Appendices

Appendix 1: Participant Autobiographical Data

Pseudonym	School type	Years of teaching	Position	Further information
Claudia[a]	**Primary**: Inner city suburban catholic primary school. Enrolment: 300 students Staff: Approx. 25	10 years teaching experience	Working part- time (2 days per week) as School Teaching & Learning Coordinator	As the school's Teaching & Learning Coordinator, Claudia works with teachers across all levels of the school to support their planning and teaching in all curriculum areas. At the time this research was conducted the school was working to raise the profile of science education, therefore positioning science effectively in multi domain approaches to planning was an area of concern and attention in her work.
Carol[a]	**Primary**: Inner city suburban catholic primary school. Enrolment: 300 students Staff: Approx. 25	30 years + teaching experience. Carol had been at present school for 20 years	Working part time in a co-teaching role as Grade 1 classroom teacher. Level leader in school.	As a school Level Leader, Carol was responsible for ensuring that all of the Grade 1 and Grade two teachers were attending to school curriculum and were implementing teaching approaches that were in line with school priorities and goals.
Helen	**Primary**: school located 37 km northeast of Melbourne, on a 17acre bush land setting. Enrolment: 300 students Staff: Approx. 18	20 + years teaching experience	Grade 1 classroom teacher & also School Curriculum Coordinator	The role of Curriculum Coordinator involved leading staff in curriculum matters, organizing some P.D, running P.D as a part of staff meetings & overseeing curriculum developments & any other emerging sector and education initiatives.

Joanne	**Primary**: school situated in Southern region of Melbourne. Enrolment: 160 students Staff: Approx. 12	7 years teaching experience	Grade 4 teacher & School Science Coordinator	Joanne was responsible for the development of science across the school. Prior to this research, Joanne had been satisfied with science being presented as a stand-alone subject but increasingly she was seeing the need to integrate the teaching and learning of science as part of inquiry unit planning in all classrooms. This new thinking was not gaining traction in school & this was frustrating for her, as she wanted to relinquish the ownership of science so that it would become an area of learning shared by all teaching staff.
Keith[b]	**Secondary**: year 7–12 Catholic coeducational secondary college. Enrolment: 1900 students Staff: Approx. 150	8 years experience. One school prior to present appointment	General science years 7–10	At the time of the research Keith was experiencing some tension with school leadership. He had tried to develop an initiative to raise the profile of science in the junior school & provide an opportunity for student learning beyond the classroom. This initiative had been meet with little interest by school leadership. The lack of support became a source of frustration for him & as a result he had disengaged with leadership opportunities for some time. Keith described how he wanted to see himself in terms of a leader within school, didn't know to what capacity, yet he was realizing the difficulty involved in gaining an official position of leadership.

Pseudonym	School type	Years of teaching	Position	Further information
Maree[b]	**Secondary**: year 7–12 Catholic coeducational secondary college. Enrolment: 1900students Staff: Approx. 150	20 years experience presently teaching senior chemistry.	General science to years 7 & 9, Year 11 Biology	Maree was an experienced teacher who had volunteered to enrol in the research project however she was extremely nervous about the use of technology within the programme, in particular the use of the flip camera to record personal ideas and reflections. Therefore the programme involved lots of personal risk taking.
Georgia	**Secondary**: year 7–12 metropolitan Catholic secondary boys' college. Enrolment: 1300 students Staff: Approx. 105	9 years	Year 12 science teacher also KLA coordinator on senior campus	The College operates as two campuses (Years 7–9 and Years 10–12). Georgia was working as KLA (Key Learning Area) coordinator in the senior campus and this involved working with junior school KLA coordinator to ensure that performance across both campuses was consistent and satisfactory across all areas of the curriculum. This role also required her to work closely with the school's Curriculum Coordinator.
Anna	**Secondary**: year 7–12 metropolitan Catholic secondary girls' college. Enrolment: 1000 studentsStaff: Approx. 100	8 years	Senior science teacher and Science Coordinator	The role of Science Coordinator involves working to budget, maintaining curriculum – ensuring documentation is up to date, looking after the labs and the lab technicians, promoting science in the school and enhancing the teaching and learning that happens is science.

Megan	**Secondary**: year 7–12 metropolitan Catholic secondary girls' college. Enrolment: 1200students Staff: Approx. 100	15 years + Presently teaching year 9 and senior classes.	Science teacher and Science Coordinator	At the time the research was conducted, the College operated as two campuses (Years 7–10 and Years 11–12). Science Coordinator role involves a strong focus on the development of curriculum, establishment of teamwork at all levels & consistent implementation of curriculum across all levels. It was the second year of Megan's appointment to this position. The move to this school and this position had been personally very challenging. At the time of the research, student assessment and engagement was a particular focus of school-based development.
Sophie	**Secondary**: year 7–12 metropolitan Catholic co-educational secondary girls' college. Enrolment: 1200 students Staff: Approx. 100	10 years + teaching experience	7–10 science teacher. Has position of transition coordinator	4 years prior to this research, a primary school and secondary school had amalgamated to form the present P – 12 college. The college maintained the 2 campuses, i.e. P-6 and 7–12. At the time of the research, the school was once again in transition as the 7–12 campus was in the process of being relocated to a new site. Sophie had been given the role to ensure that the transition for students was a smooth process & to ensure that there was some consistency in science teaching between the primary campus and the secondary campus. This role involved meeting with primary teachers and opening dialogue between the teachers at both campuses.

Pseudonym	School type	Years of teaching	Position	Further information
Elizabeth	**Secondary**: year 7–12 metropolitan Catholic co-educational secondary college. Enrolment: 1600 students Staff: Approx. 120	30 years + teaching experience.	Senior science teacher and Science Coordinator	Elizabeth has held the position of science coordinator for a number of years. At the time the research was conducted the school was working towards being accredited for the International Baccalaureate, this appeared to add more work to her position. Elizabeth missed day 2 of the programme due to illness.
Kathy (real name)	Professional Learning Facilitator	20 years + experience in teacher professional learning	Science Resource Officer Catholic Education Office	Originally a primary school teacher, Kathy has extensive experience working with teachers across the catholic sector in Melbourne facilitating professional learning programmes and working with individual schools to support planning and teaching. Also undertakes Critical Friend role visiting all teachers in the STaL programme.

[a]*Claudia and Carol*: Both teachers worked together at the same school and had done so for many years. Both teachers worked together to develop a shared action research project for this study, which focused on building teachers' awareness of and confidence in developing authentic learning opportunities for their students. It is important to note that at the time the study was conducted the school underwent a significant shift in leadership with the appointment of a new principal. This presented significant challenges for both Claudia and Carol in terms of their individual responsibilities as leaders within the school, also as members of a staff that had worked closely with the previous principal and had developed a number of initiatives in science education that had received sector wide acclaim. The new principal did not appear to hold these initiatives as important priorities within school planning and action, and over the course of this research study both Claudia and Carol witnessed the removal of the infrastructure that had been put in place to sustain the practices which supported these initiatives.

[b]*Keith & Maree*: Both these teachers worked together at the same school. While both teachers worked at the same school each developed their own action research plan.
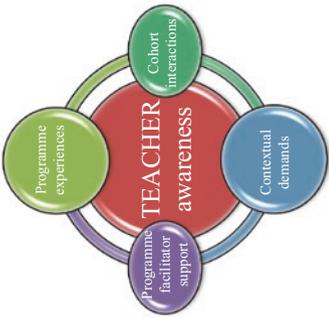
Appendix 2: Code Definitions

CATEGORY: Self efficacy

Subcategory: Building a sense of personal professional identity

CODE:

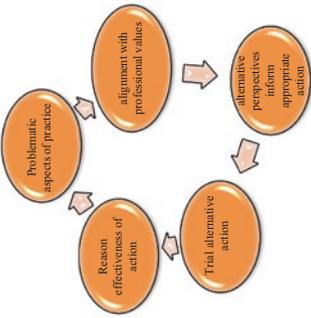| Characteristics	Evidence	The Connections	Catalyst
Characterized by:	Initially general observations across cohort:	Building a sense of personal professional identity appears to be essentially a personal experience albeit constructed within a shared programme experience. The programme operational structures initially facilitated an alternative perspective for teachers about the relationship between teaching and professionalism. Teachers then began to value the potential place of such thinking within their own school context. Teachers began work to emulate these conditions in their schools, in their personal interactions.	Quality Venue
Explicit recognition and value of personal expertise	evidence captured describing what teachers saw, did, etc.		Selected entry
			Learning experiences that were explicitly mindful of teacher knowledge & experience
Awareness of the complexity of the relationship between professional knowledge & professional practice	Individual interviews & reflections identify experiences that were personally significant: comments capture emotional responses, teachers emphasize; value, trust, empowerment, ownership.		
Valuing professional knowledge derived from the contextual reality of teaching			Professional interactions that continually attend to and are respectful of teacher concerns and experience
Actively sharing professional knowledge	Teachers articulate expected conditions for learning in particular that their ideas, experiences and insights are overtly valued at a school level. Evidence in a range of data sets demonstrating teacher decisions about: The relationship between personal self-esteem, trust, respect & meaningful learning Effective school based support for their learning.		The ongoing personalized support of a purposeful, teacher centered programme facilitator.

CATEGORY: Aligning reasoning and action

Subcategory: Reflecting on professional reasoning to clarify personal professional principles of practice

CODE:

Characteristics	Evidence	The Connections	Catalyst
Characterized by:		The teacher works as a learner to build personal awareness. Learning experiences & professional interactions support teachers to notice & value their practice. Support structures enable teachers to notice the thinking, which drives their action. Teachers identify issues of concern or existing challenges within their practice.	Selected entry
Recognizing that personal teaching practice provides a valuable context for examining professional thinking	Teachers valued programme information that was personally & contextually relevant; essentially this meant they found it useful to their teaching. Evidence in a range of data sets of teachers drawing on personal teaching context to exemplify issues. However many experienced conflict between workplace demands & achieving clarity of thinking and learning about their practice.		Formative programme design
			Extended timeline for learning
Drawing on a range of diverse perspectives to make sense of familiar routines and topics	Evidence in a range of data sets demonstrated teachers articulating concerns about:		Learning experiences that were explicitly mindful of teacher knowledge & experience
Articulating personal principles of practice which underpin professional action			The ongoing personalized support of a purposeful, teacher centered programme facilitator
Noticing tensions between stated principles and reality of practice	The interrelatedness of intellectual engagement, professional practice and contextually relevant actions		Facilitator action that reframed the ownership of teaching expertise & assisted teachers to recognize personal professional knowledge; develop attention to awareness in action; meaningfully link thinking with teaching context.
	The need to build effective relationships to enhance practice		
	The value of alternative perspectives - seeing things differently and therefore thinking differently		
	The importance of redefining success		Embedded, ongoing diagnostic programme evaluation ensuring programme actively responded to teacher learning needs.

Subcategory: *Identifying specific tensions between personal professional principles of practice and the reality of action*
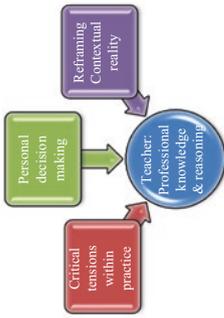
CODE:

Characteristics	Evidence	The Connections	Catalyst
Characterized by:	There is evidence of strong individual teacher learning as a result of teachers interacting with each other to discuss implications of ideas & issues raised through learning experiences. Teachers began to determine what mattered for their own learning, in terms of applying new perspectives to inform action in their working context. This process was ongoing and fluid, not linear.	Teachers utilize learning experiences & professional interactions to notice their practice and begin to identify the professional knowledge that drives their teaching within their contextual reality. Teachers check consistency between principles and action.	Formative programme design
Focusing on a specific tension between stated principles and an inconsistent & therefore problematic aspect of teaching practice			Extended timeline for learning
Re-examining personal reasoning about purpose to define tension			Learning experiences that were explicitly mindful of teacher knowledge & experience
Drawing on a range of diverse perspectives to inform & scaffold alternative action	Evidence demonstrated teachers recognized: Personal thinking changes over time The importance of having a flexible learning focus		The ongoing personalized support of a purposeful teacher centered programme facilitator.
Owning decisions about appropriate action	Flexibility provided opportunities to refocus their learning needs and think & work differently		Facilitator action that reframed the ownership of teaching expertise & assisted teachers to recognize personal professional knowledge; develop attention to awareness in action; meaningfully link thinking with teaching context.
Trialing alternative action			Embedded, ongoing diagnostic programme evaluation ensuring programme actively responded to teacher learning needs.
Evaluating effectiveness of alternative action			

Subcategory: *Realigning action with professional thinking*

CODE:

Characteristics	Evidence	The Connections	Catalyst
Characterized by:	Evidence across data sets demonstrated that teachers believed 'success' in teaching did not happen without effort or frustration. Teachers wanted to hear about challenges experienced when working towards success. In teaching, the degree of difficulty experienced was an important indicator of the degree of success that was achieved (teacher interviews). Evidence that programme-learning experiences (guest speakers in particular) enabled teachers to undertake purposeful reflection in action. Taking time to reflect and think was not a routine part of teachers' day-to-day actions. (Free talk, final day transcripts). Taking time to think about personal practice assisted teachers to develop awareness of action and in action.	Teachers continually work to reframe problematic aspect of practice within their contextual reality. Throughout this sometimes interrupted and shifting process, teachers are actively supported to assess consistency of personal reasoning in action.	Selected entry
Valuing tensions in practice as markers for personal professional learning opportunities			Formative programme design
			Extended timeline for learning
Acknowledging personal professional responsibility to determine & initiate contextually relevant & meaningful practice			Learning experiences that were explicitly mindful of teacher knowledge & experience
Applying professional reasoning to inform decisions and affect appropriate actions			The ongoing personalized support of a purposeful teacher centered programme facilitator.
Reframing conditions within professional context through alternative action and new perspectives			Facilitator action that reframed the ownership of teaching expertise
			Facilitator action that assisted teachers to recognize personal professional knowledge & develop attention to awareness in action
			Facilitator action that assisted teachers to meaningfully link thinking with teaching context.
			Embedded, ongoing diagnostic programme evaluation ensuring programme actively responded to teacher learning needs.

CATEGORY: Valuing emerging expertise

Subcategory: Articulating new thinking and sharing professional knowledge

CODE:

Characteristics	Evidence	The Connections	Catalyst
Characterized by:	Evidence across data sets indicated that;		Formative programme design
Awareness of the complexity of the relationship between professional knowledge & professional practice	Teacher – teacher interactions clarified the role of teachers as leaders of change		Extended timeline for learning
			Learning experiences that were explicitly mindful of teacher knowledge & experience
Awareness of the contextual nature of professional practice	Teachers learn from each other		The ongoing personalized support of a purposeful teacher centered programme facilitator.
Actively sharing professional knowledge	Teachers value the opportunity to; engage with someone outside their teaching situation; have the complexity of their work acknowledged by someone outside their teaching situation; listen to new ideas and construct personal meaning;		Facilitator action that reframed the ownership of teaching expertise
			Embedded, ongoing diagnostic programme evaluation ensuring programme actively responded to teacher learning needs.

Appendix 3: Email to Robyn Re Information for Her Session

Email:

Hi Robyn,

As promised I have attached a sheet with some questions for you to consider when sharing your experiences as Science Coordinator and leader in schools. Of course we may not get through all of these and or much of this information may arise as you work through your ppt.

Leadership

The intent of this conversation is to allow the following to emerge:

1. Sharing both your successes and failures – warts and all.
2. Identifying and talking about specific challenges
3. The key issues/experiences from which you have learnt a great deal
4. How you deal with the complexities of issues such as - differing personalities, teacher identity and ownership.
5. How experience has contributed to the way you think about your role as a leader.
6. The structures or strategies that you use to build the capacity of people around you to share and take on the ideas that you see would be beneficial to enhancing learning?
7. How you determine success and progress.
8. Personal awareness – how you maintain this and use this to inform your leadership (muscle skills)

Intro:

PPT (as discussed) providing an overview briefly recounting your journey as Science Coordinator in schools particularly outlining the initiatives you have put into place and the strategies you used to do this.

Questions

1. What were the structures or strategies that you use to build the capacity of people around you to share and take on the ideas that you saw would be beneficial to enhancing learning?
2. In terms of your leadership what have been the biggest challenges?
3. How did you deal with these?
4. What approaches/strategies or ideas didn't work?
5. How do you determine progress/success?
6. What have you learnt about yourself and how has this shaped how you now undertake your leadership role?
7. Are there ever times when you just accept that something cannot be achieved?
8. What have you learnt about change and promoting change?
9. How would you define 'leadership'?
10. What knowledge and experiences have you drawn on to help you reach this definition/personal meaning of leadership?

Appendix 4: The Five Whys Activity

CLAUDIA: 5 Whys

Question 1: Why did I decide to participate in this 'Leading Science in Schools' Program?

Answer: I decided to participate in this program because of our commitment to develop our 'scientific literacy' project, and for my own development as a 'leader'.

Question 2: Why..

Answer: It was time to 'take stock' as to where we were at with this project and to set direction for the future of it. To explore my own leadership style, to be challenged and motivated.

Question 3: Why

Answer: (the Projects) To ensure its effectiveness from Prep - Six in terms of staff development, action learning and improving student outcomes. To re-consider my own role as a leader, especially in a new setting.

Question 4: Why

Answer: To review and build on the project to ensure success for all stakeholders. To continually challenge myself and explore effective leadership.

Question 5: Why

Answer: To achieve our goal of scientific literacy as an educational outcome as it is highly valued. To contribute to the use of our new learning space. To be more effective as a leader.

GEORGIA: The 5 Why's

1. Why did I decide to participate in this 'Leading science in schools' programme?

   I was asked, I liked how the previous PD was run and it sounded interesting?

2. Why did it sound interesting?

   There is very little PD around that helps you prepare for leadership in your school. Leadership PD tends to be very general in nature. It sounded like this PD would give me an opportunity to explore and develop my own style of leadership, taking into consideration the school circumstances.

3. Why is there nothing much around?

   Good question? Is it because leadership is an assumed capability of teachers? Do schools underestimate the demands of leadership on teachers? Is it too hard/costly to tailor leadership PD?

4. Why is it assumed I'm capable of leadership in my school?

   Possibly because I prefer to listen/act/communicate rather than complain about problems. I can also see the big picture most of the time, so look for solutions myself.

5. Why are these things seen as leadership qualities/important by the school?

   I believe leaders look for solutions to problem or guide others to find their own solutions by asking the right questions.

   I think the school might see this as a desirable quality in a leader because it's working in a positive/constructive way.

Appendix 5: Listening to Learn Reflection Sheet

MAREE: Listening to Learn

Listening to Learn

The closer we look the more we can learn about ourselves. *Joan Richardson (2002)*

At the heart of reflection is the belief that educators possess the knowledge to improve their Practice; all they need are opportunities to consider their work. *Joan Richardson (2002)*

What am I learning about leadership?
Consider this question in terms of what you are hearing about aspirations, communication, relationships, personal & external expectations, action.

Listening - what stands out?	Connecting: Why did this resonate? What ideas are emerging for me?	Learning about leadership: What are the leadership attributes & actions I value?
Vertical leadership P.L → Product vs Process	Managing up Celebrating successes	Collaboration Relationship building 1. Relationship building 2. Modelling listening + learning 3. Value contributions, skills of others. Pinpoint.

GEORGIA: Listening to Learn

Listening – what stands out?	Connecting – why did these ideas resonate? What ideas are emerging for me?	Learning about leadership – what are the leadership attributes and actions I value?
Start collecting data to see what the situation is at present.	It is a way to be objective about the current problems in the school. Issues might be resolved more productively if there is data from many voices, rather than concerns raised by a few.	Listening to others.
		Giving people the opportunity to be heard.
		Creating a safe environment to encourage critical evaluation/reflection
		Be open to critique
		Being able to see the big picture.

Quantifying what success looks like.	Wow!	Giving clear directions about expectations
	I could use this to clarify my (new) role. I ask my Curriculum coordinator to determine what it looks like when I'm doing my job well. From this I can determine what tasks I can prioritise. (measurable outcomes)	Providing regular feedback
Measuring success after asking what it looks like		Being interested in work underway and completed
		Acknowledgement
Using data to measure progress or inform change	In my role, collecting data from KLA leaders to present to a review of the assessment and reporting policy will help to make meaningful changes. It will allow decisions to be based on the thoughts of the people who will use it.	Being open to positive, considered change.
		Listening and being open to others, even if you don't agree
		Acting for or serving the interests and needs of people you are leading
The coordinator had a desk near/around the staff (even though she could have had an office.)	Understanding what is going on day to day is important. Taking time or being near people you lead is important, so you know when to ask for something and when to give.	Leaders know what is going on for those they lead. They develop and maintain a relationship that is going to benefit both leader and staff.
Acknowledging staff for the work they put in, not taking credit for 'the idea'.	How can I do this? What opportunities do I have in my role. This is important. As I am working out my role, I will try to make time and opportunities to do this.	Leaders can release ownership. They can develop skills in others by supporting them, rather than doing it all.

Appendix 6: Action Research Template

Project Title
This project aims to:
The reason I am pursuing this project is (rationale, why is project this needed) …
How does this project link to my school's priorities? (Does it need to? Why?)
The way I will implement this project is: (Map out the whole project, identifying each stage that you will design. If you plan to begin with a workshop or session, start to think about the design of your session).
How will I determine the impact of my project?
Timelines and milestones (this should be detailed enough to be helpful to you to know what needs to be done and when).

Thinking about yourself as a leader

What would you like to learn about/develop in yourself as a leader by undertaking this project?
How will you notice or reflect on your learning or development as a leader as you undertake this project?

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