

Small Study – Big Success Story

*Primary Connections Incorporating
Indigenous Perspectives Pilot Study Report*

October 2008

A report by the Australian Academy of Science

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In this document, the term 'Indigenous' refers to the Aboriginal and Torres Strait Islander people of Australia.

Disclaimers

The views expressed here are those of the author and do not necessarily represent the views of the Australian Government Department of Education, Employment and Workplace Relations.

This report uses pseudonyms for places and people rather than actual names of teachers, schools and students to protect their privacy.

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A story about success

This report is a story—it is based on the stories told by thirteen educators who participated in a pilot study of the PrimaryConnections Indigenous Perspective Framework in Western Australia in Term 4 of 2007. The narrative style of this report reflects the richness of the qualitative data that informed the study and the authenticity of the partnerships that developed as the pilot study progressed.

Although the pilot study was small, the teachers' stories tell of big results. The results were consistent across the seven pilot schools, and they were more than anyone had expected. At the conclusion of the pilot, Erin, the Aboriginal Education Manager from one of the districts, reflected on her experiences with the pilot and the ongoing, national concern for the disadvantage and lack of achievement experienced by many Indigenous students, saying:

You gotta tell this story...what I've seen going on during the pilot is amazing—I've never seen the kids so engaged. It shows that Aboriginal kids are really smart—we've just helped them to bridge some gaps. Science is a really powerful way of doing that, because for Aboriginal people it's a way of life—they are very connected to the land and the environment—which are integral to their culture.

Erin's plea and the pilot teachers' anecdotes about their students' achievements made the results of this pilot study a story that needed to be told. All too often

the stories we hear and the reports we read about Indigenous education feature disadvantage and failure and the tone of the dialogue is pessimistic.

In contrast, the stories underpinning this report are exciting and optimistic. The stories are about engaged Indigenous (and non-Indigenous) students achieving learning outcomes and experiencing success at school. At a time when governments, schools, teachers and communities struggle to arrest declining Indigenous social, economic and educational wellbeing, can we afford to ignore any report about Indigenous education that reflects hope and optimism?

The report contains summaries of the teachers' stories about their experiences during the pilot—stories that feature enriched learning environments and enthusiastic learners. Yvette, a part-time literacy teacher who taught the pilot curriculum unit with students from Years 4 to 7 explained:

During the pilot all the students were very engaged, and it was a rich learning environment.

Sylvia, who taught a Year 4 class was overwhelmed with her student's achievements:

All [my] students were more motivated for writing and literacy...one of the Indigenous students, whose attendance record was normally extremely erratic, was at school every Thursday for science during the pilot.

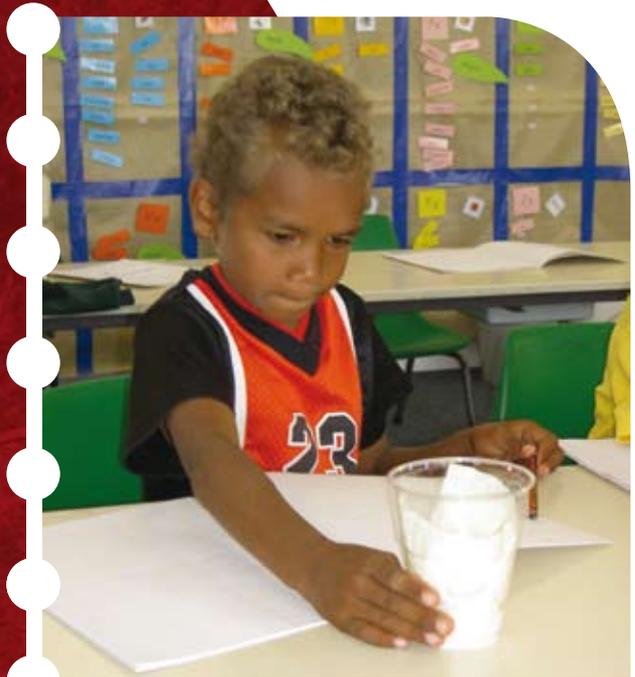
“During the pilot all the students were very engaged...”

(Yvette, teacher at Kennedy Primary School)



“All [my] students were more motivated for writing and literacy...”

(Sylvia, teacher at Pannington Primary School)



During the recording of several post-pilot interviews, Louisa, the curriculum consultant who had helped to organise the pilot as part of a district project she was managing, reported that she couldn't get the lyrics from Kev Carmody's tune, 'from little things, big things grow' out of her mind. Little did she know then the predictive nature of those words.

Other projects have been initiated following the success of the pilot and some of the teachers involved have moved into leadership roles in their schools. The successful partnership between Indigenous and non-Indigenous educators that enabled the pilot and continues to contribute to quality educational outcomes for Indigenous students will be part of a presentation at the December 2008 World Indigenous Peoples Conference – Education (WIPC-E) in Melbourne.

The background to the story

The Primary**Connections** Stage 3 Project Brief argues that ‘high quality teaching of both science and literacy in Australian primary schools is a national priority in order to develop scientifically literate citizens who can contribute to the social and economic well-being of Australia and achieve their own potential’ and that ‘a community with an understanding of the nature of science and scientific inquiry will be better equipped to participate in and contribute to an increasingly scientific and technological world’ (Peers 2006).

Despite the recognition by parents, teachers, principals and education leaders that science should be a priority area of learning, science teaching has a low status in the primary curriculum (Peers 2001) and has been a cause for concern for some time. It is acknowledged internationally that the major purpose of science education is to develop the scientific literacy of students. This purpose underpins the activities of the Education and Public Awareness section of the Australian Academy of Science (AAS), including the Primary**Connections** project.

The Primary**Connections: linking science with literacy**¹ program aims to support primary students’ development of scientific literacy, using the supportive relationship between the learning of science and literacy to provide exciting and engaging ways for students to learn both literacy and science. Primary**Connections** includes a sophisticated professional learning program and exemplary curriculum resources.

Scientific literacy was described in the national review of science teaching in Australia (Goodrum, Hackling & Rennie 2001) as a person’s capacity to:

- be interested in, and understand the world around them
- engage in the discourses of and about science
- be sceptical and questioning of claims made by others about scientific matters
- be able to identify questions and draw evidence-based conclusions
- make informed decisions about the environment and their own health and well-being.

Prime Minister Rudd’s ‘sorry’ speech to the Stolen Generations on 13 February 2008 stated the need to close the gap between Indigenous and non-Indigenous educational achievement and social outcomes. The goal of social and educational equity is a driver for the inclusion of Indigenous perspectives in the Primary**Connections** project. The hands-on, inquiry-based and collaborative approach to learning in Primary**Connections** aligns well with the needs of Indigenous learners.

The Primary**Connections** Indigenous Perspective Framework aims to accelerate science and literacy learning outcomes for Indigenous students and increase non-Indigenous students’ and teachers’ awareness and understanding of Indigenous perspectives. While school attendance and outcomes for Indigenous students have improved in recent years as education programs increasingly address the needs of Indigenous students across the country, only 30 per cent of Indigenous students achieved the proficient standard in the 2003 National Assessments of Scientific Literacy at Year 6, compared with 58 per cent of non-Indigenous students (MCEETYA 2006).

As Phillips and Lampert (2005) suggest, central to the process of addressing Indigenous educational disadvantage and under-achievement is teachers’ development of pedagogical practice and a ‘critical consciousness’ that builds awareness and supports understanding of the multiplicity of perspectives that are the reality of Australian classrooms. Development of curricula that has ‘cultural significance to students’ (Aikenhead 2000) must therefore be a priority.

Australian Directions in Indigenous Education 2005–2008 (2006) states that ‘quality teaching’ that enhances learning environments with responsive pedagogical practice is fundamental to meeting Indigenous students’ needs, and that ‘engaging learning environments’ are essential for the development of effective learning relationships that enhance success and subsequently foster students’ self-worth and sense of belonging. The Garma 2006 Key Forum on Indigenous education and training highlighted the implications of cultural and linguistic diversity on the educational needs of Indigenous learners and learning communities, suggesting that ‘a one size fits all’ approach to meeting Indigenous students’ learning needs is flawed.

¹ <<http://www.science.org.au/primaryconnections/>>

A draft framework for the incorporation of Indigenous perspectives in the PrimaryConnections program (Appendix 1) was developed in 2007 in consultation and collaboration with Indigenous groups, cultural consultants, Indigenous education and linguistic experts and other key stakeholders across Australia. The framework is designed to support teachers with incorporation of inclusive, relevant and embedded Indigenous perspectives, and its development has been in progress since Stage 2 funding for PrimaryConnections was provided by the Australian Government in August 2004.

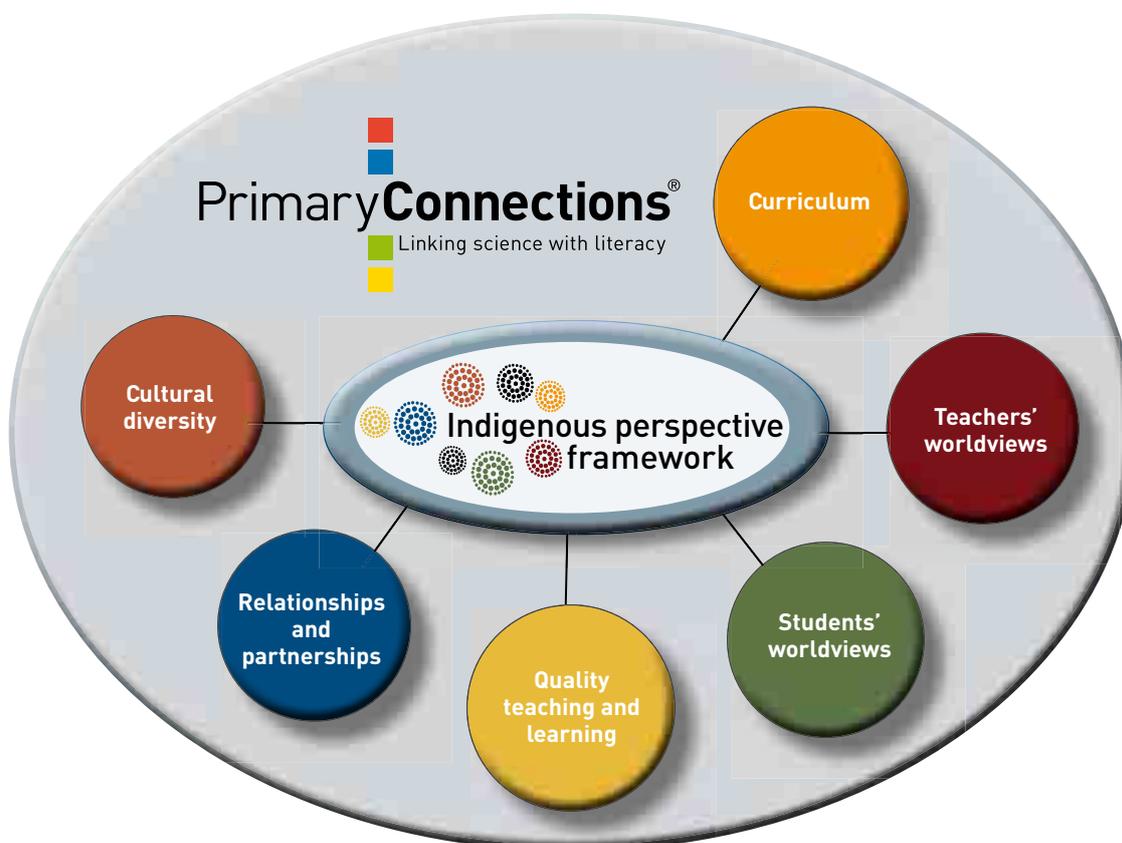
The draft framework, based on national Indigenous education research findings is intended as a guide for schools and teachers to incorporate Indigenous perspectives in the context of science in order to foster improved science and literacy learning outcomes for Indigenous (and non-Indigenous) students. The framework is designed to support teachers' development of inclusive curricula and pedagogical practice that scaffolds students' border crossings from their 'life-world culture to the culture of science' (Aikenhead 2001). Students, indeed all people, are often involved in 'cultural border crossings' as they negotiate the many subcultures that underpin their

society. Teachers of science, as 'culture brokers', are crucial in guiding students back and forth across those borders in the classroom (Jegede and Aikenhead 1999).

The draft framework aims to focus teachers' attention on six key concept areas:

1. students' worldviews and perspectives
2. teachers' worldviews and perspectives
3. relationships and partnerships: establishing links with Indigenous communities
4. quality teaching and learning: best practice
5. curriculum that is inclusive, relevant and contextualised, and
6. cultural diversity.

The draft framework included plans to develop a professional learning module, Indigenous curriculum links for the PrimaryConnections suite of units, a teaching and learning guide, and web-based links to information and resources, including Australian Government, state and territory Indigenous education programs and other inclusive Indigenous education materials.



PrimaryConnections Indigenous Perspective Framework

The pilot study

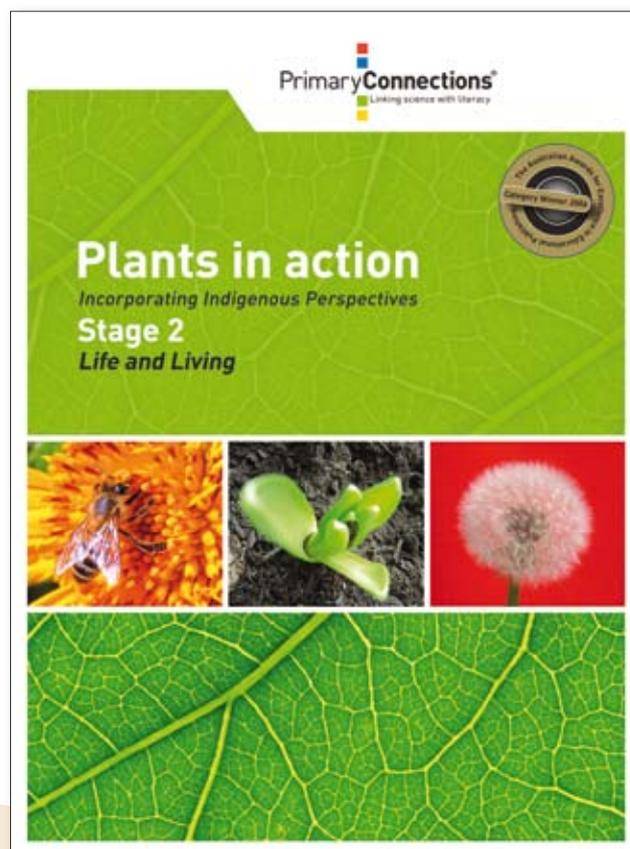
Following development of the draft PrimaryConnections Indigenous Perspective Framework consultation meetings were held with Indigenous education experts, teachers and other stakeholders in various locations across Australian states and territories. The consultation meetings determined the potential and appropriateness of the draft framework as part of a national project to meet needs across a range of contexts and locations. Participants at the meetings were encouraging and provided a critique of the draft framework, including suggestions for teaching Indigenous students and the inclusion of Indigenous perspectives in science and literacy teaching.

In March 2007, a focus group meeting was held in Perth in response to requests from several Western Australian education officers, including the Aboriginal Education Directorate, for information about the draft PrimaryConnections Indigenous Perspective Framework. The focus group participants were interested in using the PrimaryConnections Indigenous perspectives materials to coincide with Indigenous teaching and learning projects in their state. The enquiries were identified as an opportunity to pilot the draft framework. Following the focus group meeting, four of the focus group participants helped to coordinate the implementation of the pilot in seven schools in Western Australia.

A draft Indigenous perspectives professional learning module was developed in consultation with Tamika, PrimaryConnections professional learning facilitator, focus group participant and Aboriginal Education Coordinator from the Townley district. The module (Appendix 2) immersed participants in a range of activities to explore:

- the purpose of Indigenous perspectives in science education
- the PrimaryConnections Indigenous Perspective Framework
- unit planning to incorporate Indigenous perspectives.

An existing curriculum unit—*Plants in action*—was revised to incorporate Indigenous perspectives. The *Plants in action* unit was chosen because of its particular relevance to Indigenous perspectives and the unit had proven to be popular and effective for both students and teachers. The Indigenous Perspectives professional learning module and the revised 'Plants in action Incorporating Indigenous Perspectives' unit were used for the pilot study.



The pilot teachers reported that the use of the Indigenous names for plants, which were displayed on the word wall, and the sharing of knowledge about plant uses, were important in forging cultural bonds and extending the learning for both students and teachers.

Who was involved?

Fifteen educators participated in the pilot of the Primary**Connections** Indigenous Perspective Framework:

- eight teachers
- three Aboriginal & Islander Education Officers (AIEOs), and
- four Department of Education officers.

Eight non-Indigenous teachers and three AIEOs in seven government schools—one urban, five rural and one semi-remote location—taught the ‘Plants in action Incorporating Indigenous Perspectives’ unit. The four Department of Education officers, two in curriculum consultancy and two in Aboriginal education management roles provided liaison between the local Aboriginal community, the schools and the AAS, and helped coordinate the pilot.

Four of the pilot participants were trained Primary**Connections** professional learning facilitators (PLFs), having completed a three-day training program (which included an overview of the Primary**Connections** Indigenous Perspective Framework) at the AAS:

- Louisa, literacy consultant managing the Bromley Engagement Project
- Tamika, Aboriginal Education Coordinator for the Townley Education district

- Cheryl, curriculum consultant with the State Education Office, and
- James, a classroom teacher.

The AAS in Canberra coordinated the pilot study through Robyn Bull, the AAS’s Primary**Connections** Indigenous perspective coordinator and the author of this report.

Thirteen of the fifteen participants (eight teachers, one AIEO and the four Department of Education officers) were interviewed as part of the pilot study.

Louisa and Erin coordinated the pilot for the five rural schools in the Bromley district. Prior to commencement of the study, the pilot teachers from this district participated in a day of professional learning that included the draft Primary**Connections** Indigenous Perspectives professional learning module. Erin, Louisa and the AAS coordinator facilitated the workshop at Bromley. Following the pilot, two of the pilot teachers completed the three-day Primary**Connections** training to become PLFs.

The other two pilot schools were in an urban location and a semi-remote location, with Cheryl and Tamika coordinating implementation at those sites.

The teaching experience of the eight teachers involved in the study ranged from ‘recent graduate’ to ‘highly experienced’ (more than ten years)—five had taught



The teachers worked with their AIEOs and Erin and Tamika to establish links with the local community in order to identify relevant, contextualised Indigenous perspectives.

for more than five years and three for less than five years. All the teachers had some experience teaching Indigenous students, mostly in rural locations. Before the pilot study began, the teachers were mostly concerned about their Indigenous students' low literacy levels, absenteeism, and the lack of curriculum relevance for these students. Some also expressed concern about a lack of knowledge of Indigenous perspectives and a corresponding lack of confidence to integrate Indigenous perspectives into their teaching and learning programs. They suggested that web resources to support incorporation of Indigenous perspectives would be helpful. The teachers identified the lack of curriculum relevance for Indigenous students as a major factor contributing to their lack of engagement in learning.

Two teachers, one a part-time literacy teacher and the other a secondary science teacher, taught the pilot unit once per week: one with a Year 5/6 composite class, the other with various composite classes from Years 2–7. The other six were full-time classroom teachers, and they integrated the unit into their program for the term. Class sizes averaged 28 students and included a Year 1/2 composite, a 2/3 composite, two Year 4 classes, a Year 5/6 and 6/7 composite and a Year 7 class. The flexibility of the 'Plants in action Incorporating Indigenous Perspectives' unit enabled teachers to adapt the learning outcomes in order to suit their students. The teachers worked with their AIEOs and Erin and Tamika to establish links with the local community in order to identify relevant, contextualised Indigenous perspectives.

In total there were approximately 50 Indigenous and 180 non-Indigenous students in the study, comprising three or four Indigenous students in most classes, while 60 per cent of the students in the semi-remote location were Indigenous. Their teacher, James, indicated that at least half of the Indigenous students had very low literacy levels. Two other teachers, Beryl and Roseanne, each had a disaffected male Indigenous student in their class. Both of these teachers were frustrated that they had not been able to engage the boys in the learning environment and that subsequently both students had achieved very little in the three terms before the pilot started. Josephine, one of the Year 4 teachers, also taught an autistic student with a short attention span who was not easy to engage in learning.

How was the study conducted?

The pilot study was structured around ongoing collaboration between the AAS coordinator and the pilot participants for a period of at least eighteen months. This long-term partnership established trusting and respectful relationships with the pilot participants and contributed to the AAS coordinator's deepened understanding of the context of the study. This 'prolonged engagement' helped to avoid the possibility of misinterpretation of data and misrepresentation of information about the study, and contributed to the 'credibility' and 'trustworthiness' of the report (Guba and Lincoln 1989).

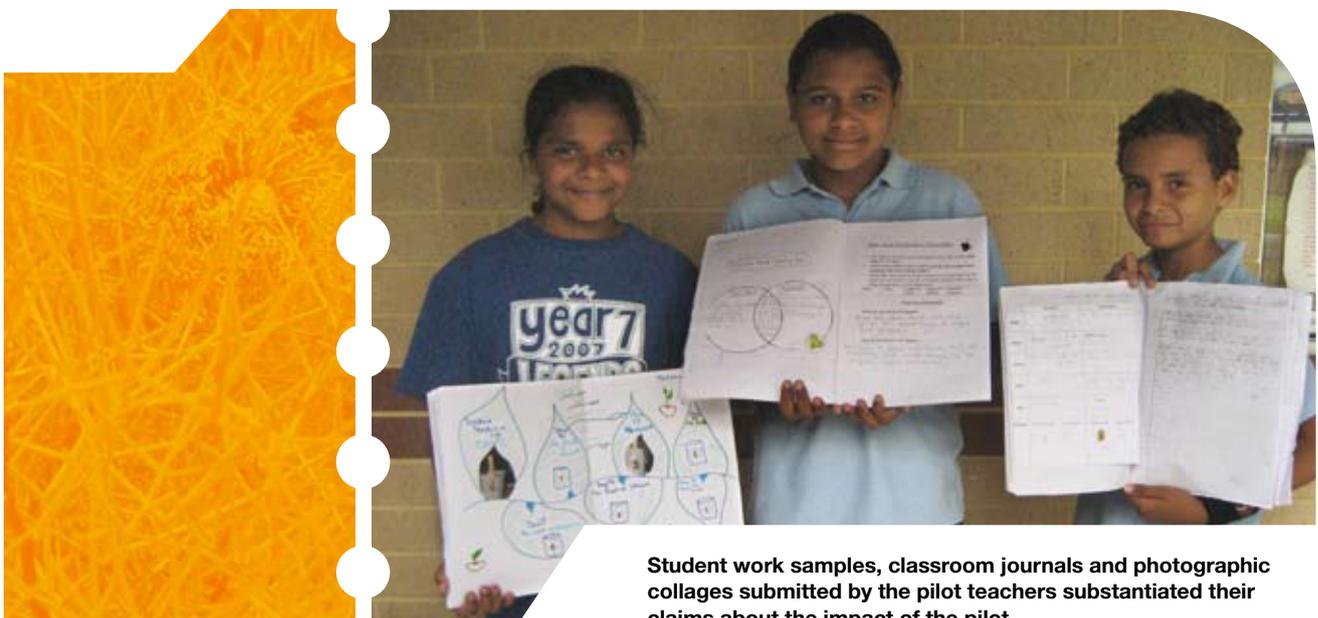
The collaboration began with the focus group meeting in March 2007 and has continued for the entirety of the study—until completion of this report. During this time, the AAS coordinator met with, teleconferenced or used video-conferencing to establish consistent and open communication with the pilot participants. The meetings included ongoing consultation with the Aboriginal education manager and coordinator from the pilot study.

The pilot teachers, the AIEOs, the Aboriginal education manager and coordinator and the two Western Australian Education Department's curriculum consultants met prior to the commencement of teaching the pilot unit. Pre- and post-pilot evaluation questionnaires were completed by some of the participants. This was helpful in establishing some of the baseline data. However, it was the teachers' anecdotal feedback—recorded through interviews and

video conferencing, along with their written feedback recorded on the revised 'Plants in action Incorporating Indigenous Perspectives' unit—that provided rich and informative data about the impact of the pilot. Student work samples, classroom journals, and photographic collages submitted by the pilot teachers substantiated their claims about the impact of the pilot.

Face-to-face interviews were conducted with twelve of the pilot participants and a video conference was held with the remaining teacher in the semi-remote location at the conclusion of the pilot. A summary of the pilot teacher interviews is included at Appendix 3. A 'member check' (Guba and Lincoln 1989) process was used during the interviews and during data collation and analysis to verify that the recordings and interpretations accurately represented the pilot participants' experiences. A final member check was also completed before publishing the report.

In general, all Primary**Connections** curriculum units are trialled in 56 schools in a variety of locations across Australia. Trial teacher feedback, student work samples and classroom journals are collated and analysed to inform final publication of the units. This process was also utilised for the seven schools in this pilot study and a summary of the data from the pilot teacher's feedback (seven of the eight pilot teachers returned annotated units) on the revised unit 'Plants in action Incorporating Indigenous Perspectives' is attached at Appendix 4.



Student work samples, classroom journals and photographic collages submitted by the pilot teachers substantiated their claims about the impact of the pilot.

What happened? The main themes

Across a range of contexts, a consistent message from the teacher's anecdotal feedback on the pilot study was that the PrimaryConnections Indigenous Perspective Framework contributed to:

- Theme 1:** increased engagement with learning for **all** students
- Theme 2:** increased awareness and understanding of science and Indigenous perspectives
- Theme 3:** connectedness driving motivation and participation of Indigenous students
- Theme 4:** increased teacher confidence and competence with linking science and literacy and Indigenous perspectives
- Theme 5:** improved relationships and partnerships across the school and wider community
- Theme 6:** establishment of links between schools, parents and community.

A synthesis of these emerging themes is listed in the following pages. Comments by pilot teachers have been included to help characterise each theme.

Theme 1: Increased engagement with learning for **all** students

The Indigenous kids were much more motivated to speak up and have a voice ... They were able to be more expressive and therefore more creative. Their improvements in literacy transferred to other subject areas so they were experiencing more success across the curriculum.

(Margie, Aboriginal & Islander Education Officer at Middleton Primary School)

The students (both Indigenous and non-Indigenous) involved in the pilot were very engaged, which led to improved participation, learning and success, noticeably in literacy-based activities. Teachers were most excited by the effects on their most reluctant students, admitting surprise at how engaged all students were and at the range of literacy learning they were involved with (quite subconsciously at times). One teacher talked about major changes in learning and estimated that 70 per cent of the class had improvements in literacy, particularly in spelling. The teacher suggested that the science context provided students with an authentic reason for learning how to spell their words.

The pilot teachers were overwhelmed and delighted by the fact that students were completing homework tasks, staying in class during lunch and recess breaks to complete activities, and bringing all sorts

of information and items (plants, flowers, seeds) to the classroom. They reported many instances of 'learning outside the school', with students 'observing plants in and out of school' and then



sharing this information with others. In particular, Indigenous students were motivated to seek out information outside the formal learning area and were sharing their findings with the class. The pilot teachers said that such social behaviours and involvement in learning were definitely 'firsts' for some Indigenous students. Subsequently these students experienced a

more positive classroom and school profile, resulting overall in a more effective relationship with learning. They added that the students' improvements in literacy learning from the 'Plants in action Incorporating Indigenous Perspectives' unit were being transferred to other learning areas.

Theme 2: Increased awareness of science and Indigenous perspectives

Indigenous perspectives in the context of science breaks down the barriers ... it bridges the 'us and them' dichotomy.

(Madeline, Science Teacher at Boswood Primary School)

The difference and the understanding that the Indigenous perspective brought to the classroom was most beneficial ... and it motivated others (like Benjamin, an African student) to share his culture, which enriched the learning environment for all the students.

(Margie, Aboriginal & Islander Education Officer at Middleton Primary School)

All pilot teachers reported that the Indigenous perspectives unit had 'raised intense interest' across their school, and the principals asked the teachers to 'thank the Academy' for involving their school. Some schools included information about the pilot on the school intranet, including details about the class involved, information about the 'Plants in action Incorporating Indigenous Perspectives' unit, and relevant Noongar (South-west Western Australian Aboriginal group) information. They also displayed photographs of the students involved in a range of science activities in and around the school. Pilot teachers talked about 'classrooms coming alive' and exemplifying 'two-way learning'.

The teachers reported that following the teaching of the unit their students had been keen to discuss 'science careers' and that the students were more aware of scientific processes as part of that role. They said that students had enjoyed being scientists so much during the unit of work that they were constantly asking about 'What science topic they would be doing next, if they could do science next year, and if they could organise a science club'.

The Indigenous students were more motivated than ever before with independent inquiries and learning outside the classroom and school environment. They contributed more to the learning environment (for example, volunteering information, asking and answering questions and sourcing more information from family and community members).



Theme 3: Connectedness driving motivation and participation of Indigenous students

The pilot was about Corey overcoming the failure syndrome—Corey spending a lot more time in the classroom ... because of his success in science.

(Roseanne, Teacher at Eastern Valley Primary School)

The most amazing thing about the Plants unit and the pilot was the sense of connectedness that our Aboriginal kids felt ... seeing our kids doing lots of literacy and being so engaged has been wonderful.

(Erin, Bromley Aboriginal Education Manager)

Two pilot teachers gave moving accounts of two disaffected male Indigenous students who had successfully participated in the learning environment and engaged with literacy tasks during the 'Plants in action Incorporating Indigenous Perspectives' unit. Before starting this unit, the boys were more often in time-out situations rather than in the classroom, and they were certainly not engaged in most learning activities, particularly literacy tasks. These two teachers (from the same school, but different year levels) organised an excursion to a local native plant reserve and reported that this was a most successful learning activity for all students, importantly also for the two Indigenous boys.



Both teachers reported unparalleled feelings of satisfaction as they shared photographs of the boys working together (and with others) to observe and record information during the excursion and throughout the unit. All the pilot teachers shared exciting stories about improvements in learning outcomes for Indigenous (and non-Indigenous) students in their classes.

They spoke of Indigenous students' enhanced profiles with their non-Indigenous peers (both in and out of the classroom) as they became the 'experts' due to their Noongar background and knowledge of plants. This in turn boosted their motivation and they tended to be more involved in the learning environment in general.

Most pilot teachers reported that Indigenous students with previously erratic and very low attendance records attended school more often during the pilot.

Theme 4: Increased teacher confidence and competence in linking science with literacy and Indigenous perspectives

PrimaryConnections is fantastic ... I wish I could do it all the time.

I can see so much benefit for the students ... for Indigenous students they are more engaged in the learning, it enables them to have a voice, they are participating more, they are putting their hands up, asking questions, even the shyest students came forward and talked about what they knew about plants.

(Jennifer, Teacher at Middleton Primary School)

All pilot teachers reported feeling more confident and enthusiastic about teaching science, and incorporating Indigenous perspectives, as well as being reinvigorated in their teaching generally. They were able to articulate the purpose and benefits of teaching science incorporating Indigenous perspectives. They had developed more understanding of the links between science and literacy and reported that this was especially advantageous for Indigenous students and reluctant learners. The teachers had enjoyed the unit of work and they reported having learnt as much as their students. Five of the teachers inquired about further training in **PrimaryConnections** and they all said they would be teaching **PrimaryConnections** in 2008 and were keen to try other units.

Most spoke of enhanced personal profiles in the school due to their involvement in the pilot. Following the success of the pilot in her school, one teacher has been appointed as science coordinator. Another will now work as a science teacher leader in her school, teaching science each week with students in Years 4/5 and 6/7, as well as mentoring other teachers and working with an ICT specialist teacher to develop interactive whiteboard templates for the **PrimaryConnections** units. The principal at this

school considers science a priority, even though there are other significant priorities at the school. He was so pleased with the outcomes of the pilot that he is supporting further implementation of **PrimaryConnections** across the school. Another pilot teacher has been promoted to Assistant Principal.



Theme 5: Improved relationships and partnerships across the school and wider community

The Aboriginal & Islander Education Officers' contribution significantly enhanced the process ... with contextualisation on the unit, building positive relationships and the sustainability of science in remote schools, given teacher transience in these areas.

(James, Teacher at Cranston Primary School)

During the pilot, dialogues were opened up between students, teachers, AIEOs, parents and Indigenous community members that were not happening previously. This brought about more opportunities for two-way learning and helped improve school and community relationships.

The Aboriginal Education Manager from the Bromley district was extremely helpful with identifying and implementing the Indigenous perspectives for the teachers. She helped to facilitate a contextualised professional learning session for teachers on Indigenous perspectives in science before the unit started. The teachers reported that this session was extremely helpful in boosting their confidence with science teaching and with developing Indigenous perspectives.

One of the pilot teachers modified an activity from the professional learning session (building a shelter from local plant items) to develop a design task for students and reported that this was an extremely successful activity. She said, 'all the students were very engaged, cooperative and enthusiastic, and the activity provided Indigenous relevance for the unit'.

The Aboriginal Education Manager from the Bromley district was also instrumental in mustering support for the teachers with local Indigenous elders and community members. The teachers were surprised at the level of support received, and will now maintain these links with the Indigenous community to further enhance the teaching of science and other areas of the curriculum.



Theme 6: Establishment of links between schools, parents and community

There was a lot of learning across the whole school due to the science unit, and this didn't go unnoticed.

All the students were very engaged, and it was a rich learning environment.

(Yvette, Teacher at Kennedy Primary School)

Parents from all pilot schools gave PrimaryConnections 'a very big tick' —they were most impressed with the children coming home and sharing what they'd been learning about and, importantly, being excited about going to school. For some parents this was unusual but very welcome behaviour from their children. The pilot teachers reported that parents willingly helped with all aspects of the unit and were most involved with the garden buddy activity. In many instances, this was a new occurrence, and it resulted in more students participating in quality literacy and science learning, with some students participating and producing literacy products as never before.

Community elders also became involved in the schools, supplying information and offering support for the program. Again, this was not usual practice before the pilot study. Participating Indigenous communities now support whole-school science programs and are becoming more involved in the school community generally.



Other PrimaryConnections findings

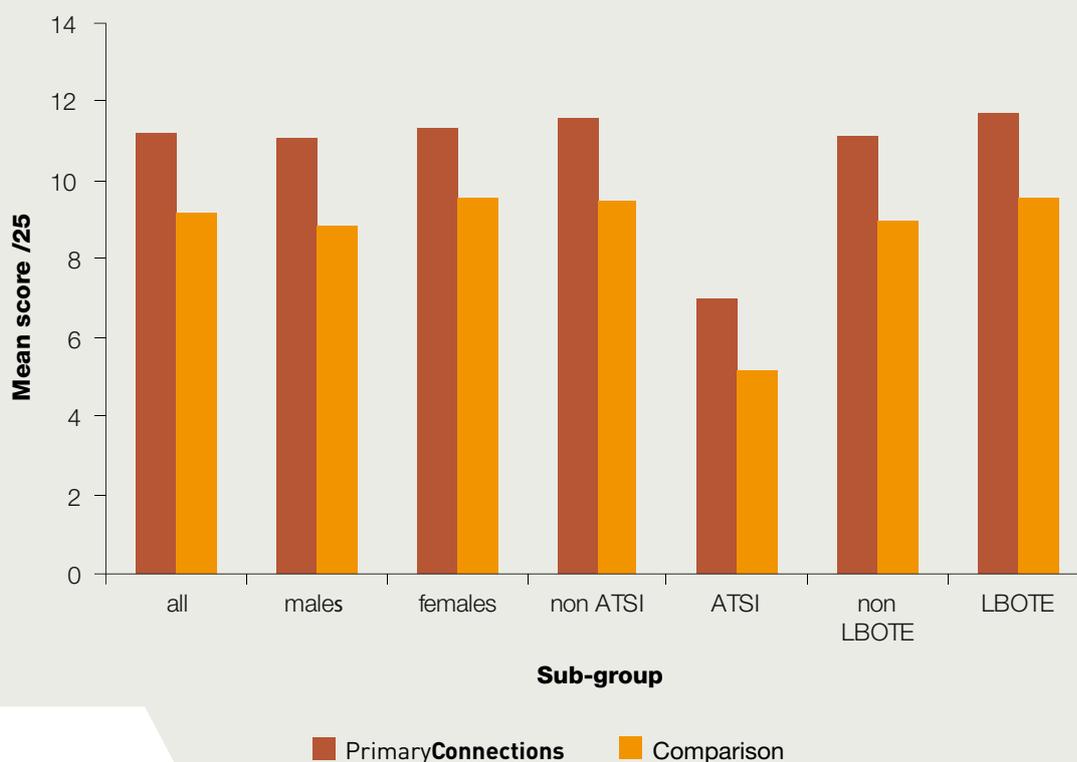
A concurrent study of 1467 students in Years 3–7 from 26 government schools in Western Australia and Queensland reported similarly positive results from implementing PrimaryConnections units.²

The study revealed that students from PrimaryConnections classes achieved significantly higher mean literacies of science, processes of science (see Figures 1 and 2) and some aspects of attitudes to school science than students in comparison classes.

Importantly, the higher mean scores for literacies and processes of science were reported for all groups—males, females, students of Aboriginal and Torres Strait Islander descent (ATSI)—students with a language background other than English (LBOTE) and for non-ATSI and non-LBOTE students.

The evaluation revealed that the impact of PrimaryConnections on students' achievements in literacies of science and science processes was both statistically significant and substantial, as evidenced by the effect sizes. The research indicated that the linking of science and literacy, the explicit teaching of literacies of science and the inquiry-based teaching and learning model that underpins the PrimaryConnections approach most likely contributed to the enhanced performances of the students from the PrimaryConnections classes.

Figure 1: Mean scores for literacies of science for subgroups of Year 5–7 students for primary science tests



² PrimaryConnections Stage 3 Interim research and evaluation report 15: *Impact of PrimaryConnections on students' science processes, literacies of science and attitudes towards science* (Hacking and Prain 2008) <<http://www.science.org.au/primaryconnections/irr-15.pdf>>

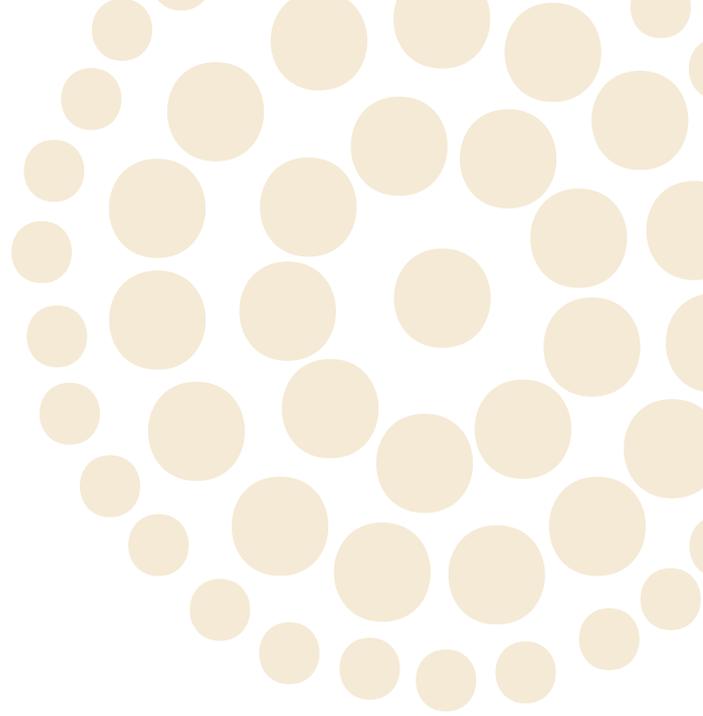
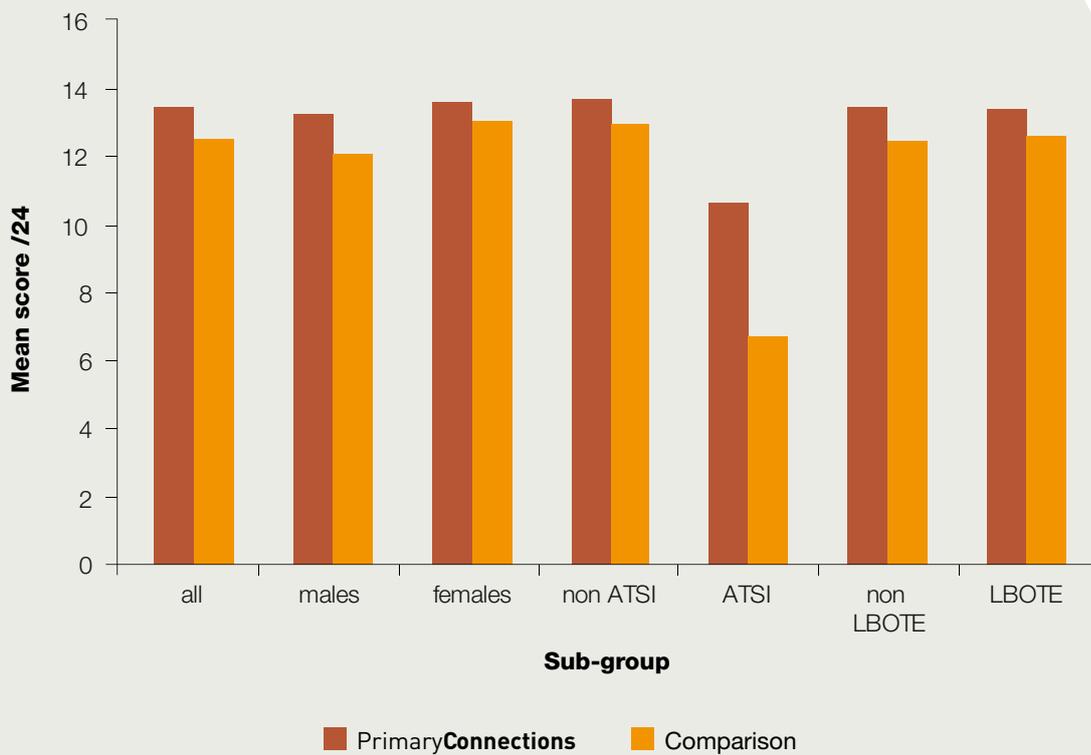


Figure 2: Mean scores for processes of science for subgroups of Year 5–7 students for primary science tests



Note: The students who identified as Indigenous were a relatively small group (8 per cent, $n = 112$) and comparisons between the performances of Indigenous students from PrimaryConnections classes with Indigenous students from comparison classes should be considered with caution as sampling effects are likely to influence findings.

What does all this mean?

The study is small, so we cannot generalise or assume ‘transferability’ (Guba and Lincoln 1999). Even so, the results of the pilot were consistent across a range of contexts in the eight classrooms that were part of the pilot—including urban, rural and a semi-remote school with Indigenous and non-Indigenous students from Years 1–7.

The pilot teachers, the curriculum consultants and the Aboriginal education manager and coordinator unanimously endorsed the pilot as contributing to successful outcomes for students, teachers, and schools. Does this therefore indicate some potential for the Primary**Connections** Indigenous Perspectives Framework to support teachers in meeting the learning needs of Indigenous (and non-Indigenous) students?

The pilot teachers reported improved and sustained student engagement during the pilot (approximately one term in duration) with students remaining enthusiastic and committed to learning throughout the unit. Most frequently, they mentioned students’ increased engagement with a broad range of literacy tasks and that they were most excited and often surprised as their previously resistant and sometimes recalcitrant students demonstrated unprecedented levels of engagement, motivation and participation in literacy activities.

These results are particularly interesting in light of the *What Works* Program (DEEWR 2007), which states that ‘developing literacy is one of the central challenges for teachers of Indigenous students’. Also, if the effects on students’ learning that the teachers described can be sustained, there is hope that Indigenous students can break the cycle of failure that so often represents their experience in education.

The rich array of Indigenous culture and knowledge in the context of plants and science in which the pilot teachers immersed their students helps to demonstrate that ‘engagement will not occur, or be sustained, unless Indigenous education is built-in to core business’ (AESOC 2006). Also, the reported transference of students’ improved literacy skills to other curriculum areas is positive as it provides evidence of learning retention. It is indicative of the students’ enhanced participation levels and increased attendance levels.

The increased involvement of all stakeholders in the learning environments in the pilot indicates a positive flow-on effect, as it included reports that this would enable further development of effective school and community partnerships. The involvement of Indigenous people in educational decision-making is central to the National Goals for Indigenous Education. (MCEETYA 2000).

Following the pilot, the teachers indicated considerable increases in their enthusiasm and confidence with science teaching, and linking science with literacy and incorporating Indigenous perspectives. Several pilot teachers indicated a desire to participate in further professional learning and all the pilot teachers indicated their intention to teach more science and to use the Primary**Connections** Indigenous Perspectives Framework to incorporate Indigenous perspectives across the curriculum. Some of the pilot teachers have moved into leadership roles in their schools.

The *Australian Directions in Indigenous Education 2005–2008*, agreed to by the Ministerial Council on Education, Training and Youth Affairs, states that ‘strong, proactive and informed leadership at the school level is fundamental to establishing and maintaining a culture of learning that is inclusive of Indigenous students and enables their engagement and successful participation’ (AESOC 2006).

In summary, the study of the Primary**Connections** Indigenous Perspective pilot showed compelling anecdotal evidence of:

- increased student engagement and participation in literacy learning
- improved student self esteem, confidence and attitude to learning
- increased student participation and contribution
- increased experiences of success by students
- increased student attendance
- improved student relationships with learning (enthusiasm and commitment to learning)
- improved teacher attitudes to teaching science and literacy incorporating Indigenous perspectives
- improved relationships and development of partnerships with parents and communities.

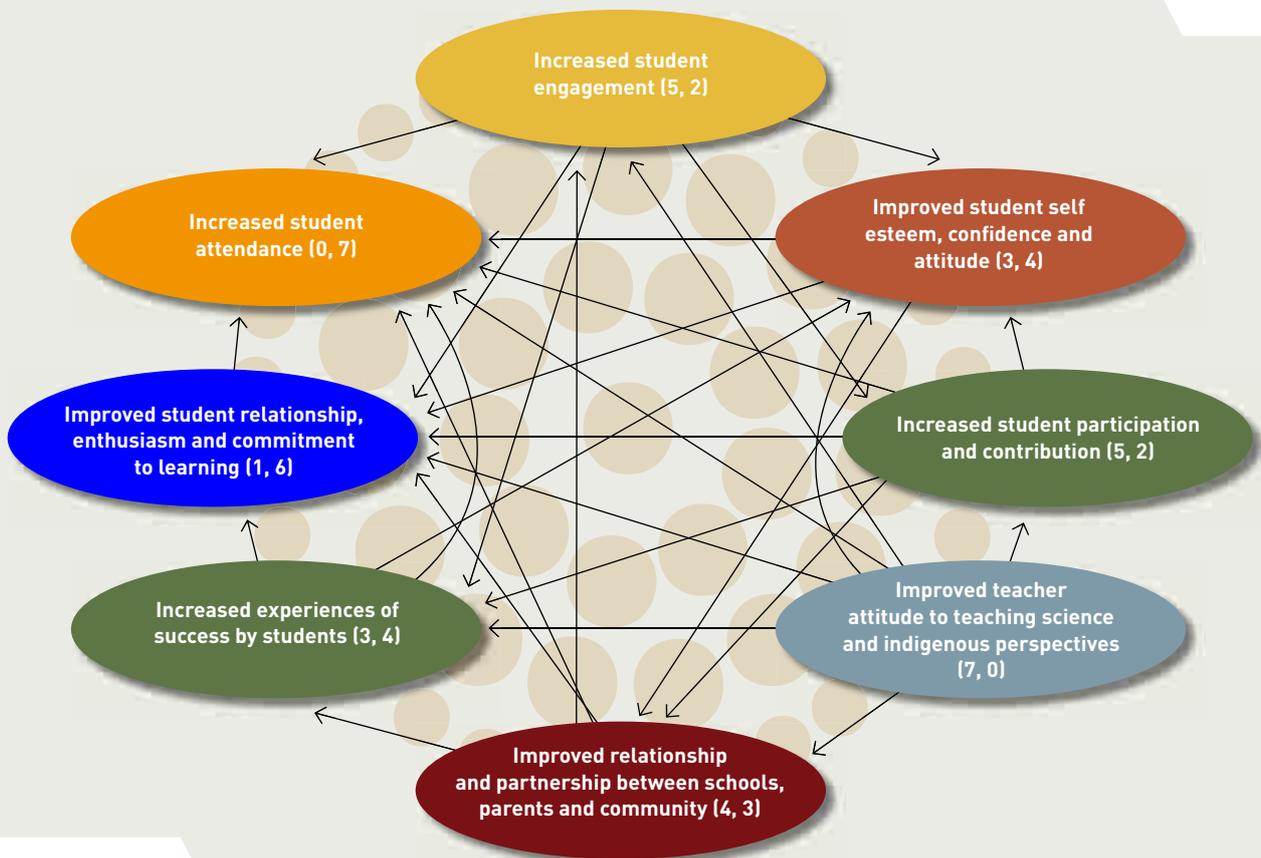
An interrelationship digraph (Appendix 5) was used to analyse the relationship between the above factors to identify those that had the most impact (the factors with the most 'out' arrows). It helps identify where efforts should be focused to gain the most benefit.

The interrelationship digraph (Figure 3 below) identified 'improved teacher attitudes to teaching science and Indigenous perspectives' as the major driver of success, followed by 'increased student engagement, participation and contribution'. Since quality teaching and engagement of students is integral to meeting Indigenous students' needs and improving their learning outcomes (AESOC 2006), these findings

demonstrate the potential of the PrimaryConnections Indigenous Perspectives Framework to support teachers to develop and implement embedded Indigenous perspectives, which will contribute to improved science and literacy learning outcomes for students.

This report is a story about success—success at school for Indigenous (and non-Indigenous) students and their teachers. Success established through science incorporating Indigenous perspectives, which enabled an enriched learning environment with cultural significance to students to foster engagement and connectedness with learning.

Figure 3. PrimaryConnections Indigenous Perspective Framework pilot teacher feedback: interrelationship digraph



References

- AESOC [Australian Education Systems Officials Committee] (2006). *Australian directions in Indigenous education 2005–2008*. A report approved by state, territory and Commonwealth Ministers for Education and Training at the 20th MCEETYA Meeting on 6–7 July 2006. MCEETYA: Carlton. <[http://www.curriculum.edu.au/verve/resources/Australian Directions in Indigenous Education 2005–2008.pdf](http://www.curriculum.edu.au/verve/resources/Australian%20Directions%20in%20Indigenous%20Education%202005-2008.pdf)>
- Aikenhead G. (2000). Renegotiating the culture of school science. In R. Millar, J. Leach & J. Osborne (Eds), *Improving science education: The contribution of research*. Open University Press, UK, pp.245-264.
- Aikenhead G. (2001). Students' ease in crossing cultural borders into school science. *Science Education* 85, 180–188.
- DEST [Australian Government Department of Education, Science and Training] (2006). *National Aboriginal and Torres Strait Islander education policy (AEP)*. Australian Government Department of Education, Employment and Workplace Relations: Canberra. <<http://www.dest.gov.au/archive/schools/indigenous/aep.htm>>.
- DEST [Australian Government Department of Education, Science and Training] (2006). *National Aboriginal and Torres Strait Islander education policy (AEP)*. Australian Government Department of Education, Employment and Workplace Relations: Canberra. <<http://www.dest.gov.au/archive/schools/indigenous/aep.htm>>.
- DEEWR (2007). *What works: the work program*. Australian Government Department of Education, Employment and Workplace Relations: Canberra.
- Goodrum D., Hackling M. & Rennie L. (2001). *The status and quality of teaching and learning of science in Australian schools: a research report*. Canberra: Department of Education, Science, Training and Youth Affairs.
- Guba E.G. and Lincoln Y.S. (1989). *Fourth generation evaluation*. Sage Publications: Newbury Park, California.
- Hackling M.W. and Prain V. (2008). 15: *Impact of PrimaryConnections on students' science processes, literacies of science and attitudes towards science*. A research report to the Australian Academy of Science, Australian Government Department of Education, Employment and Workplace Relations and the Australian Academy of Science: Canberra, La Trobe University. <<http://www.science.org.au/primaryconnections/irr-15.pdf>>
- Jegede O.J. and Aikenhead G.S. (1999). Transcending cultural borders: implications for science teaching. *Research in Science and Technology Education* 17, 45–66.
- Lea T., Martin W. and Wurm J. (2006). *Garma 2006 Key forum report, Indigenous education and training*. School for Social and Policy Research, Charles Darwin University: Darwin, Northern Territory.
- MCEETYA (2000). Report of MCEETYA Taskforce on Indigenous Education. <http://www.curriculum.edu.au/verve/_resources/reportm_file.pdf>
- MCEETYA (2006). *2006 National assessments of scientific literacy*. Ministerial Council for Education, Employment, Training and Youth Affairs: Canberra.
- National goals for Indigenous education*. Australian Government Department of Education, Employment and Workplace Relations: Canberra. <http://www.dest.gov.au/sectors/indigenous_education/policy_issues_reviews/national_goals_for_indigenous_education.htm>
- Peers, C. (S.) E. (2001). Teacher professional growth during implementation of a science curriculum innovation. Unpublished Masters (Research) thesis, Queensland University of Technology, Brisbane.
- Peers, C. (S.) E. (2006). *Making a difference: PrimaryConnections Stage 3 Project Brief*. Canberra: Australian Academy of Science.
- Phillips J. and Lampert J. (2005). *Introductory Indigenous studies in education*. Pearson Education Australia: Frenchs Forest.
- Rudd K. (2008). *Apology to Australia's Indigenous peoples*. Speech made to the House of Representatives on February 13, 2008. <http://www.pm.gov.au/media/Speech/2008/speech_0073.cfm>

Appendix 1: PrimaryConnections Indigenous Perspective Framework

Plants in action

Indigenous perspectives

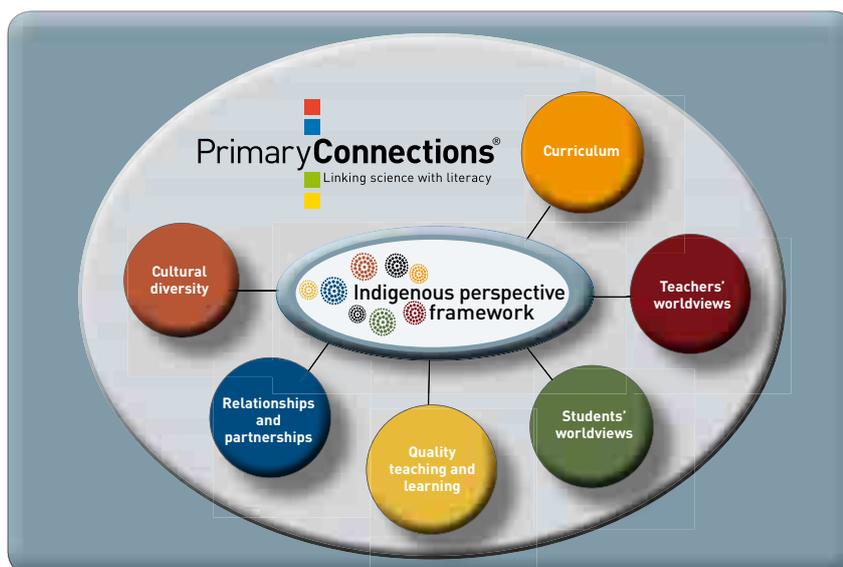


The PrimaryConnections Indigenous perspective is based on national research findings and extensive consultation and collaboration with local Aboriginal and Torres Strait Islander groups, cultural consultants, Indigenous education and linguistic experts and other stakeholders. In this document the term 'Indigenous' refers to the Aboriginal and Torres Strait Islander people of Australia. PrimaryConnections gratefully acknowledges the contributions of all those involved with development of the Indigenous perspective.

The PrimaryConnections Indigenous perspective acknowledges the differing worldviews of Indigenous and non-Indigenous Australians and the multiplicity of perspectives that are the reality of Australian classrooms. It aims to accelerate science and literacy learning outcomes for Indigenous students and increase non-Indigenous students' and teachers' awareness and understanding of Indigenous perspectives.

The PrimaryConnections Indigenous perspective includes a teaching and learning framework, intended as a guide for schools and teachers to implement Indigenous perspectives that are integrated and embedded within the curriculum. Indigenous perspectives relevant to the learning outcomes in PrimaryConnections units are identified by the  icon and included in the curriculum links for lessons. The Indigenous perspective is supported by a professional learning component which will be included in the *Making Connections—a guide for facilitators* professional learning resource and be available on the PrimaryConnections website in 2008.

The PrimaryConnections Indigenous perspective is informed and underpinned by six key concept areas represented by the windows in the model below. The globular organisation of the windows indicates the non-hierarchical, interconnectedness of these concept areas. Information and resources for each of the concept areas will be available on the PrimaryConnections website.



(Please note that this component is still in development. An example of information and resources behind the 'Cultural diversity' window is available on page xiii of this 'pilot' document.)

Draft document – pilot version

xi

Teaching and learning guide



Relationships	Establish genuine and effective relationships based on mutual respect and trust between teachers, students, their families and communities. Be fair, consistent and supportive. Genuine partnerships based on intercultural respect between individuals, schools and communities provide greater opportunities to improve the educational outcomes of Indigenous students.
Supportive environment	<p>Incorporate ESL strategies where appropriate and be patient: suspend judgment and ask clarifying questions to support students' storytelling and representations of their developing understanding. Indigenous students' thinking and accompanying representations may involve a 'whole-part-whole' process. For some Indigenous students ESL or ESD will be the biggest barrier to engaging with learning.</p> <p>Precede all learning and written tasks with discussion: incorporate yarning and narratives to support students to develop oral skills. Provide adequate time for students to develop skills. Allow students to use Indigenous language and/or Aboriginal English (code-switching) for discussions, but distinguish between these and Standard Australian English (SAE). The teaching of SAE is recommended to assist in improving educational outcomes.</p> <p>Scaffold literacy tasks: include pictures and photographs, models, sentence starters, sentence strips, shared writing, tables, etc.</p> <p>Include relevant, contextualised Indigenous perspectives to enhance participation in learning activities. Make connections between concrete, pictorial and symbolic or abstract information.</p> <p>Observe cultural protocols, for example, some students may be sensitive to questioning, direct eye contact, being put on the spot and/or having attention drawn to them. Model and encourage educational 'risk-taking' behaviours to encourage Indigenous students to 'have a go' at asking and answering questions.</p> <p>Support student confidence with repetition and scaffolding: repeat procedures, cues, and instructions until they are learned, then add on and provide new information. Use explicit, minimal instructions and provide verbal and visual cues. Use chunking or mini-tasks to make learning more achievable. Predictability is important. Model and role-play task requirements, use of equipment and appropriate behaviours.</p>
High expectations	Establish high expectations based on individual learning achievements for all students. Make goals achievable: unpack the expectations and demonstrate and model procedures and processes to promote success and build confidence. Offer frequent and authentic feedback, encouragement and recognition for efforts and achievements.
Learning styles	<p>Provide active, hands-on, collaborative learning opportunities, supporting students to choose partners and groups. Include games, inside and outside activities, formal and informal and multi-sensory learning experiences and offer choice where possible.</p> <p>Provide visual cues and tools: use colour, self-adhesive notes, diagrams, models and other visual learning tools. Support students to work with a range of media and representational modes to enhance engagement and application with written tasks.</p> <p>Provide opportunities for inclusion of ICT and multimedia presentations and support students to develop skills with these applications.</p>
Links with Indigenous community	Establish links with local Indigenous community members to access contextualised, relevant Indigenous perspectives. Observe protocols recommended in state and territory Indigenous education policy documents to seek out and engage with Indigenous community members.

 links available on the website

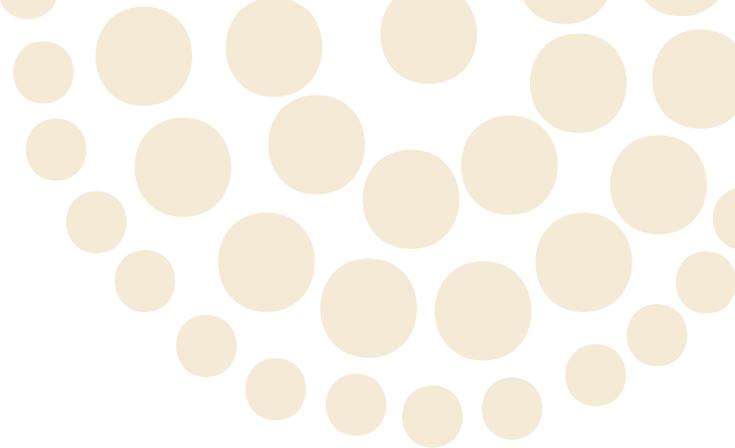
Appendix 2: Primary**Connections** Indigenous Perspective Framework: running sheet for professional learning workshop module

5Es PHASE	FOCUS	FACILITATION TOOLS	SLIDES	RESOURCES
INTRO (5mins)	Welcome and workshop overview Acknowledgement of country ('Welcome' if local Indigenous person available)	Parking lot	1–2	Parking lot chart
ENGAGE (15mins)	Complete 'before' of the BDA activity Eliciting ideas about 'where people are coming from'...what sort of lens they use to view the world: 'Sea of hands' activity Have a 'yarn' about your partners 'hand' Arrange 'hands' as a group 'collage'	BDA (b efore– d uring– a fter a ctivity) Talking partners	3	coloured card, pens, pencils, self-adhesive tape, display board
EXPLORE (25mins)	Exploring the purpose of Indigenous perspectives in science education: View DVD Discussion on the DVD Develop a purpose statement	View DVD Small group discussion P3T	4	BDA sheets Catalyst DVD: <i>Missing mammals</i> A4 coloured paper, markers
EXPLAIN (20mins)	Share 'purpose' statements and add to the 'collage' Complete 'during' of the BDA activity Explanation of the Primary Connections Indigenous Perspective Framework and the <i>Plants in action</i> 'pilot' unit		5–8	BDA sheets <i>Plants in action</i> 'pilot' curriculum unit with Indigenous perspectives
ELABORATE (20mins)	Planning a unit with Indigenous perspectives (refer to APAC units)	Small group discussion	9	An elaboration of the 5Es sheet Primary Connections <i>Weather in my world</i> units
EVALUATE (5mins)	Summary of the workshop: refer to the 'collage' to demonstrate 'different perspectives/worldviews' and their value Complete 'after' of the BDA activity Evaluate workshop	Correlation chart	10-11	BDA sheets Correlation chart
TOTAL				(90 Minutes)

Appendix 3: PrimaryConnections Indigenous Perspective Framework pilot: summary of teacher interviews

(8 teachers, 1 Aboriginal education manager, 1 Aboriginal education coordinator, 2 curriculum consultants, 1 AIEO)

Jennifer, Middleton (Year 7 teacher)	Margie, AIEO1 Middleton (Year 7)	Beryl, Eastern Valley (Year 1/2 teacher)
<p>Student dialogues were opened up—there was a lot more sharing of cultures and more debates between students</p> <p>The class experienced ‘two-way learning’ as never before, where experiences and knowledge were shared which enriched the learning for all: teachers and students</p> <p>Indigenous students were much more involved in literacy activities and initiating their own learning (sourcing information from home and involving parents, grandparents and community)</p> <p>Students compiled storyboards of their learning with a class interactive whiteboard which was also very engaging for the Indigenous students</p> <p>Indigenous students gained increased confidence, which enhanced their learning ability, as they were the class ‘experts’ (Indigenous plant knowledge, language) and gained respect from the other students</p> <p>The flexibility of PrimaryConnections units is a plus as teachers are able to follow it precisely or personalise it</p> <p>The PrimaryConnections framework helped me to work with the AIEO and to know what was culturally appropriate for the unit —this would be helpful across all KLAs.</p>	<p>The Indigenous Perspective was engaging for <u>all</u> students and also motivated students from other cultural backgrounds to share their knowledge with others</p> <p>The Indigenous students’ confidence was increased and they were more motivated to speak up and have a voice</p> <p>The activities in the Indigenous perspective allowed students to be more expressive, which enhanced their creativity and their motivation to participate in a lot more literacy learning</p> <p>Importantly, students’ improvements in literacy were transferred to other subject areas</p> <p>The Indigenous students’ success with the science gave them more confidence in and out of the classroom and so their relationships with other students improved also.</p>	<p>The unit outcomes and literacy activities were adapted for Year 1/2 and it was surprising how well the students handled the concepts with the entire class ‘having a great time with the unit’ especially the literacy activities—The students used the context of plants and science to plan and write narratives</p> <p>Teaching cultural education in the context of the <i>Plants</i> unit was much more relevant and meaningful for students</p> <p>The students adapted well to cooperative learning and worked very well with the Year 4 buddy class at the excursion</p> <p>Exceptionally positive results were gained with an Indigenous male student who was usually disengaged and not at all interested in learning—during the <i>Plants</i> unit this boy was transformed into the class ‘expert’, which boosted his self-esteem and confidence and he became much more involved in learning and in the school in general</p> <p>The unit was easy to use, flexible and the Indigenous perspective enriched the learning environment for all students and me, the teacher.</p>



Madeline, Boswood (secondary science teacher)	Roseanne, Eastern Valley school (Year 2/3 teacher)	Sylvia, Pannington (Year 4 teacher)
<p>Indigenous students were very engaged in their own culture and sourced information from family members—grandparents (older Indigenous community members seem to have more cultural knowledge than parents)</p> <p>Indigenous students were much more involved in oral language than in previous science units—previously students just copied information and performed closed investigations—this unit encouraged discussion and open ended investigations</p> <p>Students who were previously reluctant literacy learners and all students were more engaged in literacy learning and this learning was being transferred to other subject areas</p> <p>A design task incorporating an Indigenous perspective was added to the unit: design a shelter for humans using plant materials (grasstrees etc)—the students have never been so committed to learning as with this task and often worked through recess and lunch throughout this unit</p> <p>Teaching Indigenous perspectives in the context of science breaks down barriers ... it bridges the us-and-them dichotomy.</p>	<p>The engagement of the students in the unit was excellent and promoted more ‘on-task’ behaviour—and had a very positive effect on the negative behaviour issues and previously poor and erratic attendance record of an Indigenous male student</p> <p>All students were more involved in literacy learning—the disaffected Indigenous boy wrote more than ever before and kept a journal during the unit—he also worked better with other students and spent more time in the classroom (rather than in time-out) because of his success in science</p> <p>The classroom and learning for all students was improved—helping this student to overcome the failure syndrome was the biggest success</p> <p>The framework helps teachers with planning and could be used across the curriculum.</p>	<p>The ‘pilot’ was very successful—across the whole school (as students have been sharing their learning with other classes, siblings, parents and teachers)</p> <p>Teachers across the school have requested information about PrimaryConnections as the unit has raised much attention with the entire school community as students have been observed participating in informal observations and discussions during recess breaks</p> <p>All the students were more motivated for writing and literacy in general—students kept ‘big journals’ and a class power-point collating their learning was developed</p> <p>An Indigenous student who previously had an extremely poor attendance record was at school every science day since the commencement of the pilot.</p>

<p>James, Cranston school (Upper primary) (PLF, Year 6-7 teacher)</p>	<p>Josephine, Brownstone school (Year 4 teacher)</p>	<p>Yvette, Kennedy school (literacy teacher Years 2–7)</p>
<p>The teacher and AIEO collaboration enhanced the learning environment for all students (as well as teachers involved)—this has potential to enhance relationships, as well as the contextualisation and sustainability of science in regions—given the transience of teachers in remote locations</p> <p>The relevance of the unit was the key to the increased engagement with all students</p> <p>The units make the literacy and science links clear for teachers and align well with the WA Aboriginal Literacy Strategy</p> <p>The pilot generated major learning changes for students with improved literacy skills, particularly spelling (70 per cent of students) being evident and transferring to other areas of the curriculum ‘for Indigenous students this is a big plus’</p> <p>The units are adaptable for different abilities and Multiple Intelligences and contain a good range of literacy strategies for Indigenous students, for example pictorial representation, role-plays, narrative etc.</p>	<p>Indigenous students were more cooperative and willing to participate in learning</p> <p>Indigenous students were also more involved in literacy activities than prior to the unit</p> <p>Indigenous students became ‘experts’ of the class, which boosted their self-esteem and confidence</p> <p>All students enjoyed co-operative learning and exploring native seed germination and recorded findings as story maps, flow charts and explanations</p> <p>The big positive is the strong links to literacy and the range of literacy products that students can use to represent their understandings</p> <p>My autistic student was also very engaged with this unit, which is not always the case</p> <p>The unit raised a lot of interest with other classes and there was a lot of sharing of progress and knowledge between my class and other students.</p>	<p>The unit was easily adapted to provide the context for literacy specialist lessons for two student groups: Years 2–4 and Years 5–7</p> <p>The students used visual diaries and graphic organisers to record findings in their science journals and were more engaged with literacy activities than usual</p> <p>Three types of seeds (Indigenous perspective) were germinated and students researched native plants in the local area—a community expert visited to talk about bush tucker and emu dung dispersal</p> <p>There was a lot of learning across the whole school due to the science unit—which didn’t go unnoticed—the learning environment was rich</p> <p>The learning that students retained from each weekly lesson was a surprise and was obviously because of their engagement with the content of the lessons.</p>
<p>Erin, Aboriginal Education Manager, Bromley district</p>	<p>Louisa, Curriculum consultant for the Education Department, Bromley district</p>	<p>Cheryl, Curriculum consultant for the Education Department, State Office</p>
<p>The most amazing thing about the Plants unit and the pilot was the sense of connectedness that our Aboriginal kids felt—also it really connected the school with homes and communities. The way this extended into the communities was wonderful and I’ve not seen that before—it improved relationships and that really helps the kids. I’ve not seen them so engaged before—they know a lot of science from their culture, so it gives them a starting point for learning</p> <p>The teachers and the AIEOs talked to each other more because of the pilot—the teachers asked more</p>	<p>The greatest thing to come out of the pilot was the empowerment of our teachers. I had always been passionate about Indigenous education, but some of our teachers were definitely not. NOW they too feel more motivated about Indigenous education and importantly, more confident about making a difference for all students</p> <p>Because of the pilot some of our most jaded teachers have been rejuvenated and inspired and one of the really keen ones has been promoted to a deputy principal position</p>	<p>The pilot just seemed to fall into place once the link between Western Australia (WA) and PrimaryConnections was established at the focus group meeting. it created a lot of interest as people heard about PrimaryConnections and the Indigenous perspectives framework and what was being planned</p> <p>NOW, following the pilot, the PrimaryConnections Incorporating Indigenous Perspectives Framework has really gained momentum in WA—reluctant teachers have become volunteers and are experiencing</p>

questions and everyone got involved—the whole community

It's been really positive for everyone involved—seeing our kids doing lots of literacy and being so engaged has been wonderful

The teachers found the framework helpful and suggested that it could be used across all areas of the curriculum.

The profile of science in the pilot schools has increased significantly along with pilot teachers' profiles and self-esteem—all this is due to their success with the *Plants* unit and the framework

The pilot teachers that participated in the professional learning workshops reported that they enjoyed the module and found it beneficial with ideas and teaching tips on how to link science and literacy. Thus their confidence was boosted and they were willing to have a go—NOW there is no stopping them

The pilot could not have been more successful or satisfying. We achieved exactly what we set out to do—engage students: Indigenous and non-Indigenous, in meaningful and relevant ways—they learnt a lot and so did their teachers.

success with teaching science and literacy and Indigenous perspectives. Interestingly, I've not heard anything negative about the pilot—the teachers, principals and students are all so positive and enthusiastic

The **PrimaryConnections** units provide an engaging context for literacy learning and the news has travelled fast—gaining the attention of several areas within the WA education department, including the Aboriginal directorate, the ABC Two-Way literacy project and the Getting It Right project—I expect there will be more demand for the units and the professional learning program now

A most pleasing outcome from the pilot has been the increased confidence and sense of 'I can do this' for the pilot teachers—before some of them were not confident to teach science or incorporate Indigenous perspectives—NOW, they are volunteering for more **PrimaryConnections** training and want to teach more units—for our Indigenous students this is a real bonus—the pilot showed that **PrimaryConnections** gets them doing literacy, and that it transfers to other learning areas.

Tamika,

Aboriginal Education Coordinator,
Townley Education District

The pilot program at Middleton Primary School engaged the valuable input of the Aboriginal and Islander Education Officer (AIEO) Margie. Indigenous background knowledge supported the delivery of the *Plants in Action* unit and played a very important role in engaging the Indigenous students in the classes. The suggestions and links for the unit came as a result of consultation with local Aboriginal people, including the Aboriginal workers in the schools and the district education office. The enthusiasm of the Indigenous students to participate and share their knowledge directly improved the regular attendance during these science lessons

Indigenous students became keen to share their knowledge. It became apparent that these students knew more than the teachers were aware of as the subject matter was more relevant to their interests. This participation increased their self-esteem and cultural identity leading to improved achievements in the areas of science and literacy

In my role I have been asked to support the introduction of **PrimaryConnections** facilitators to the units that have incorporated an Indigenous Perspective. It is acknowledged that the inclusion of cultural awareness when presenting the units to teachers is vital

This support allows teachers to have the confidence to firstly engage Indigenous people to assist with the delivery of the units and to understand that the information included in the units are general (or generic) suggestions on how to include Indigenous perspectives

'I am pleased to have been and continue to be part of this national program that is making a difference for Aboriginal kids.'

Appendix 4: Summary of feedback on pilot curriculum unit 'Plants in action Incorporating Indigenous Perspectives'

Number of annotated units returned from teachers = 7

Number of teachers who taught this unit = 8

Aboriginal & Islander Education Officers = 3

Summary of annotated notes for 'Plants in action Incorporating Indigenous Perspectives'

The seven pilot teachers were all extremely positive in their response to the 'Plants in action Incorporating Indigenous Perspectives' unit. Embedding the Indigenous perspectives within the unit made the 'cultural education' experience much more meaningful to students and teachers as the context of plants was interesting and relevant to student experiences.

They highlighted the following:

- The emphasis on observing, germinating and comparing native seeds along with exotic varieties was fully engaging for the students and stimulated curiosity and discussion about the differences in size and germination rates of native seeds.
- The mystery bag in Lesson 1 was particularly successful as teachers were able to include both native and non-native plants. This generated extended discussion which was particularly effective for eliciting students' prior knowledge.
- The suggested activities sparked interest in plants in their own school gardens and the local environment.
- The use of the Indigenous names for plants, which were displayed on the word wall and the sharing of knowledge about plant uses, were important in forging cultural bonds and extending the learning for both students and teachers.
- Teachers were able to adjust or extend the program effectively and relatively easily with literacy techniques such as word walls, TWLH charts and science journals—all of which were adapted to include an Indigenous focus.
- Cooperative learning roles and strategies worked very effectively with Indigenous students.

Teachers also provided some practical advice for consideration:

- Difficulties might arise when trying to germinate native seeds as they often require special treatment (heat) to begin the process and many native seeds, being small, require magnification to observe the initial germination easily. Two classes were successful in germinating acacia seeds and the teachers supervised the use of hot water (with caution) to begin the germination process.
- The time required for native seeds to germinate can vary, so teachers need to be mindful of this.
- Inclusion of information and alternative work sheets on native plants would be useful. An example is the life cycle of a native plant as an additional Resource sheet 1 (Plant life stages jumble).

The following comments recorded by the teachers and AIEOs highlight the strengths and weaknesses of the embedded Indigenous perspectives and reflect the richness of their experiences:

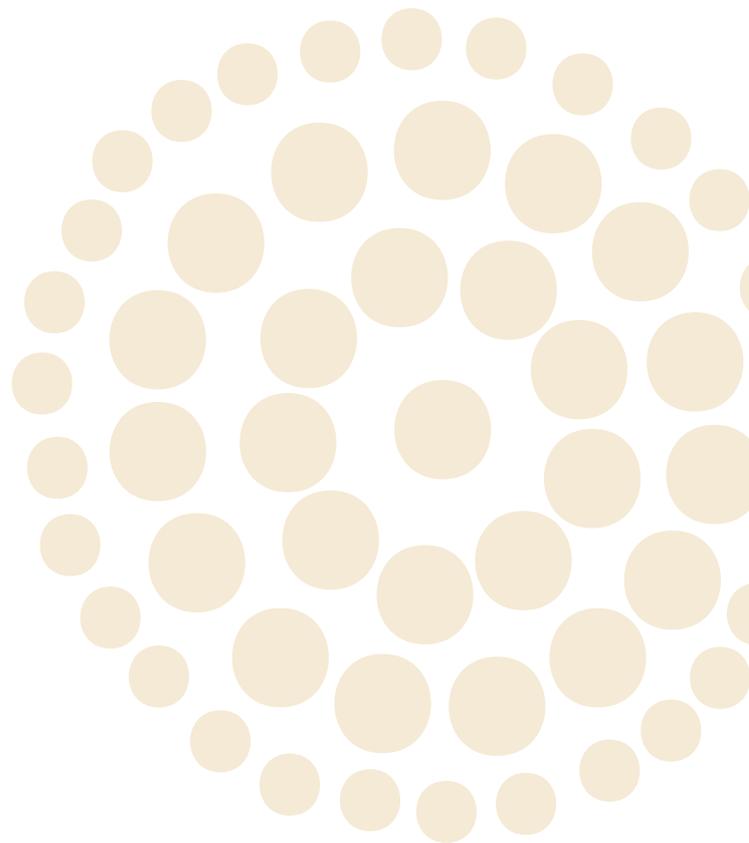
Strengths

- All students were interested and engaged... what we did in class was within the realm of their experiences. We used the lovely school gardens as a beginning, then went out into the bush. All students were more motivated for writing and literacy (for example, recording data, drawing, diagrams, making tables and mind maps, etc). We used a special book for this unit. The word wall went in the centre, journal at the front, field study notes at back and all handouts glued in for a complete record. One Indigenous student, whose attendance record was normally extremely erratic (all year), had been at school 'every Thursday during the pilot'. [Madeline, Science Teacher at Boswood Primary School]

- The students' enthusiasm spread across the school and a science club has now been established. Indigenous perspectives in the context of science breaks down the barriers...it bridges the 'us and them' dichotomy. [Roseanne, teacher at Eastern Valley Primary School]
- The unit was easy to use, flexible and the Indigenous perspective enriched the learning environment for all students (and the teacher). We adapted the word wall so all science words were printed on green gum leaf shapes so students could identify science words easily. [Jennifer, teacher at Middleton Primary School]
- The sharing of ideas and resources by Margie and other students was a bonus. The students were immersed in the topic, it was motivating for the students. They love plants and living things! There was a lot of sharing of cultural knowledge, all students and the teacher learning about local environment and Australian plants. There were opportunities for using ICT. The Word wall was very successful. One of the Indigenous students found some information on Bush Tucker (including scientific, common and Noongar names of plants) and photocopied the information which was then laminated. These were used for our word wall and the students enjoyed using them to categorise information and to reflect on their learning in the unit. The photo-story on plants in our environment was a success. [Yvette, teacher at Kennedy Primary School]
- The difference and the understanding that the Indigenous perspective brought to the classroom was most beneficial. It was very engaging for 'all' students and also motivated others (for example, an African student) to share their culture, which also contributed to the enriched the learning environment. [Margie, AIEO at Middleton] [Yvette, teacher at Kennedy Primary School]
- This was a great theme—native plants, Australia, Flora and Fauna....What we know/what we wanted to know) about native plants. I would definitely do it again and I feel I could add more next time with bush walks and talks. [James, teacher and PLF at Cranston Primary School]
- The Word wall was decorated with real plant objects and some flower pressings were used for the students' journals. [Beryl, teacher at Eastern Valley Primary School]

Weaknesses

- Not enough time to teach the entire unit, would have liked to be able to link the topic into the literacy block more comprehensively. [Yvette, teacher at Kennedy Primary School]
- A lot of extra work was required by me to include the Indigenous perspective. Bad timing for trials—reports, end of year activities etc. Term 3 would have been much better timing. Did not complete the entire unit of work and students did not get to explore all the things they identified as wanting to know about. [James, teacher and PLF at Cranston Primary School]
- The science journal was only partially successful as I only saw them once a week. [Roseanne, teacher at Eastern Valley Primary School]



Appendix 5: Primary**Connections** Indigenous Perspective Framework: teacher feedback interrelationship digraph

An interrelationship digraph (Langford International, Inc. 2003) is used to study the cause and effect relationship between factors of a system. It is most effectively used when there are multiple factors and there is a requirement for understanding which factors have the most effect on the others.

The multiple factors of the system are identified, recorded and arranged in a circle. Each pair of factors is examined in turn until all pairs have been compared. A line is drawn if there is a relationship between each pair. An arrowhead is placed on the end of each line showing which of each pair of factors affects the other the most. Only one headed arrows can be drawn.

Each factor will now have arrows going in and arrows going out. Parentheses are drawn for each factor showing the number of arrows out and in (out, in). The factors with the most 'out' arrows are those that have the most effect on the others.

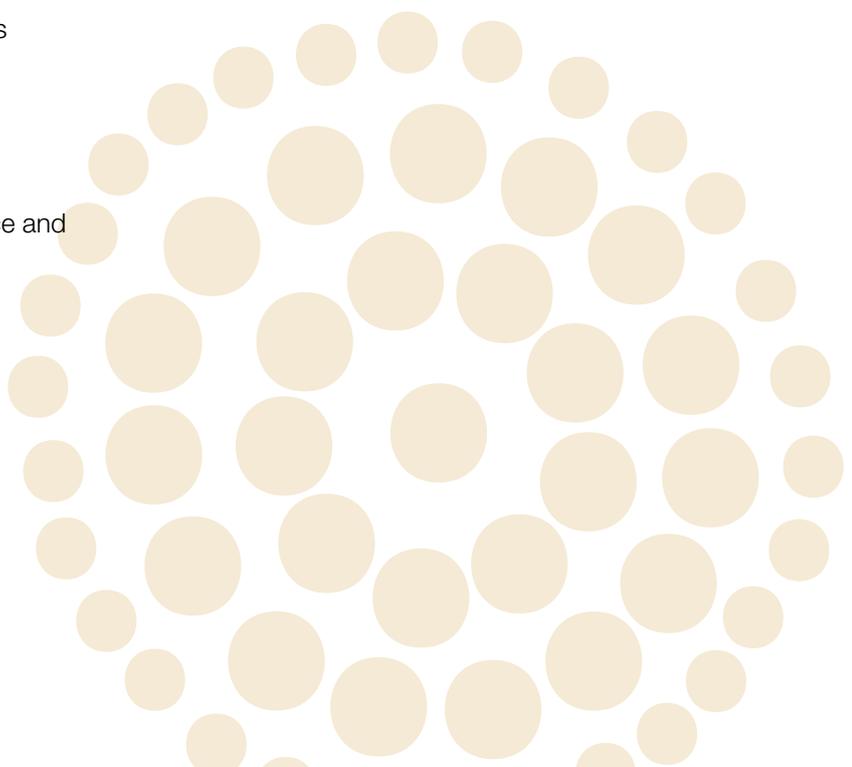
The system in this study consists of the 'factors contributing to the success of the Primary**Connections** Indigenous pilot', as reported by the teachers. Eight success factors were identified:

- increased student engagement
- improved student self esteem, confidence and attitude
- increased student participation and contribution
- increased experiences of success by students
- increased student attendance
- improved student relationships with learning (enthusiasm and commitment to learning)
- improved teacher attitudes to teaching science and Indigenous perspectives
- improved relationships/partnerships between schools, parents and community.

An interrelationship digraph was used to analyse the relationship between the success factors in order to identify which of the factors had the most impact on the others (Figure 3). The process identified three main success factors:

- improved teacher attitude to teaching science and indigenous perspectives (seven 'out' arrows)
- increased student engagement (five 'out' arrows)
- increased participation and contribution (five 'out' arrows)

The other success factors are progressively a consequence of these three main factors with 'increased student attendance' being a direct result of all other factors.



This report is a story about success—success at school for Indigenous (and non-Indigenous) students and their teachers.

Success established through students' engagement and connectedness with learning.

The story reports on the pilot study of PrimaryConnections incorporating Indigenous perspectives conducted in Western Australia in Term 4, 2007.

[www.science.org.au/primaryconnections/
indigenous.htm](http://www.science.org.au/primaryconnections/indigenous.htm)



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