PrimaryConnections®
Linking science with literacy

Stage 3
Interim research and evaluation report 7

Trial teachers' activities and perceptions at the end of term 1, 2006

A research report for the Australian Academy of Science

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Introduction

Teachers' practice is strongly influenced by their beliefs about practice (Keys, 2003; Peers, 2001) and self-efficacy (Riggs & Enocks, 1990) and confidence (Yates & Goodrum, 1990), and their pedagogical content knowledge (Appleton, 1995). To improve practice teachers need the support of quality professional learning and curriculum resources (Goodrum, Hackling & Rennie, 2001). Research with professional learning programs at secondary and primary schools (Goodrum, Hackling & Trotter, 2003; Goodrum, Hackling & Sheffield, 2003; Hackling & Prain, 2005; Lewthwaite, 2006; Peers, Diezmann & Watters, 2003) indicates that the provision of professional learning workshops and exemplary curriculum resources, successful pedagogical experiences, opportunities for collegial interaction and reflection on practice, support of the principal and strong leadership by leader teachers/co-coordinators are required for successful implementations of new initiatives. The growth and effectiveness of teacher leaders depends on their personal attributes (e.g., motivation, self-efficacy, willingness to modify practice and beliefs (Peers, Diezmann & Watters, 2003)) microsystem factors such as collegial and external supports, mesosystem factors such as the priority placed on the subject by their school and the schools openness to change, exosystemfactors such as parent and community expectations, and macrosystem factors such as state and national curriculum agendas (Bronfenbrenner, 1989; Lewthwaite, 2006).

Research into the perceptions of trial teachers regarding the implementation of *Primary Connections* in their classrooms and more broadly in their schools is required to understand how trial teachers and their schools can be further supported to ensure a successful implementation. By this stage of the trial, original trial teachers had implemented one trial unit in each of term 1, 2005 and term 3, 2005. The workshop was to prepare them to implement a third trial unit in term 2, 2006. They had also written and taught their own unit in term 2, 2005 using a unit planer to scaffold the *Primary Connections* approach.

Purpose

The purpose of this study was to elicit from trial teachers information about their roles within the school, teaching activities, rating of their practice against the components of the pedagogical principles, professional learning needs, and science co-ordination at their schools.

Method

A questionnaire based survey method was adopted to seek the trial teachers' views about their teaching and the status of *Primary Connections* in their schools. Teachers completed the survey at the commencement of the workshop held at the end of term 1 in 2006. Questionnaires are effective and economical for gathering information from large numbers of participants and the data gathered are relatively easy to code and analyse. The questionnaire included a mix of open response questions and closed objective items. A copy of the questionnaire is attached as Appendix 1.

Sample

Eighty-six trial teachers attended the trial teacher workshops and of these 67 completed questionnaires. Eleven teachers were new trial teachers in 2006. Demographic data regarding the sample are presented in Tables 1 and 2.

Table 1: Numbers of respondents to end of term 1 trial teachers survey

State	Number participating in 2006 PC trial	Responded to end of term 1 2006 survey	Also participated in 2005 PC trial	In 2005 PC trial but now in PLF program	Total numbers in original PC 2005 trial
WA	12	9	11	7	21
SA	12	9	12	5	16
NT	2	2	1	1	2
QLD	13	11	10	1	18
NSW	21	17	18	1	22
ACT	6	6	3	0	4
VIC	18	11	15	0	18
TAS	2	2	2	1	4
Total	86	67	72	16	106

The apparent drop in WA trial teachers participating in the workshop and completing the survey may have been an artefact of holding concurrent workshops for trial teachers and professional learning facilitators. Seven of the WA trial teachers were also acting as professional learning facilitators and may have completed the survey for facilitators rather than trial teachers.

Table 2: Origin of participants at trial teachers workshop by sector (n=67)

Sector	Number	Percent
Government	55	82
Catholic	8	12
Independent	4	6

Approximately four fifths of trial teachers came from government schools and one-fifth from Catholic and independent schools.

Data analysis

The questionnaire responses were read and re-read by an experienced and informed researcher who identified categories of responses for all open-ended items. The senior researcher reviewed the proposed codes, some new codes were added and others collapsed to minimise overlap between code categories. Codes were assigned to responses and these were entered into SPSS spreadsheets for analysis. Simple descriptive statistics were calculated using SPSS. Data have been aggregated across jurisdictions during the analysis as the research was not designed to distinguish between jurisdictions' success with the program.

Results

Data are presented for the roles and workplace of trial teachers, years and topics taught, trial teachers' practice and support needs, school level implementation, professional learning activity and co-ordination of science within trial schools.

Roles and workplace of trial teachers

The majority of trial teachers (70%) were classroom teachers, about one-fifth were also science co-ordinators at their school and 10% were also school principals or deputy principals. In addition to these roles, some of the trial teachers had also trained as professional learning facilitators in January 2006.

Table 3: Current role of trial teachers (n=67)

Professional role	Number	Per cent
Class teacher	47	70
Class teacher and science co-ordinator	12	18
Science co-ordinator	1	1
Deputy/assistant principal	2	3
Co-ordinator of science and deputy	1	1
Deputy principal and class teacher	2	3
Principal and class teacher	2	3
Total	67	100

About three-fifths of the trial teachers were continuing with the roles they were performing in 2005, however, others had taken on new roles or had relinquished roles while one-fifth were teaching a new year level (see Table 4).

Table 4: Professional role in 2006 (n=66)

Professional role	Number	Per cent
Same as in 2005	38	58
Taken on new role	9	14
Reverted back to classroom only	5	7
Different class level	14	21
Total	66	100

Twelve per cent of teachers were working at a different school to that at which they taught in 2005.

Table 5: Workplace in 2006 (n=67)

Workplace	Number of teachers	
	In 2005 PC Trial	New to 2006 trial
Same as in 2005	52	6
New school	3	5
No response	1	0
Total	**56**	**11**

The majority of trial teachers were teaching in Term 1 (94%). Two teachers taught science to all year levels at their school. About one-fifth were teaching at Early Stage 1, one-third at Stage 1, one-fifth at Stage 2 and one-eighth at Stage 3 (see Table 6).

Years and topics taught by trial teachers

Tables 6-8 report the year levels and topics taught by the trial teachers in term 1 of 2006.

Table 6: Year level taught by PC Trial Teachers, as at end of term 1 2006. (n=67)

Year level	Stage	Number	Per cent
not teaching		4	6
0	ES1	3	5
1		11	16
2	S1	10	15
3		12	18
4	S2	8	12
5		6	9
6	S3	4	6
7		4	6
All years		2	3
level not given		3	5
Total		67	100

When asked about the science topic they were teaching in term 1, one-fifth of the teachers indicated they were teaching no science, one-fifth said they were teaching a specified *Primary Connections* unit and half of the teachers named the conceptual strand they were teaching which suggests they may have been teaching a unit from another resource or a school developed unit (Table 7).

Table 7: Science topics taught by PC trial teachers in term 1 2006 (n=67)

Science topic	Number of teachers	Per cent
No science taught	15	22
Weather in our world	3	5
Push pull power	2	3
Plants in action	5	8
Spinning in space	1	1
Marvellous microbes	2	3
Many topics	1	1
Life and living strand	11	16
Natural and processed materials strand	6	9
Energy and change strand	8	12
Earth and beyond strand	4	6
Investigating scientifically	4	6
Not specified	5	8
Total	67	100

When analysed in more detail, the units from other sources taught by half the teachers represented teacher developed units based on the *Primary Connections* model (25%) and units from other sources (22%). Conversations with trial teachers indicate that their freedom to implement *Primary Connections* units is limited by the school's own scope and sequence chart for science. Trial teachers are often constrained by the need to teach the same topic

as their colleagues for assessment and reporting purposes, or they are teaching integrated units which would have to be revised to incorporate *Primary Connections*.

Table 8: Type of unit taught in term 1 2006 (n=67)

Type of unit	Number of teachers	Per cent of teachers
Primary Connections unit	14	21
Teacher developed PC unit	17	25
Unit from another curriculum resource	15	22
Not applicable (not teaching science)	16	24
No response	5	8
Total	67	100

Trial teachers' practice

Trial teachers rated their practice against the components of the *Primary Connections* pedagogical principles. These ratings are reported in Table 9 against a 4-point scale from High to Low.

Table 9: Teacher ratings of science and literacy teaching practice as a percentage of teachers (n = 67)

	***Primary Connections* pedagogical principle or component** **In my class…**	**Extent or frequency of your practice**			
		High 4	**3**	**2**	**Low 1**
1	**Students are supported and challenged to develop deep levels of thinking**				
1.1	Learning sequences build ideas through exploration, explanation and elaboration	30	64	6	0
1.2	Students interact with ideas through a range of literacy practices	31	63	6	0
1.3	Strategies promote substantive discussion of ideas	36	55	3	0
1.4	Students are explicitly supported to engage with investigative and inquiry processes	34	54	12	0
1.5	Students engage in scientific reasoning by linking ideas and evidence	24	52	22	0
1.6	Strategies are used to foster imagination and creativity	37	49	13	0
2	**Science is linked with students' lives, perspectives and interests**				
2.1	Strategies are flexible and responsive to students' perspectives and interests	31	52	16	0
2.2	A range of strategies is used that support the different ways of thinking and learning	40	48	9	0
2.3	Strategies explore and build on students' prior experiences and literacy practices	42	46	12	0
3	**Learning connects with communities and practice beyond the classroom**				

3.1	Students are supported to engage with contemporary knowledge and practice	13	61	24	0
3.2	Technologies are used in ways that reflect professional and community practices	18	55	27	0
3.3	Students develop awareness of values associated with scientific processes	15	63	21	1
4	**The learning environment promotes independence, and collaboration**				
4.1	Students are encouraged and supported to take responsibility for their learning	54	43	3	0
4.2	Strategies build skills of productive collaboration	39	52	9	0
5	**Assessment practices are an integral part of teaching and learning**				
5.1	Assessment practices address a wide range of outcomes	24	60	16	0
5.2	Students' existing beliefs are made explicit and built upon	37	45	18	0
5.3	Students receive frequent constructive feedback that supports further learning	36	55	9	0
5.4	Assessment practices encourage reflection and self assessment	30	46	24	0
5.5	Students use a range of forms of representation to demonstrate their learning	33	57	10	0

Note. Not every teacher responded to every component, hence some rows do not sum to 100%.

At least 80% of teachers rated their practice as High (4 or 3 on a 4-point scale) on 14 of the 19 components which demonstrates a high level of confidence and self-efficacy which is likely to be based on a sound level of pedagogical content knowledge. At least one-fifth of teachers rated their practice Low (2 or 1 on a 4-point scale) on five components; these were:

1.5: Students engage in scientific reasoning by linking ideas and evidence (22%)
3.1: Students are supported to engage with contemporary knowledge and practice (24%)
3.2: Technologies are used in ways that reflect professional and community practices (27%)
3.3: Students develop awareness of values associated with scientific processes (22%)
5.4: Assessment practices encourage reflection and self assessment (24%)

Three of these five components (1.5, 3.3,5.4) relate to quite sophisticated pedagogical practices that require high levels of knowledge and skill. Component 3.1 relates to the currency, authenticity and relevance of the enacted curriculum. School constraints on access to learning technologies may account for the lowest rating of component 3.2.

In coding these data a significant number of trial teachers responded by ticking the line between the boxes for 2 and 3; these responses were split equally between 2 and 3. A five-point scale would reduce these coding difficulties.

Trial teachers' need for further support

The most frequent response was a need for support with assessment (Table 10) and it is most likely that this relates to the Australian Government's requirement that all schools report students' achievement to parents using A-E grades and that all jurisdictions are changing their assessment and reporting processes to meet this requirement. Ten per cent of teachers requested further support with using learning technologies and nine per cent requested further help with new units. Teachers may also feel they need further support with student self-assessment and reflection on learning (Table 9).

Table 10: Teachers' response to the question "Now that you have reviewed your practice against the pedagogical principles and components, what aspects of practice do you need further support with in terms of curriculum resources or professional learning activities?" (n=67)

Aspects needing support	Number of responses	Per cent of respondents with this response
Assessment	25	36
Use of IT	7	10
Help with new units	6	9
None	5	7
Units available at beginning of year	5	7
Time for planning with other teachers	5	7
More units	4	6
Scientific investigations	4	6
Regular PD with other trial teachers	3	4
Connecting beyond classroom	3	4
Whole school PD	2	3
More whole school sharing	1	1
Total number of responses	70	100

School-level implementation of *Primary Connections*

Tables 11-15 report data about the extent of implementation, commitment to implementation and factors influencing implementation of *Primary Connections* at trial teachers' schools. The level of implementation is quite varied. In one fifth of schools implementation is limited to only trial teachers' classes, in a little more than half of the schools implementation involves trial teachers and some others, and in almost a quarter of schools *Primary Connections* is being implemented in all classes (Table 11). Trial teachers' rating of the level of commitment to *Primary Connections* appears to reflect the level of implementation in their schools. Of concern is the low level of commitment in 18% of schools (Table 12), however, 70% of the trial teachers indicated commitment to *Primary Connections* is increasing at their schools (Table 13).

Table 11: Teachers' response to the question, "What is the extent of implementation of *Primary Connections* in your school?" (n=66)

Teachers responses (per cent of teachers)		
Only trial teachers are teaching *Primary Connections*	Trial teachers and some others are teaching *Primary Connections*	All classroom teachers are teaching *Primary Connections*
21%	56%	23%

Table 12: Teachers' responses to the question "How would you rate the level of commitment to *Primary Connections* in your school?" (n=67)

Teachers responses (per cent of teachers)		
Low	Medium	High
18%	63%	19%

Table 13: Teachers' responses to the question "Is the commitment to *Primary Connections* at your school …" (n=66)

Teachers responses (per cent of teachers)			
Decreasing	Remaining same	Increasing	Cant say yet
4%	23%	70%	3%

Trial teachers were also asked about the factors limiting and enhancing implementation of the program. The most frequently mentioned factors limiting implementation were the difficulty of linking *Primary Connections* to other aspects of the school curriculum, e.g., to existing integrated units of work, time, staff resistance to change and the crowded school curriculum (Table 14). The most frequently mentioned enhancers were the enthusiasm and support provided by trial teachers, other teachers' interest in the program, the curriculum resources and support from school administration (Table 15).

Table 14: Teachers' responses to the question "What factors are limiting the success of, commitment to and implementation of *Primary Connections* at your school?" (n=66)

Factors limiting	**Number of responses**	**Per cent of respondents with this response**
None	4	6
Hard to link to other programs	25	38
Time	13	20
Staff resistance/ maintaining staff interest	11	17
Crowded curricula	10	15
New staff, new school	8	12
Lack of new units this year	7	11
Money, resources	3	5
Poor support from admin	3	5
Lack of PD for staff	3	5
Low priority of science	2	3
Poor knowledge of science outcomes	2	3
Total responses	**91**	

Table 15: Teachers' responses to the question "What factors are enhancing the success of, commitment to and implementation of *Primary Connections* at your school?" (n=67)

Factors enhancing	Number of responses	Per cent of respondents with this response
Enthusiasm/support of Trial Teachers	24	36
Staff interest, positive	24	36
The PC units/format	14	21
Good support from admin	9	13
Positive response from students and parents	6	9
Being a trial school	4	6
Time made available	3	4
Better than existing programs	3	4
Previous experience of PD	3	4
One teacher doing all science	3	4
Ranking of science/school region priorities	2	3
Money, resources	2	3
Specific comment noted	2	3
Total responses	99	
No response	4	6

Schools needs for professional learning and curriculum units

The trial teachers were asked to report on professional learning workshops conducted in 2005, in term 1 of 2006 and planned for later in 2006. By the end of 2006 it was anticipated by almost one quarter of the teachers, that the Introduction to *Primary Connections* workshop would have been conducted at their schools. Short information sessions and informal support of other teachers by trial teachers were more common activities. No professional learning activities has occurred in a significant number of schools in 2005 (18% of teachers) and first term of 2006 (61%), and was not planned for approximately one-fifth of schools for later in 2006.

Table 16: Professional learning conducted or planned at schools of 2006 *Primary Connections* trial teachers. (n=67)

Workshop	Per cent of teachers with this response		
	Conducted at school in 2005	**Conducted at school in term 1 2006**	**Planned for later this year**
Introduction to *Primary Connections* workshop	13	0	10
School Co-ordinators workshop	0	0	0
Auditing workshop	0	0	0
Investigating workshop	0	0	2
Assessment workshop	0	0	0
Literacies of science workshop	0	0	0
Short introduction at staff meeting	25	10	7
Informal with trial teachers	28	13	12
A facilitator is doing whole school PD	0	3	25
5Es	2	0	2
PD days planned (not specified)	0	5	16
Area meetings	0	5	0
None	18	61	21
No response or don't know	11	3	10

To gain information about the potential extent of implementation of *Primary Connections* in terms of units to be taught per year, trial teachers were asked how many units they would teach each year when a full range of units is available (Table 17). Responses were evenly spread across two units per year, three per year and four per year. Given that these trial teachers are highly committed to the program and that a little less than one third of trial teachers indicated they would teach two units per year, it is likely that ongoing implementation may be of the order of two units per year as there is a need by teachers to address all curriculum areas.

Table 17: Teachers' responses to the question "How many *Primary Curriculum* units will you teach each year when a larger range of units is available? " (n=67)

Teachers responses (per cent of teachers)				
Not specified	1 unit	2 units	3 units	4 units
6%	0%	28%	34%	31%

The majority of teachers (90%) indicated they had the confidence to write new units or modify existing school units using the *Primary Connections* model, however, time to do this was a problem for some (15%) and 40% thought they had both the time and motivation to write units (Table 18).

Table 18: Teachers' responses to the question "Are you confident and have time and motivation to write or modify existing science units using the PC model? "(n=67)

Confident to write or modify	Time and motivation to modify or write	Motivation but not time to modify or write
90%	40%	15%

Science co-ordination

It was thought that the trial teachers would have good insights into science co-ordination at their schools as many were leading teachers of science. Teachers rated aspects of science co-ordination as good, adequate or poor (Table 19). All aspects were rated by at least a fifth of teachers as poor at their schools. Only two aspects were rated as good by at least one-third of teachers, these were purchase, organisation and replacement of equipment and consumables, and school or year level or stage planning occurs to make connections between the science, literacy and other learning areas.

Table 19: Teachers' responses to the question "What aspects of science co-ordination are working well at your school? " (n=67)

Science co-ordination aspect	**How well it is working (per cent of teachers)**		
	good	**adequate**	**Poor**
Purchase, organisation and replacement of equipment and consumables	34	33	24
Linking the science curriculum to the assessment and reporting schedule of the school	30	37	19
School or year level or stage planning occurs to make connections between the science, literacy and other learning areas	37	30	24
Productive meetings are held to share experiences, ideas and strategies	18	36	37
Productive meetings are held to review, evaluate and improve units	15	22	52
Mechanisms or processes are in place to keep the school staff informed about developments with the *Primary Connections* program	22	40	28

When asked how co-ordination could be better supported (Table 20), the two most common responses were time to work with other staff (19%) and fund staff relief (13%) so that co-ordinators have the time to plan and work with colleagues. Resources, such as more units/copies of units (13%), a larger science budget (9%) and having a professional learning facilitator on school staff (6%) were also mentioned

Table 20: Teachers' responses to the question "What resources or professional learning activities would help improve *Primary Connections* co-ordination at your school? " (n=67)

Resources / learning activities to help improve co-ordination	Number of responses	Per cent of respondents with this response
None	2	3
Time to work with other staff	14	21
Fund staff relief	9	13
PD for other teachers	9	13
More units or more copies	9	13
Money to buy resources	6	9
Facilitator in school	4	6
A DVD or video to introduce PC to school staff	3	4
Academy support	1	1
Other	3	4
Total responses	**60**	
No response	21	31

Discussion and Conclusions

The workshop conducted for trial teachers at the end of term 1 in 2006 provided an opportunity to monitor their teaching activities, the implementation of *Primary Connections* at their schools, the co-ordination of science within their schools and any needs for further support. A total of 106 trial teachers commenced the Stage 2 trial in 2005, 86 participated as trial teachers in 2006 and of these 11 teachers were new to the program. Twelve per cent of teachers were working at a new school in 2006. The trial teachers who commenced the trial in 2005 taught two trial units and a teacher-developed unit in 2005. There was an adequate representation of trial teachers across all four *Primary Connections* stages.

One-fifth of the teachers were teaching no science in term 1, one-fifth were teaching a *Primary Connections* unit, one quarter were teaching a teacher developed *Primary Connections* style unit and one-fifth were teaching a non-*Primary Connections* unit. The practice of teaching school-developed integrated units of work constrains the freedom trial teachers have to teach *Primary Connections* units as the integrated units need to be modified to accommodate the change.

Teachers' rated their practice highly against most of the components of the *Primary Connections* pedagogical principles. This is likely to reflect high levels of confidence and self-efficacy previously reported for this group (Hackling & Prain, 2005) and sound levels of pedagogical content knowledge. On five of the components only, did less than 80% of the trial teachers rate their practice as high. These components related to: linking ideas and evidence, assessment, values associated with science processes; engaging with contemporary knowledge and practice; and, use of technologies.

Engaging students in scientific reasoning by linking ideas and evidence (component 1.5) is at the heart of the science process of developing evidence-based conclusions and is a focus of Explain and Elaborate lessons. This pedagogical practice is required to develop

explanations in the Explain lesson from observations made in the Explore lessons, and to develop evidence-based conclusions from investigations conducted in the Elaborate lesson. This practice requires high levels of pedagogical skill and knowledge of science on the part of the teacher and sophisticated skills of argumentation on the part of students.

Developing students' awareness of values associated with scientific processes requires a rich knowledge of the nature of science on the part of the teacher and a degree of abstract thinking on the part of students. It is therefore not surprising that teachers do not rate their practice highly in relation to component 3.3. There has been no explicit unpacking of values associated with science processes in workshops for trial teachers or in the curriculum resources. Values such as rationality when interpreting data, being questioning and sceptical of claims made by others, being aware of the need to be responsible in relation to making decisions about health and the environment, and considering carefully the potential impact of decisions on the community, are important to the scientific enterprise and the applications of scientific knowledge.

One quarter of teachers rated their practice of using assessment to encourage reflection and student self-assessment (component 5.4) as low. The *Primary Connections* curriculum units embed diagnostic, formative and summative assessment into the teaching and learning process. Formative assessment in the Explore and Explain phases is intended to provide students with feedback to help them reflect on their own ideas and their learning. Evaluate lessons in all units scaffold an opportunity for students to review their learning throughout the unit and reflect on their learning journey. Rubrics provided in the assessment resources for each unit could be used by teachers as resources for peer and self-assessment.

One quarter of teachers rated their practice low on supporting students to engage with contemporary knowledge and practice (component 3.1). There has been no explicit unpacking of this component in workshops for trial teachers and consequently there may be a low level of understanding of the meaning of the component statement. The statement refers to students engaging with ideas and processes that are current in the broader community of practice. This relates to the currency, authenticity and relevance of the enacted curriculum. This has been a focus of the *Primary Connections* curriculum development process to ensure that learning tasks are relevant, purposeful and reflect current ideas and practice.

The component given the lowest rating was 3.2 which relates to use of technologies in ways that reflects professional and community practice. *Primary Connections* units provide suggestions about how to incorporate the use of technologies into lessons, however, access to computers in schools is often mentioned by teachers as a constraint on their practice.

Having reviewed their practice against the components, the trial teachers were asked what further support they needed to improve their practice. The most common response related to assessment which reflects the significant changes occurring in schools throughout Australia as standards-referenced A-E grading is adopted.

The level of implementation and commitment to *Primary Connections* in trial schools is varied. At the time of the survey (end of term 1, 2006) the trial teachers and some others were teaching science with *Primary Connections* at the majority of schools, two-thirds of teachers rated commitment to the program as Medium on a three-point scale, however, 70% of the trial teachers indicated that commitment to the program in their schools was increasing. As more units become available and schools recognise that they can base their school's science program largely on *Primary Connections*, the level of implementation within schools is likely to increase. A key factor limiting implementation appears to be the

work required in schools to unpick integrated studies units and revise them including *Primary Connections* as the science component, or to restructure integrated studies units excluding science, or to work out the relationships between *Primary Connections* units and units of work from other science programs.

The most common forms of professional learning that occurred in term 1 were short introductions to *Primary Connections* presented at staff meetings and informal support provided to colleagues by the trial teachers. About one-third of trial teachers reported that a whole-school professional learning session would be presented later in the year.

Adoption of the program at school level requires effective leadership at school level and at learning area level. Previous research with trial teachers (Hackling & Prain, 2005) indicated that 36% of trial schools had no science co-ordinator. Effective co-ordination of a learning area requires a person to be responsible for leadership in the area and have the time and skills to do it. When asked how well various aspects of science co-ordination were being performed at their schools, the trial teachers indicated that linking the science curriculum to the assessment and reporting requirements of the school was done best and meeting to review, evaluate and improve units was done worst. It is likely that in many trial schools, the trial teachers are attempting to provide leadership in science without being given the authority or time to do so. When asked how co-ordination could be better supported, most of the responses related to having time or staff relief to make it possible to work with other teachers.

Implications arising from these data include a need for some additional support in relation to pedagogies associated with assessment and linking ideas and evidence, and help in exploring values associated with science and the meaning of contemporary ideas and practice and how these can be achieved through *Primary Connections*. Use of learning technologies in primary science appears to be limited by access to computers, however it may also be a result of low confidence, and both of these factors may be beyond the scope of the *Primary Connections* initiative. Levels of implementation and commitment to *Primary Connections* appear to be constrained by difficulties in linking PC to other programs. Unpicking integrated units of work that include science requires a commitment to *Primary Connections* and a readiness to revise aspects of school-developed integrated curriculum units. This will require leadership and advocacy from school principals. There is also a need to advocate for the appointment of science co-ordinators at schools who have time to carry out the role effectively.

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Appendix

Australian Academy of Science: *Primary Connections* Program

Trial Teachers End of Term 1, 2006 Questionnaire

Dear Colleague

We seek your views about your science and literacy teaching practice, and the level of implementation and co-ordination of Primary Connections at your school.

Data from this survey will be aggregated and summarised so that it will not be possible to identify any respondent in any reports of this research. Data will be used for research purposes only. We request your name and workplace details for follow-up purposes only.

Please answer this questionnaire honestly and frankly. Respond in the way that it is, rather than portraying things as you would like them to be seen.

Professor Mark W Hackling
Edith Cowan University

ID number

For office use only

Your background

Your name: _____

State/Territory: _____

Sector: Government / Catholic / Independent

Name of workplace for 2006: _____

Your professional role for 2006:
Principal /Deputy / Science co-ordinator / Teacher of Year _____ **(*circle one or more options as appropriate)***

What science topic did you teach in Term 1, 2006?
_____

Was this a *Primary Connections* unit / a teacher developed unit based on *Primary Connections* / a unit from another curriculum resource? ***(circle one)***

Name of workplace in 2005: _____

Your professional role in 2005: _____

Please rate your science and literacy teaching practice in the table below.

***Primary Connections* pedagogical principle or component** **In my class…**		**Extent or frequency of your practice**			
		High 4	**3**	**2**	**Low 1**
1	**Students are supported and challenged to develop deep levels of thinking**				
1.1	Learning sequences build ideas through exploration, explanation and elaboration				
1.2	Students interact with ideas through a range of literacy practices				
1.3	Strategies promote substantive discussion of ideas				
1.4	Students are explicitly supported to engage with investigative and inquiry processes				
1.5	Students engage in scientific reasoning by linking ideas and evidence				
1.6	Strategies are used to foster imagination and creativity				
2	**Science is linked with students' lives, perspectives and interests**				
2.1	Strategies are flexible and responsive to students' perspectives and interests				
2.2	A range of strategies is used that support the different ways of thinking and learning				
2.3	Strategies explore and build on students' prior experiences and literacy practices				
3	**Learning connects with communities and practice beyond the classroom**				
3.1	Students are supported to engage with contemporary knowledge and practice				
3.2	Technologies are used in ways that reflect professional and community practices				
3.3	Students develop awareness of values associated with scientific processes				
4	**The learning environment promotes independence, and collaboration**				
4.1	Students are encouraged and supported to take responsibility for their learning				
4.2	Strategies build skills of productive collaboration				
5	**Assessment practices are an integral part of teaching and learning**				
5.1	*Assessment practices address a wide range of*				

	outcomes				
5.2	Students' existing beliefs are made explicit and built upon				
5.3	Students receive frequent constructive feedback that supports further learning				
5.4	Assessment practices encourage reflection and self assessment				
5.5	Students use a range of forms of representation to demonstrate their learning				

Now that you have reviewed your practice against the pedagogical principles and components, what aspects of practice do you need further support with in terms of curriculum resources or professional learning activities?

_____

_____

_____

_____

Science and literacy teaching in my school

What is the extent of implementation of *Primary Connections* in your school? (circle one)

1. Only trial teachers are teaching *Primary Connections*
2. Trial teachers and some others are teaching *Primary Connections*
3. All classroom teachers are teaching *Primary Connections*

How would you rate the level of commitment to *Primary Connections* in your school? (circle one)

1. High
2. Medium
3. Low

Is the commitment to *Primary Connections* at your school … (circle one)

1. increasing,
2. remaining the same, or
3. decreasing.

What factors are <u>limiting</u> the success of, commitment to and implementation of *Primary Connections* at your school?

_____

_____

_____

What factors are enhancing the success of, commitment to and implementation of *Primary Connections* at your school?

_____

_____

_____

What *Primary Connections* professional learning has been conducted at your school in….

2005 _____

_____

2006 _____

_____

What further *Primary Connections* professional learning is planned for later this year

_____

_____

Curriculum units

How many *Primary Curriculum* units will you teach each year when a larger range of units is available? 1 ; 2 ; 3 ; 4 ***(circle one option)***

Do you feel confident to write or modify existing units based on the *Primary Connections* model?

Yes / No ***(circle one option)***

Do you have the time and motivation to write or modify science units using the *Primary Connections* model?

Yes / No ***(circle one option)***

What aspects of science co-ordination are working well at your school? Please rate each of the following aspects in the table below

	Aspect of co-ordination	Good	Adequate	Poor
1	Purchase, organisation and replacement of equipment and consumables			
2	Linking the science curriculum to the assessment and reporting schedule of the school			
3	School or year level or stage planning occurs to make connections between the science, literacy and other learning areas			
4	Productive meetings are held to share experiences, ideas and strategies			
5	Productive meetings are held to review, evaluate and improve units			
6	Mechanisms or processes are in place to keep the school staff informed about developments with the *Primary Connections* program			

What resources or professional learning activities would help improve *Primary Connections* co-ordination at your school?

_____

_____

_____

Any other comments

_____

_____

Thank you for responding to this questionnaire