICT to support both management and delivery of partnerships
- providing comprehensive resources for teachers, scientists and mathematicians on how to link SiS with the Australian Curriculum

6.2 Review the financial and other resources needed to continue and grow the Program beyond June 2012.

The assessment highlighted an urgent need to confirm the quantity and source of revenue at the end of the current funding agreement. While growth of the program into the future may be the ultimate goal, it is unrealistic to look at major growth until the current level of funding is assured. In this context, the assessment found:

- there are no realisable economies of scale with the current model, a finding based on both anecdotal and financial evidence that the time required to assign, activate and support a single partnership remains the same whatever the number of partnerships
- further urgent work is required to determine DEEWR's position on future funding and to identify additional sources of revenue including state/territory, philanthropic and corporate funding
- the most efficient ways to boost the program if funding does not increase is to focus on consolidating existing active partnerships, strengthening online resources, and increasing the conversion rate of assigned to active partnerships rather than driving for ever more registrations to meet targets

- if ongoing funding at the current or higher level is confirmed, the priority should be on funding additional SiSPO hours, professional development for SiSPOs and regional workshops/symposia
- to pursue dedicated, additional Indigenous and very remote partnership programs only where funded outside the current agreement while maintaining regular partnerships as usual
- there is value in considering continuing liaison with other complementary programs and, if funding is to be withdrawn after mid 2012, investigating the possibility of joint approaches to government for further assistance.

In summary, the assessment found an effective program working well within the current funding and governance structures, but with a need to focus more keenly on an evidence and risk based approach to strategic direction. Broadening of the program funding mix is also essential to lock in future viability.

Attachment A Brief for independent assessment

Purpose

The purpose of the assessment is to identify any opportunities to improve the efficiency and effectiveness of the Program through enhancements to its operation and management and to review the financial and other resources needed to continue and grow the Program beyond 2012.

Requirements/outcomes

- 1. The assessment will examine and report on:
 - the efficiency and effectiveness of the business structure (current management, administrative and financial structure) of the Program;
 - the cost-effectiveness of the current Program, with consideration of: the spread of partnerships across sectors and regions; and the maths and Indigenous foci;
 - the continuing viability and sustainability of the Program under the current structure and funding;
 - the place of the Program in the Australian school science and mathematics education landscape, with regard to comparable initiatives and any opportunities for connecting and collaborating with other initiatives; and
 - opportunities to align more closely the operation of the Program to the Government's priorities for school education and, especially, the implementation of the Australian Curriculum.
- 2. The assessment will include recommendations about optimal governance and administrative arrangements, and such other changes to the operation and delivery of the Program as seem appropriate.
- 3. The assessment will include recommendations about the budget necessary to see the Program continued at the same level or expanded sustainably beyond 2012, based on the recommended business structure identified above.
- 4. The assessment will address revenue streams and make recommendations about ways to access longer term funding that will assist the Program to be more sustainable.

Timeline

Assessment Report	Due date	Format
Draft	3 June 2011	Electronic
Final	30 June 2011	Electronic Two hard copies

Attachment B Documents reviewed

Scientists in Schools:

Common reasons for partnership withdrawal

Communications Strategy 2010-12 v1.0

Count of scientists and teachers, 7 March 2011

CSIRO 2009-10 Actuals

CSIRO 2010-11 Budget

CSIRO 2010-11 YTD Actuals

DEEWR 2009-10 Actuals

DEEWR 2010-11 Budget

DEEWR 2010-11 YTD Actuals

EMPHASiS issue 1, May 2010

EMPHASiS issue 2, August 2010

EMPHASiS issue 3, February 2011

Importing Scientist Enquiry into SiS Database Procedure, 11 November 2010

List of protocols to be developed

Making Partnerships Procedure, March 2011

Mathematicians in Schools website

Organisation Charts, October 2009 and March 2011

Salary worksheet, 2011-12 Budget

Sample weekly reports, February/March 2011

Scientists in Schools Progress Report 1, 20 November 2009

Scientists in Schools Progress Report 2, 21 May 2010

Scientists in Schools Progress Report 3, 19 November 2010

SiS Budget and rationale 2009-10. 18 May 2009

SiS Regional Action Plans 2010-11 for all States/Territories

SiS Statistics, 1 March 2011

SiS teams status, 16 March 2011

SiS/MiS estimates of students reached

SiS/MiS partnerships active or assigned during a calendar year

Steering Committee and Reference Group Terms of Reference

Work Plan 2009-12, v2.0 19 November 2009

Writing Showcase Procedure, February 2011

Curtin University of Technology:

Howitt, C., & Rennie, L. J. (2008). *Evaluation* of the Scientists in Schools Pilot Project. Perth: Curtin University of Technology

Rennie, L. J., & Howitt, C. (2009). "Science has changed my life!" Evaluation of the Scientists in Schools Project 2008-2009. Perth: Curtin University of Technology

Department of Education, Employment and Workplace Relations:

Annual Report 2009-10

Funding Agreement between the Commonwealth of Australia as represented by DEEWR and CSIRO regarding funding for the Scientists in Schools Program (2009-2012), 19 June 2009

Department of Innovation, Industry, Science and Research:

Inspiring Australia: A national strategy for engagement with the sciences. A report to the Minister for Innovation, Industry, Science and Research, December 2009

Australian Government:

The Shape of the Australian Curriculum: Science. Australian Government, May 2009

Websites:

http://www.ansto.gov.au/School_resources /Scientists_in_Schools_program

http://www.scientistsinschools.edu.au/

http://www.scitech.org.au/scientists-inschools.html

http://www.acpsem.org.au/index.php/hom e/careers-information/scientists-in-schools http://www.abc.net.au/catalyst/stories/298 7799.htm

http://www.montmorencyps.vic.edu.au/sci ence-program.html

http://www.pims.math.ca/educational/edu cational-outreach

http://www.fields.utoronto.ca/programs/o utreach/

http://www.ams.org/programs/students/hi gh-school/high-school

http://www.scienceworld.ca/sis

Interviewees	Position/organisation
Marian Heard	Programs Manager, CSIRO Education
Headquarters team	Science in Schools Program, CSIRO
Gary Carey	Curriculum Adviser, Science, NSW Catholic Education Office
Leonie Rennie	Research Professor, Office of Research and Development, Curtin University of Technology
SiS Project Officers	All states and territories
Ross Kingsland	Manager CSIRO Education
Lisa Bailey	Senior Programs Coordinator, Royal Institution of Australia and member, SiS Reference Group
Jim Peacock AC	Fellow CSIRO
Scott Lambert, Clare Wynter and Nikki Knieriem	Curriculum Support, National Curriculum Branch, Curriculum, Assessment and Teaching Group, DEEWR
Louise Nielsen	Principal Consultant Policy and Advice, K-12 Curriculum, Assessment and Reporting Science, WA Department of Education
Denise Devitt	PEO Curriculum, SPP, Tas Department of Education
ACT Partner focus group	Teachers and scientists from the ACT
NSW Partner focus group	Teachers and scientists from Sydney
Prof Denis Goodrum	Professor Emeritus, Australian Academy of Science
Robert Randall	General Manager, Curriculum, Australian Curriculum, Assessment and Reporting Authority
Will Morony	Executive Officer, Australian Association of Mathematics Teachers Inc
Peter Russo	CEO Australian Science Teachers Association
Graham Smith	General Manager, Development, Questacon

Attachment C Stakeholders consulted