Science Spark
Interim Evaluation Summary
Background

In May 2009, Professor Geoff Masters of the Australian Council for Educational Research (ACER) presented the report of the Queensland Education Performance review to the Premier and to the Minister for Education and Training.

The report recommended that “additional funding be made available for the advanced training and employment of a number of ‘specialist’ literacy, numeracy and science teachers to work in schools (and/or district offices) most in need of support”.

The Science Spark initiative was a three-year, $37.7 million program response to this recommendation. Science Spark commenced in 2009 and concluded in June 2012.

Specifically, Science Spark focused on building the capacity of Year 4 to Year 7 teachers to plan, deliver and assess effective science learning experiences through targeted professional development and extended collegial support. The long-term goal of the Science Spark program was to improve student achievement in science and to support students to develop more positive attitudes towards science.

Key features of the Science Spark initiative

Under the Science Spark initiative, 15 Regional Managers - Science (RMS) were collectively tasked with:

- curriculum leadership emphasising the significance of science education in the primary curriculum and the central role of an investigative approach to science teaching and learning
- delivery of one day of professional development for each Year 4 - 7 teacher in Queensland state schools by June 2012.

The professional development milestone was achieved by February 2012 with over 8,000 teachers attending funded science professional development.

While the approach to the professional development varied with the facilitating RMS, a common core of material was implemented:

- Inquiry-based science teaching focused on the five Es instructional model
- Fair test investigating
- Literacies of science
- Cooperative learning (student group work)

The professional development for teachers of Years 4 – 7 was designed to:

- increase teachers’ scientific knowledge
- develop teachers’ skills in the teaching of science
- enhance teachers’ confidence in teaching science
- help teachers make learning science accessible and engaging
- improve student performance in science and help build a community with a high level of scientific literacy.

In addition, 100 full-time equivalent Primary Science Facilitators (PSF) worked in schools to provide on-going support to teachers of years 4 - 7 to develop and teach more engaging science programs that enhanced science accessibility for all students.

The main focus for PSFs was to work with teachers in classrooms with students in Years 4 to 7. Areas of support included:

- **Planning**
  - Providing models of effective plans and planning processes.
  - Reviewing and commenting on school unit plans.
  - Sharing responsibility for unit planning.

- **Teaching**
  - Delivering demonstration lessons.
  - Observing and providing feedback on lessons.
  - Co-teaching lessons or aspects of a lesson.

- **Resources**
  - Developing resource management plans.
  - Organising sharing of resources across a cluster or region.
  - Demonstrating the safe use of equipment.

- **Curriculum links**
  - Identifying local examples of science in the community.
  - Introducing “experts” to classrooms.
  - Arranging visits to science-related sites.

- **Assessment**
  - Identifying exemplar assessment resources.
  - Providing examples of appropriate standards.
  - Assisting in interpreting school performance data.
  - Promoting practices leading to consistent teacher judgements.
  - Supporting local moderation of Queensland Comparable Assessment Tasks (QCATs).

- **Professional learning communities**
  - Encouraging the development of local clusters.
  - Leading and facilitating school-based workshops.
  - Supporting teachers in pre and post professional development activities.

- **Leadership**
  - Supporting Principals/Heads of Curriculum in promoting prioritisation and accessibility of science across their school.

- **Corporate**
  - Assisting RMS when required.
  - Reviewing and responding to draft materials to support the Science Spark program and development of the C2C science materials.

### Evaluation of Science Spark

An evaluation of Science Spark commenced in March 2011. The evaluation was designed to:

- Determine the major outcomes of the initiative and provide advice on future directions for primary science education in Queensland.
- Define the essential elements of Science Spark and how it was implemented in Queensland state schools and regions.
- Determine implementation barriers, enablers and other relevant issues.

A range of evidence was collected and a series of case studies based on 13 schools from regions and schools across Queensland was then developed. Methods of collection included:

- on-site interviews with over 20 school leaders
- discussion with more than 60 teachers using a short survey instrument
multiple observations of classroom activities including the work of the PSF and teachers together
interviews with 15 PSF and eight RMS.

The case studies, while context specific, provided overall insight into the diversity of school environments and highlighted issues around implementation, outcomes, and opportunities.

**Key findings of the Evaluation**

The Science Spark program was implemented across a wide variety of school contexts and starting points. Prior to the implementation of the Science Spark initiative, based on informant response, the most common characterisation was that schools had taught limited science (in terms of quality, time commitment and consistency) in the recent history of the school or there was limited knowledge of science curriculum due to turn over amongst leadership team and teachers.

However, results of the teacher survey suggested that prior to implementation of the Science Spark program, science in the case study schools had been regularly taught, which the evaluation found may have been attributable to the influence of the Primary Connections program.

The teacher survey found that the professional development provided by the Science Spark staff had positively influenced teaching practice. Both the one day professional development provided by the RMS and the individual work with PSF rated well, with the PSF more positively received.

In particular, the following teacher perceptions of teacher involvement in Science Spark were noted.

Three outcomes received significant levels of positive support:

- Increased engagement with science among teachers in Year 4 – 7.
- Improved confidence and skills in science teaching Year 4 – 7.
- Increase student participation and engagement in science.

Another three outcomes were relatively not as well supported:

- Increased accessibility to high quality material to support science teaching.
- Spread and dissemination of best practice leadership in science education Year 4 – 7.
- Increased involvement of schools in science activities with community organisations and partnerships.

Additional observations:

- Case study schools provided evidence of increased engagement with science for Year 4 - 7 teachers. In addition, in some schools the engagement

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2 Primary Connections professional learning program and curriculum resources (2004-2008) promote an inquiry and investigative approach to primary science incorporating the 5Es instructional model. It was developed by the Australian Academy of Science for primary school teachers with financial support from the Commonwealth government.
extended to the involvement of the school leadership team, teacher aides and Prep to Year 3 teachers.

- Teacher respondents agreed that their involvement in Science Spark had led to increased teacher knowledge of pedagogy in science teaching Year 4 – 7.
- All school leaders demonstrated awareness of the importance of science and skill development of Year 4 - 7 teachers.
- There was a mixed response from schools in regard to increased involvement of schools in science activities with community organisations and partnerships. Many schools believed that there had been improved involvement although others already had existing partnerships that were not attributable to Science Spark.
- There was a positive correlation between teacher confidence and previous exposure to the Primary Connections program.
- There was high support for the perception that there had been an increase in student participation and engagement in science.
- The program highlighted the already existing high level of engagement of some schools with science across all school year levels.
- Resourcing of science in schools was a significant obstacle for many of the case study schools - the evaluation highlighted the need to put in place strategies to maximise use of existing resources and effectively manage purchasing of new resources.

Medium to long term outcomes that were not directly observable in the evaluation time frame:

- Evidence of changes in school-based policies, budgets, data monitoring, staffing and other professional development activities to support the teaching of science over the longer term.
- Enhanced school community knowledge and valuing of science education. The evaluation found this was not readily measurable but used the proxy of open days and other science related events run by the school as a measure.
- Improved student achievement in Years 4 – 7. Schools reported that they did not expect to see improvement in the short term but expected to see results in student outcomes in two years. However some schools did report observable improvements in QCAT\(^3\) results during the evaluation period.

Conclusion

Overall the majority of teacher survey respondents said they had gained from Science Spark. Only those already confident in their skills and teaching of science did not report a gain.

Evidence from Science Spark evaluation, indicates that at least for the case study schools:

\(^3\) QCATs are authentic, performance-based assessments in the key learning areas of English, Mathematics and Science in Years 4, 6 and 9.
• The profile of science for primary school teachers (often beyond Year 4 - 7) primary students, their parents and school leaders had been raised.

• Inquiry-based science is being taught explicitly, confidently and regularly in Year 4 - Year 7 classes for more than an hour a week and following a whole school plan.

• Science is the subject of partnerships with outside organisations with designated days focused on science within and across schools.

The evaluation found that these positive outcomes could be attributed to a range of factors, including:

• The Science Spark model appeared to align with Current Year 4-7 teacher needs. Teachers identified the coaching and co-teaching as a positive learning model. There was particular support for the flexibility of the program with professional development occurring in the school and the PSF working alongside teacher. The model also catered for teachers with different levels of confidence and familiarity in the teaching of science. There was school-based support for continuation of the model.

• The skills, knowledge and personal attributes of teachers in the PSF role were positively highlighted. Positive attributes included: liked, respected, practical, knowledgeable and purposeful, helpful, expert.

• The positive influence of the Primary Connections program as a precursor to Science Spark.

• Support from school leadership.

• Consistency of the Science Spark program with concurrent programs and changes associated with the Australian Curriculum and Education Queensland’s C2C initiative.

Overall Science Spark achieved the objective of building the capacity of Year 4 to Year 7 teachers in Queensland state schools to plan, deliver and assess effective science learning experiences through targeted professional development and extended collegial support.

The Science Spark program has assisted in preparing teachers and schools for the introduction of the Australian Science Curriculum in 2012 and in particular the delivery of the Queensland C2C science curriculum materials.

It has also highlighted the fact that many Queensland state schools were already delivering a high quality science program to their students and the importance of the Primary Connections program in supporting that delivery which Science Spark was able to build on.

However the goal of the Science Spark program to improve student achievement in science is yet to be observed as this outcome was not able to be measured in duration of this evaluation.