CHANGES IN TEACHERS' KNOWLEDGE AND BELIEFS ABOUT SELF-REGULATED LEARNING DURING THEIR ENGAGEMENT WITH A GUIDED PROFESSIONAL LEARNING COMMUNITY

by

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ABSTRACT

Studies have raised concerns regarding the quality of knowledge and beliefs that teachers hold about self-regulated learning (SRL) and their consequent ability to adequately meet the needs of students and prepare them with the necessary skills to succeed today and in the future (Dignath-van Ewijk & van der Werf, 2012; OECD, 2005, 2016). A consensus exists in the research literature (e.g. Bowe & Gore, 2016; Desimone & Garet, 2015; Vangrieken, Meredith, Packer, & Kyndt, 2017) that professional learning communities are an effective method to improve teachers' professional competence (e.g. teachers' knowledge and beliefs). Responding to the concerns, the present study investigated changes in the quality of teachers' knowledge and beliefs about SRL whilst they engaged in a guided professional learning community about SRL. Four science teachers from an Independent Girls Grammar School undertook six 40 minute professional development sessions, reflective discussions with the researcher, and a collaborative process of progressive refinement of an SRL teaching approach. Following each professional development session, participants delivered an SRL teaching approach (explicit teaching about SRL and the implementation of a learning protocol) to their Year 8 classes. Data was collected from teachers through in-depth individual interviews, before and after the intervention period. Data was analysed using a combination of deductive and inductive coding methods. All participants showed substantial increases in knowledge about SRL between pre- and post- intervention interviews; however, although large effect sizes are reported, results were not statistically significant due to the small sample size. Changes in participants' beliefs were less consistent, with substantial changes noted only in the category of teacher self-efficacy. Still, results indicate that a guided professional learning community is an effective method to enhancing teachers' knowledge and beliefs about SRL. This study has implications for teacher education, and how it can prepare teachers with the necessary knowledge and beliefs to foster SRL in the classroom. Subsequently preparing students with a range of "how to learn" skills so that they can adapt to the rapidly changing job landscape and succeed in this ever-changing world.

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed: Shyam Barr

Date: 22/01/2017

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1. INTRODUCTION

A consensus exists in research literature and policy documents that the most influential factor on learning, beyond that of the student, is the teacher and his/her teaching practices (Government, 2016; Hattie, 2009; Klassen & Tze, 2014; Ladwig & Gore, 2005; Munro, 2011; OECD, 2005). As a result, teacher education and professional development programs are being increasingly scrutinised as methods to better understand how to support teachers for long term impact (ACER, 2016; Bowe & Gore, 2016; Loughran, 2014). Currently in Australia there exists a 'crisis discourse' about teacher quality, effectiveness and education; some sources are labelling teacher education programs inadequate and suggesting the need for reform (Mayer, 2014; Rowan, Mayer, Kline, Kostogriz, & Walker-Gibbs, 2015). Such discourse has resulted in state/territory governments (e.g., Government, 2016) advocating a number of change initiatives with a focus on raising the quality of teaching and learning.

Over the past three decades, success in schools has been increasingly equated to performance on literacy and numeracy measures (Ladwig, 2010), and more recently science measures (OECD, 2016). Australia has shown little to no progress on these measures (e.g. TIMSS 2015, NAPLAN 2016, PISA 2015), particularly over the past two decades (Thomson, De Bortoli, & Underwood, 2016; Thomson, Wernert, O'Grady, & Rodrigues, 2016). As a result, teacher education and effectiveness has also been the subject of such measures (Rowan et al., 2015), increasing a focus on "these narrow domains" (Hattie & Donoghue, 2016, p. 1). Yet, schools are no longer industrial hubs churning out homogenised factory workers. Teachers "must have the skills to respond to uncertainty and changing priorities" (Santoro, Reid, Mayer, & Singh, 2013, p. 123), and be able to prepare students as life-long and self-regulated learners (Eilam & Reiter, 2014; Klug, Ogrin, Keller, Ihringer, & Schmitz, 2011; Wirth & Leutner, 2008); equipping students with a range of 'how to learn' skills (Hattie & Donoghue, 2016) so they can adapt to the rapidly changing job landscape (Zhao, 2010), cope with an information-rich world, and embrace the exponential development and growth of technology (OECD, 2005, 2016; Rowan et al., 2015; Wilson & Bai, 2010). In order to achieve this, the teaching pendulum needs to

swing toward a focus on learning, or more specifically self-regulated learning (SRL; Hattie & Donoghue, 2016; Kistner, Otto, Büttner, Rakoczy, & Klieme, 2015).

This shift to a more holistic focus on student learning brings into question the professional competence of teachers about SRL. Previous studies have reported that teachers do not possess high quality knowledge or beliefs about SRL (e.g. Dignath-van Ewijk & van der Werf, 2012; Spruce & Bol, 2015), and as a result are unlikely to foster SRL in the classroom. In an attempt to respond to concerns about the preparation of current and future generations (OECD, 2005, 2016), better understand how to support teachers for long term impact (ACER, 2016; Bowe & Gore, 2016; Loughran, 2014), and contribute to the current discourse around teacher education (Mayer, 2014), the present study explored how teachers' knowledge and beliefs about SRL change as teachers engage in a professional education program. Before progressing, it is important to first clarify how SRL has been conceptualised in the present study.

1.1 Self-regulated learning (SRL)

1.1.1 Social cognitive learning theory: Reciprocal determinism

According to social cognitive learning theory, learning occurs through the observation of others (Bandura, 1997). At the core of social cognitive learning theory, Bandura (1997) proposed the notion of "reciprocal determinism": the interaction between the personal factors, environmental factors and behavioural factors of an individual (Bandura, 1997; refer Figure 1). All three factors influence one another; for example, a student's knowledge or beliefs about SRL (personal) may increase when exposed to an SRL teaching approach (environmental), which in turn may influence the student's SRL behaviour (behavioural). Alternatively, a teacher's knowledge or beliefs about SRL (personal) may increase when exposed to a professional education program about SRL (environmental), which in turn may influence the teacher's teaching practice (behavioural). To this day, social cognitive learning theory continues to be an influential theory in educational research (e.g. Herndon & Bembenutty, 2017) and is a core theoretical construct that underpins the present study.

Figure 1 has been removed due to copyright restrictions.

Figure 1: Reciprocal determinism (Bandura, 1997)

1.1.2 Zimmerman's triadic model SRL

Grounded in social cognitive learning theory, Zimmerman (2002) proposed the triadic model of SRL (Figure 2). Zimmerman (1989) "defined SRL as the degree to which students are metacognitively, motivationally, and behaviourally active participants in their own learning processes" (p. 329). Therefore, SRL is when a student engages in a self-directive process (Zimmerman & Labuhn, 2012): autonomously setting goals; developing a plan; performing a set of learning strategies; regularly evaluating the effectiveness of his/her learning approach; and adapting where necessary (Zimmerman, 2008, 2013). It can be understood as an individual being aware of the interactions between personal, behavioural and environmental factors (i.e. reciprocal determinism), and regulating the interactions in order to move learning forward.

Entering at the Forethought Phase of Zimmerman's triadic model, a self-regulated learner will analyse the set task, consider the desired outcome and plan the appropriate strategies to achieve this outcome. In this phase, there is an awareness of one's self-efficacy for the task, their interest levels, and goal orientations (i.e. personal factors). Moving into the Performance Phase requires the application of the chosen strategies (i.e. behavioural factors), management of distractions (i.e.

environmental factors) and regular monitoring of one's progress. The final Self-Reflection Phase is whereby a learner evaluates their progress taking into consideration the outcome. In this phase, a learner will attribute causes to the outcome; consider the associated emotions and adopt an adaptive or defensive reaction. This reflection feeds into the Forethought Phase, guiding future actions, and the process occurs once again.

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Figure 2: Phases and sub processes of the triadic model of SRL (Zimmerman, 2002)

Based upon its strong representation in the SRL literature and its high applicability to typical school learning environments (e.g. Eilam & Reiter, 2014; Herndon & Bembenutty, 2017; Klug et al., 2011), the triadic model of SRL is deemed a suitable background framework to inform the present study. I now return to the question of professional competence of teachers, particularly the knowledge that teachers' possess about SRL and their beliefs that influence fostering SRL in the classroom.

1.2 Teacher knowledge

A central idea amongst research literature is that the knowledge teachers hold shapes their teaching practice (Ball, Thames, & Phelps, 2008; Dicke et al., 2015; Kunter et al., 2013; Peeters et al., 2014). Today, teachers are expected to possess a broad and complex knowledge base (Adoniou, 2015; AITSL, 2012). Many researchers have attempted to determine what constitutes this knowledge base, but this has proven to be extremely difficult (Lawson, Askell-Williams, & Murray-Harvey, 2009; Munro, 2011).

The original set of seven categories of teacher knowledge put forward by Shulman (1987), continues to be widely referenced within the teacher knowledge literature (e.g. Adoniou, 2015; Ball et al., 2008; Blömeke, Buchholtz, Suhl, & Kaiser, 2014; Lawson et al., 2009). Shulman proposed that teacher knowledge consists of the following: content knowledge; general pedagogical knowledge; curriculum knowledge; pedagogical content knowledge; knowledge of learners and their characteristics; knowledge of educational contexts; and knowledge of educational ends, purposes and values, and philosophical and historical grounds. Although various new teacher knowledge models have been proposed (e.g. Adoniou, 2015; Darling-Hammond, 2006; Munro, 2011), the majority "are essentially refinements and re-packagings of this original Shulman scheme" (Lawson et al., 2009, p. 245). But, where does teacher knowledge about SRL fit in relation to the Shulman scheme?

Lawson et al. (2009) advocated for the addition of "knowledge of learning" (such as SRL) as another category to Shulman's set. However, teacher knowledge about SRL consists of elements that span Shulman's original seven categories (e.g. content knowledge and pedagogical content

knowledge, as argued later in this chapter), so adding SRL as an additional category appears inadequate. In order to recognise that teacher knowledge about SRL fits with Shulman's categories, SRL needs to be considered a separate subject, similar to that of English, mathematics or science. With this understanding, teachers are teaching two subjects simultaneously (e.g. science and SRL) and as a result, must hold a similar level of knowledge in the subject of SRL as they would a typical subject.

The current set of professional standards for teachers in Australia also fails to clearly position teacher knowledge about SRL. The first standard 'know students and how they learn' highlights the expectation that teachers understand how students learn (AITSL, 2012), not necessarily teach students how to learn. The second standard 'know the content and how to teach it' is considered an amalgamation of Shulman's categories of content knowledge (know the content) and pedagogical content knowledge (how to teach it; Adoniou, 2015), but this standard is understood to only apply to typical subjects (e.g. science), not SRL. The uncertainty about the position of SRL within the professional standards creates cause for concern, as failing to recognize SRL as a typical subject means that teachers are unlikely to value it as equal to typical subject matter, and teacher education programs are unlikely to prepare teachers with the necessary knowledge and skills (Santoro et al., 2013).

A consistent understanding among educational researchers is the existence of content knowledge and pedagogical content knowledge (Ball et al., 2008; Blömeke et al., 2014); two categories that are related to a specific subject (e.g. science). Focusing on these categories, a case for SRL, as its own domain of knowledge, is presented in the following sections. Figure 3 is an initial theoretical framework that shows the relationship between personal factors (social cognitive learning theory), knowledge and beliefs, and content knowledge and pedagogical content knowledge.

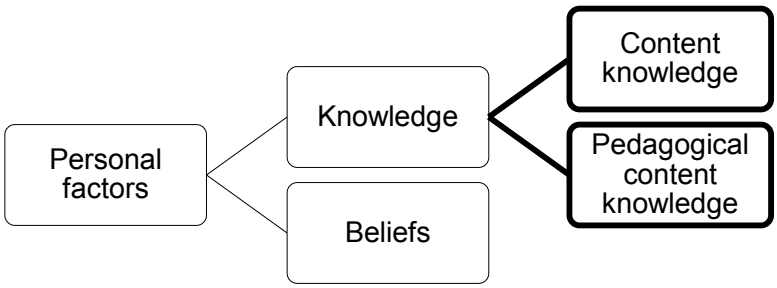

Figure 3: Initial theoretical framework showing the hierarchy between personal factors (social cognitive learning theory), knowledge and beliefs, and Shulman's content and pedagogical content knowledge categories.

1.2.1 Content knowledge

Teachers' content knowledge is the initial building block for teaching well (Adoniou, 2015). Content knowledge is the subject matter, it's the 'what' that teachers teach (Dignath-van Ewijk & van der Werf, 2012). It includes concepts, facts, and theories; but also, the justification of why society accepts these concepts as truths over others (Shulman, 1986b).

When considering the content knowledge for a typical subject such as science, often the categories of biology, chemistry and physics come to mind. Each sub-category can be further sub-divided, biology into ecology, genetics, body systems; chemistry into chemical reactions, mixtures etc. The task of the teacher is to provide students with opportunities to understand the validity of the different concepts and how scientists have theorized, proved and/or supported these concepts. This would prove extremely difficult if teachers did not possess appropriate content knowledge about science.

Similarly, in order to prepare students as self-regulated learners, a teacher should know the different concepts that underpin SRL. This includes knowing the process of SRL, the key phases of SRL (forethought, performance and self-reflection; Zimmerman, 2002), and the different motivational, cognitive and metacognitive strategies that can be utilized in each phase (refer Figure 4; Spruce & Bol, 2015). Similar to science, each sub-category can be further sub-divided. For example, within the

forethought phase, the sub-categories of task analysis and self-motivation beliefs include concepts such as self-efficacy, goal setting and planning. A teacher must be able to provide students with conceptual knowledge of such subject matter and justify why this information is valuable to the learner. Just as with science, teachers must provide students with opportunities to understand the validity of the different SRL concepts and how researchers have theorized, proved and supported these concepts. Therefore, teachers also require appropriate content knowledge about SRL.

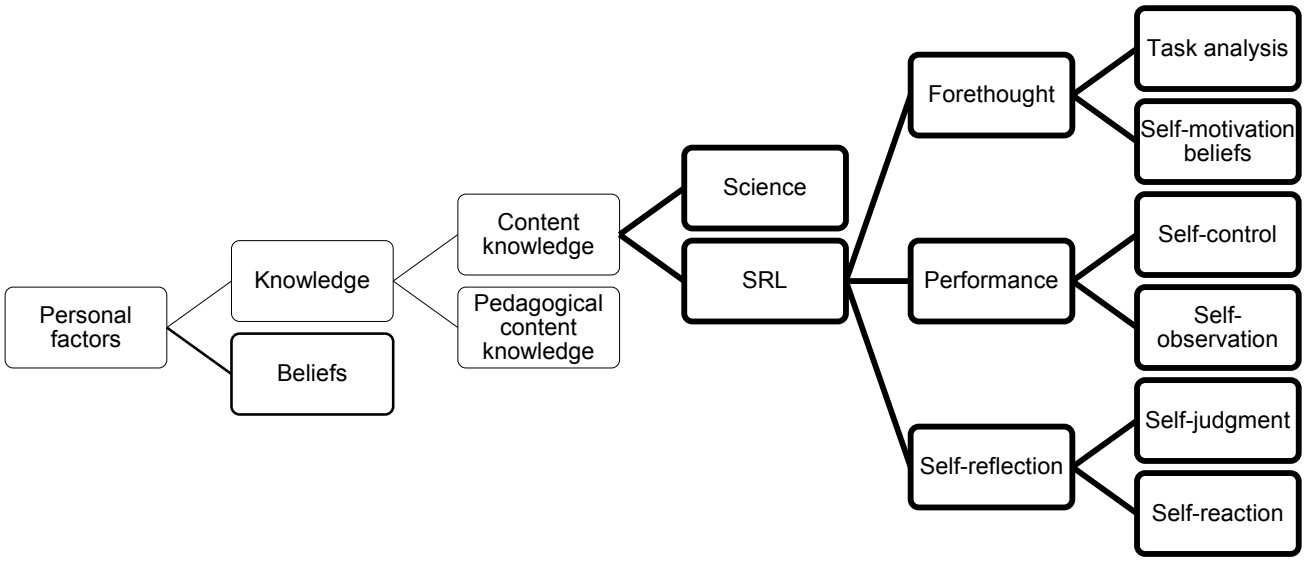

Figure 4: Emerging theoretical framework demonstrating how content knowledge is conceptualised within the present study (i.e. two subjects simultaneously, e.g. science and SRL). Additionally, this figure outlines the content knowledge related to SRL.

1.2.2 Pedagogical content knowledge

Pedagogical content knowledge relates to the knowledge that teachers hold about teaching practices specific to a certain subject area (Ball et al., 2008; Lawson et al., 2009; Munro, 2011; Shulman, 1987). It is “how teachers organise, adapt and represent specific components of the curriculum for teaching” (Munro, 2011, p. 50). As every student is different and there is no one way to represent information, teachers are expected to possess a range of different methods (Shulman, 1986b). To some degree,

one might conceptualise this as a “toolkit” that teachers can draw upon when teaching certain subject matter.

Given the complexity of pedagogical content knowledge, Munro (2011) proposed a model of six interacting elements as a way to conceptualise it. His model included: (1) what the teacher knows about the students’ knowledge; (2) what the teacher knows about useful teaching procedures for fostering the students’ knowledge of the topic or subject; (3) what the teacher does (e.g. the teaching procedures used); (4) what the teacher knows about how to construct a culture and climate to support the teaching procedures used; (5) the teachers’ attitudes and dispositions towards teaching the topic; and (6) the teachers’ ability to read and manage the learning-teaching context. Munro’s model is extensive, but can blur the lines between pedagogical content knowledge and some of Shulman’s other knowledge categories. For example, Munro’s sixth element (i.e. the teachers’ ability to read and manage the learning-teaching context) could be positioned under Shulman’s category of general pedagogical knowledge. The second element of Munro’s model (i.e. what the teacher knows about useful teaching procedures for fostering the students’ knowledge of the topic or subject) is acknowledged as a good fit with Shulman’s category of pedagogical content knowledge and therefore a suitable definition of pedagogical content knowledge for the present study.

If pedagogical content knowledge is a toolkit of useful teaching procedures for sharing certain content (whether SRL or science) with students, then teachers require a number of tools. For example, a science teacher who wishes to teach students about ecology may have a certain diagram of food chains that he/she shares with the class. This might be accompanied by a short video demonstrating a simple food chain and various worksheets, followed by a teacher-facilitated discussion with the class about where food chains exist. Like science, SRL also requires a teacher to possess certain tools for sharing SRL content with students.

In order to foster SRL, one tool that is well evidenced is explicit strategy instruction (Festas et al., 2015; Kiewra, 2002; Pressley, Harris, & Marks, 1992). Typically, this is where a teacher names a

strategy, models how to use it, explains when the strategy would be useful, and provides students an opportunity to practice using the strategy (Kistner et al., 2015). For example, González-Pienda, Fernández, Bernardo, Núñez, and Rosário (2014) tested a strategy instruction intervention for self-regulation with 277 students aged between 12 and 14 years old. Following 12 lessons that focussed on teaching students about different SRL strategies, González-Pienda et al. (2014) reported that students held a higher quality of knowledge about SRL strategies and used SRL strategies more regularly.

A second potential tool involves explicitly scaffolding SRL with a paper based learning protocol to prompt strategy selection, attention to goals, increased self monitoring etc. (Gutierrez & Schraw, 2015). Learning protocols can serve as a scaffold to focus attention on key aspects of SRL, support SRL strategy development and act as a structured diary that promotes reflection (Klug et al., 2011). Eilam and Reiter (2014) conducted a one-year study exploring students' SRL in science. They compared an intervention group (exposed to an SRL environment) and a control group (exposed to a teacher controlled environment). The SRL environment involved three protocols that acted as metacognitive tools to support SRL engagement. Results showed that students who were exposed to a SRL environment (intervention) achieved significantly (Cohen's d = .40) higher levels of self-regulation than their peers (Eilam & Reiter, 2014).

Although both of the abovementioned tools are of an explicit nature, they can also occur implicitly. Implicit strategy instruction is the "teacher utterances or behaviours that are supposed to enhance the use of a learning strategy in students, but that do neither involve informing students about a strategy nor advising them directly to use it" (Kistner et al., 2015, p. 177). For example, a teacher may model a strategy without any specific reference to what the strategy is or how to apply it. Similarly, a teacher may prompt strategy use by asking questions but provide little to no guidance around which strategies may be suitable (as opposed to explicit prompting which may involve a teacher directly telling the student to use a particular strategy). Figure 5 outlines the components of a teacher's pedagogical content knowledge about SRL that will be focussed on in the present study. It is

clear that without such knowledge, a teacher will struggle to effectively guide his/her students toward SRL.

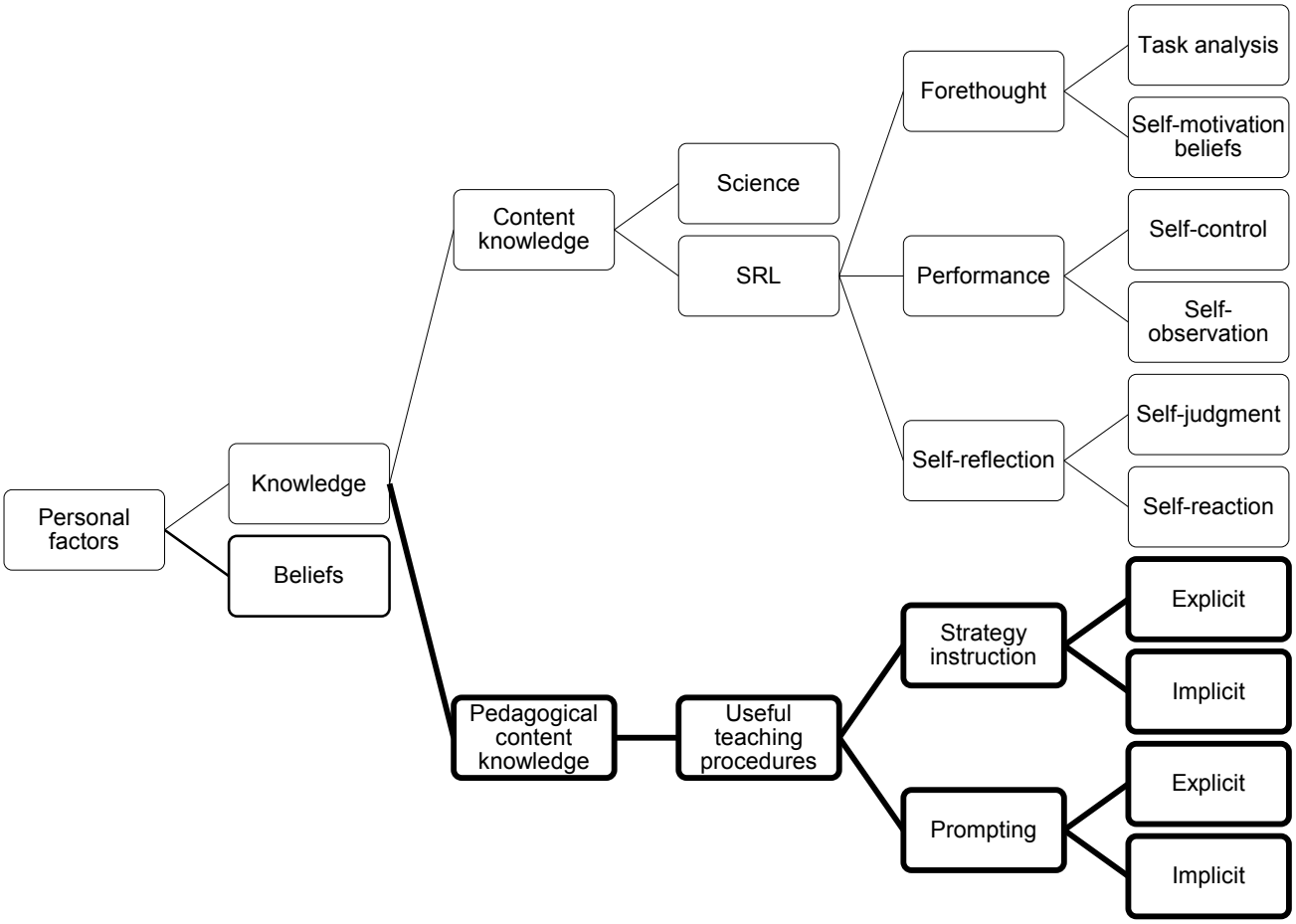

Figure 5: Emerging theoretical framework indicating the pedagogical content knowledge about SRL that is focussed on in the present study.

1.2.3 Quality of teachers' knowledge

The acquisition of content knowledge and pedagogical content knowledge (whether related to, for example, science or SRL) occurs over time through a number of different teaching and learning experiences (Kunter et al., 2013). As such, it is assumed that the knowledge that teachers possess varies between and within teachers. For example, Australian secondary school science teachers are required to hold a university degree in the field of science. One teacher might hold a science degree

with a major in Biology, whilst another may hold a major in Chemistry. Yet, as a science teacher, it is likely that these teachers will be required to teach general science that includes aspects of biology, chemistry and physics. Knowledge about SRL varies in a similar fashion. Some Australian teachers have studied a one year graduate Diploma of Education, while others have studied a four year Bachelor of Education, or Masters level education qualification. This variance in teacher knowledge indicates that some teachers will be better equipped to foster SRL in the classroom than others. This is supported by Ball et al. (2008), who argued that without the appropriate knowledge, teachers inadequately teach and address topics outside of their qualified field.

An increasing number of studies have demonstrated that teachers lack both content knowledge and pedagogical content knowledge about SRL (refer Dignath-van Ewijk & van der Werf, 2012; N. E. Perry, Hutchinson, & Thauberger, 2008). In a study of 10 teachers, using both observation and interview methods, Spruce and Bol (2015) demonstrated that teachers varied substantially in the depth of knowledge they possessed about SRL. Particularly, when considering knowledge of strategy instruction, Spruce and Bol (2015) stated “participants expressed some use of SRL strategies in their learning, though not all were able to explain what those strategies were” (p. 260). Teachers tended to focus on strategies within the monitoring phase (i.e. performance phase) such as re-reading, attention focusing, note-taking etc. However, Spruce and Bol reported that gaps were noted particularly with knowledge of strategies associated with the planning phase (i.e. forethought) and the evaluation (i.e. self-reflection) phase.

Gaps in teacher SRL knowledge have also been noted in observational studies (e.g. Bolhuis & Voeten, 2001; Dignath & Buttner, 2008; Dignath-van Ewijk, Dickhäuser, & Büttner, 2013). A study by Bolhuis and Voeten (2001) indicated that in general, teachers rarely employ strategy instruction as a method to improve student SRL. Those who do promote strategy use tend to do so in implicit ways and focus on cognitive strategies as opposed to motivational or metacognitive strategies (Dignath & Buttner, 2008; Dignath-van Ewijk et al., 2013).

Lack of teacher knowledge about SRL is only one of the potential barriers to fostering SRL in the classroom. Alongside teachers' knowledge about SRL are the implicit beliefs that teachers' hold and how these beliefs potentially shape their ability to foster SRL in the classroom.

1.3 Teacher beliefs

Numerous researchers have attempted to define the concept of teacher beliefs with a clear distinction from knowledge (e.g. Fives & Buehl, 2016; Mansour, 2013). There is agreement that teacher beliefs generally develop over time (Woolfolk Hoy, Davis, & Pape, 2006), can be implicit or explicit, and act as overarching frameworks that individuals use to understand and evaluate the world (Stathopoulou & Vosniadou, 2007; Turner, Christensen, & Meyer, 2009). Teacher beliefs about SRL in the classroom span far and wide and include beliefs about knowledge (W. G. Perry, 1970; Schommer, 1990), beliefs about intelligence (Ames, 1992; Dweck & Leggett, 1988), teacher attributions (Weiner, 1985), expectancy beliefs (Rosenthal & Jacobson, 1968) and teacher self-efficacy (Bandura, 1997; refer Figure 6).

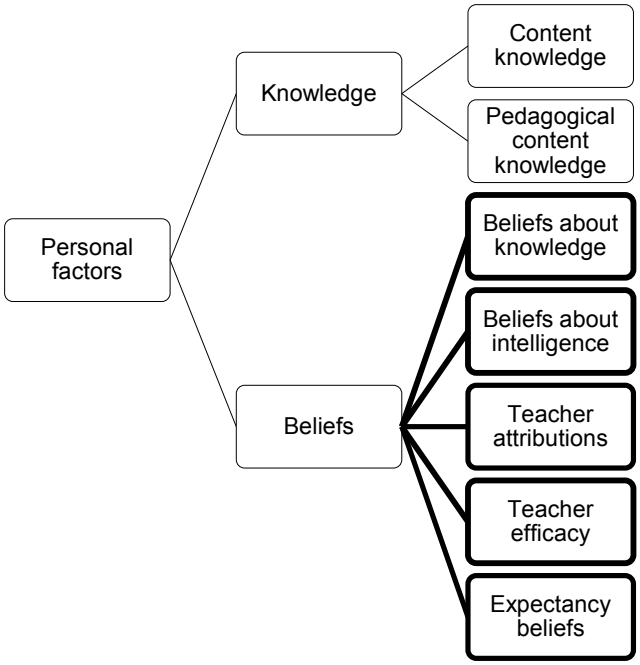

Figure 6: Emerging theoretical framework highlighting the teachers' implicit beliefs about SRL that is focussed on in the present study.

1.3.1 Beliefs about knowledge

The first of the implicit beliefs categories that the present study will focus on is beliefs about knowledge. Researchers have shown a keen interest in beliefs about the nature of knowledge (i.e. epistemic beliefs) since the mid-late 1900s, with a range of views put forward about how knowledge develops and is constructed (e.g. Bruner, 1964; Schommer, 1990; Vygotsky, 1962). Some researchers have advocated knowledge is constructed through a social process (e.g. Bruner, 1964; Vygotsky, 1962), while others believe that knowledge is constructed as children move through a series of stages (e.g. Piaget & Cook, 1952). One such researcher, W. G. Perry (1970), proposed a model whereby learners moved through sequential stages of knowledge development. In Perry's model, initially, learners held an absolutist view where knowledge was either right or wrong and was derived from an authority of the knowledge. As learners progressed through the stages, they became increasingly aware of the role they played in evaluating the information presented against the available evidence and constructing their own knowledge. A number of researchers (e.g. Glenberg, Wilkinson, & Epstein, 1982; Ryan, 1984; Schommer, 1990) have since tested Perry's theory, demonstrating some inconsistencies.

For example, in the first of two experiments, using questionnaires with undergraduate students, Schommer (1990) demonstrated beliefs about knowledge are more complex than W. G. Perry (1970) suggested (i.e. one dimensional), and instead proposed "five dimensions: the structure, certainty, and source of knowledge, control and speed of knowledge acquisition" (p. 498). Researchers (e.g. Buehl & Fives, 2009; Savoji, Niusha, & Boreiri, 2013) have continued to build on and utilise Schommer's dimensions. Therefore, the present study utilised Schommer's dimensions as a starting point when considering beliefs about knowledge, particularly focusing on teachers' beliefs about the source of knowledge.

In the past 15 years, research on beliefs about the source of knowledge has begun to focus on teachers (Walker, Brownlee, Whiteford, Exely, & Woods, 2012). There are currently a number of conceptualisations that exist within the research literature (e.g. Johnson, 2010; Olafson & Schraw,

2006). However, researchers (see Buehl & Fives, 2009; Maggioni & Parkinson, 2008 for overview) generally distinguish between three views on the source of knowledge: empiricist, constructivist and autonomous (refer Figure 7).

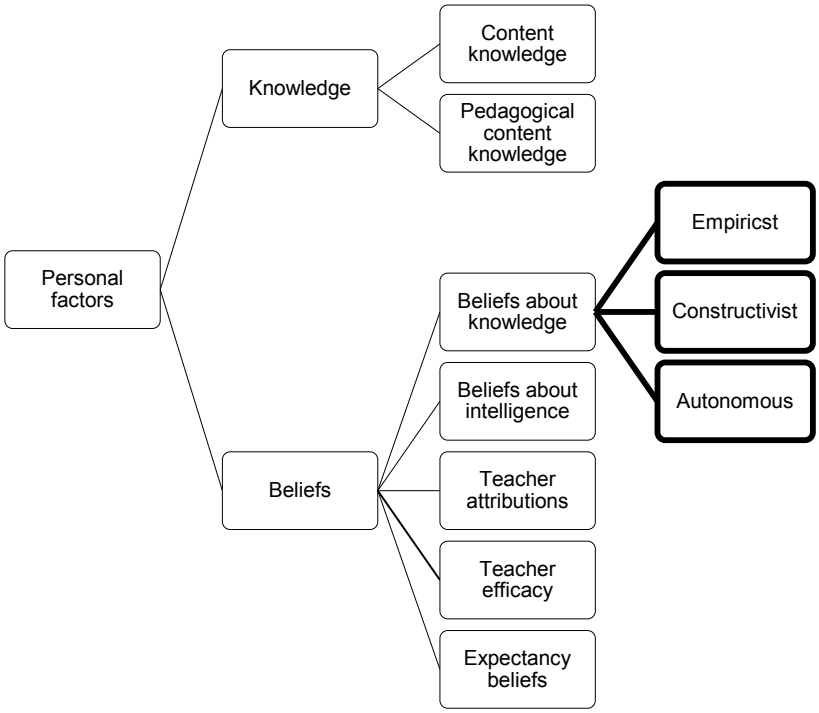

Figure 7: Emerging theoretical framework showing the addition of beliefs about knowledge categories: empiricist, constructivist and autonomous.

On one end of the continuum, teachers with empiricist views believe that knowledge is moved (i.e. transmission) from an authority (Buehl & Fives, 2009; Olafson & Schraw, 2006), such as a teacher to the student (Johnson, 2010). This puts the teacher in the centre of knowledge development and exacerbates the idea of the “sage on the stage”, the teacher as an expert (Maggioni & Parkinson, 2008). Teachers in this belief category are not concentrating on teaching students how to learn but, tend to expend energy on the individual classroom activities (e.g. traditional approaches such as rote learning) that move the class closer to completing a fixed course of content, sometimes even to the detriment of learning (Turner et al., 2009). A teacher within this belief category is less likely to provide opportunities for autonomy and for students to practice SRL (Johnson, 2010).

On the other hand, some teachers view learning as a process of construction (Buehl & Fives, 2009; Walker et al., 2012). Teachers who hold a constructivist view will see content as malleable and as a context for the teaching of learning skills (Khaled, Gulikers, Biemans, & Mulder, 2016). They will create opportunities for students to not only construct knowledge but also apply knowledge in meaningful experiences (Maggioni & Parkinson, 2008). Additionally, they are more likely to promote student autonomy, but not without active teacher support, and spend time with students on meaning making and developing the 'how to learn' proficiencies (Dignath & Buttner, 2008; Turner et al., 2009). Perhaps this is what Olafson and Schraw (2006) termed "contextualists"; teachers who "are less concerned with the type of knowledge that students construct, than the process by which they construct that knowledge" (p. 73). A constructivist view is often associated with strategy instruction (Kistner et al., 2015) and the development of SRL, as it provides opportunities for deliberate practice in a supported environment (Khaled et al., 2016). Therefore, strategy instruction has been conceptualised within the category of constructivist beliefs.

At the other end of the continuum, teachers may believe in the creation of autonomous learning environments. To clarify, this is different from constructivist learning environments, in that the teacher does not actively support the student in developing the learning skills required. Olafson and Schraw (2006) explained that teachers with this view "emphasise their role in creating an environment where students can learn to think independently" (p. 73). Simply, this is when a teacher provides opportunities for students to independently manage themselves without any guidance as to how to self-regulate their learning.

In a study of 47 primary school teachers in the Netherlands, investigating epistemic beliefs related to SRL, Dignath-van Ewijk and van der Werf (2012), reported that teachers often associated SRL with constructivist learning environments; however, no distinction was made between autonomous and constructivist learning environments, making it difficult to discriminate teacher beliefs about knowledge. Dignath-van Ewijk and van der Werf (2012) demonstrated that primary teachers rarely viewed strategy instruction as a method to support student SRL, a finding that is supported by

other research in the field (e.g. Bolhuis & Voeten, 2001). Dignath-van Ewijk and van der Werf (2012) argued that, “teachers refer more to the part of explicit strategy instruction when they think of ‘learning to learn’” (p. 7), as opposed to SRL. Therefore, teachers can hold different epistemic beliefs about the source of knowledge, which may or may not include strategy instruction depending on whether they consider SRL and “learning to learn” to be the same thing.

1.3.2 Beliefs about intelligence

Teachers’ beliefs about intelligence also shape whether they foster SRL in the classroom. Beliefs about intelligence have long been a topic of interest for researchers, particularly in the past three decades. According to an incremental theory of intelligence (Dweck & Leggett, 1988), individuals believe that intelligence is changeable and can grow given the right conditions (e.g. effort, perseverance, strategies). Incremental beliefs lead to a growth mindset and those with growth mindsets tend to achieve greater academic performance, attribute success to effort and show higher levels of academic resilience (Dweck & Leggett, 1988). On the other hand, an entity theory of intelligence is whereby individuals believe intelligence is fixed. As a result, entity beliefs give rise to a fixed mindset. Fixed mindset individuals are likely to attribute success/failure to internal, uncontrollable causes, resulting in lower levels of effort and persistence (Dweck & Leggett, 1988). Beliefs about intelligence have been shown to not only impact student learning but to also shape teaching practice.

Rattan, Good, and Dweck (2012), conducted a series of four studies (with undergraduate and graduate students as participants) that investigated the impact of beliefs about intelligence on teaching practice and student learning. Rattan et al. (2012) reported that instructors with entity views of intelligence “more readily judged students to have low ability” (p. 731), and opted for a “comfort” approach (that had detrimental effects on student motivational beliefs) over a strategy oriented approach. Given the value of strategy instruction (as indicated earlier in relation to pedagogical content knowledge), a teacher with entity views about intelligence is unlikely to effectively foster SRL in the classroom.

A more recent study by Fives and Buehl (2014), involving 443 teachers in the mid-Atlantic United States, and using cluster comparisons, demonstrated that teachers who held fixed mindsets viewed teaching knowledge differently to their growth mindset counterparts. Fives and Buehl reported teachers with growth mindsets are more likely to attribute effort to progress, sought challenge and valued the notion of strategies as opposed to their fixed mindset counterparts, who avoided challenge and were more likely to adopt performance orientations over mastery orientations. They suggested that growth mindset teachers might value professional development opportunities more than fixed mindset teachers, resulting in increased knowledge and improved teaching practice.

Teachers' mindsets have also been shown to differ based on their subject disciplines, age and years of experience. For example, Jonsson, Beach, Erlandson, and Korp (2012) investigated beliefs about intelligence using a sample of 226 Swedish high school teachers. Using self-report measures, Jonsson et al. (2012) found that teachers in mathematics and science showed a preference for a fixed mindset. Jonsson et al. (2012) also reported that (1) older and more experienced teachers and (2) younger and less experienced teachers, had a stronger preference toward entity theories of intelligence" (Jonsson et al., 2012, p. 397).

Mindsets give rise to goal theory: growth mindsets to mastery goal orientations, while fixed mindsets to performance goal orientations (refer Figure 8; Ames, 1992; Dweck & Leggett, 1988; Kaplan & Maehr, 2007). Ames (1992) defined a mastery goal orientation as a learner who is focussed on developing competence with a commitment to growth, while a performance orientation was a learner who is focussed on demonstrating competence. In their original theoretical conceptions, mastery goal orientations were connected to positive outcomes (e.g. higher levels of self-efficacy, SRL behaviours and other learning factors), while performance goal orientations correlated with negative outcomes (Ames, 1992). More recently, researchers have adopted a broader perspective of goal theory, arguing that performance orientations can be broken down further as 'performance approach goals', whereby an individual is trying to demonstrate his/her competence; or performance avoidance goals whereby an individual avoids the task in fear of failure or revealing low ability (Huang, 2012;

Kaplan & Maehr, 2007). Although performance goals were originally associated with fixed mindset individuals, there has been some inconsistencies in previous studies, suggesting that performance goals may also be utilised by growth mindset individuals and have positive effects on motivation, effort and achievement (Kaplan & Maehr, 2007).

Goal theory is well established, particularly in relation to performance and mastery orientations for student motivations and achievement (Kaplan & Maehr, 2007; Maehr, 1984). However, only in the last decade has this been applied to teachers with purposeful focus. For example, Patrick, Anderman, Ryan, Edelin, and Midgley (2001) investigated how orientations impacted teacher behaviour. Drawing on observational data of teaching practice and survey data from 223 students, Patrick et al. (2001) found that teachers perceived as being oriented toward mastery focused on the process of learning, attributed learning success to effort, and emphasised student involvement. Teachers with performance orientations focused on assessments of student ability, such as grades.

Butler (2007) also argued that goal theory be extended to teaching and tested her theory with 320 teachers and a goal orientation self-report measure. Butler reported that teachers held different orientations, namely mastery, ability-approach (performance-approach), ability-avoidance (performance-avoidance) and work-avoidance goals. Similar to student orientations, teacher orientations also correlated with certain perceptions and behaviours. For example, mastery goals were associated with positive outcomes (e.g. higher levels of self-efficacy, engagement in SRL behaviours) whilst ability avoidance goals were associated with negative outcomes (e.g. task avoidance, low effort; Butler, 2007).

More recently, Rubie-Davies, Flint, and McDonald (2012) explored the relationship between teachers' implicit beliefs (e.g. expectancy beliefs, self-efficacy and goal orientations), with a sample of 68 teachers from New Zealand. Collecting data through questionnaires, and conducting subsequent simultaneous linear regressions, Rubie-Davies et al. (2012) found that mastery oriented teachers had higher self-efficacy, particularly for classroom management and student engagement. However, "there

was a trend for teachers who were more performance oriented to be less efficacious about their instructional strategies (and vice versa)" (Rubie-Davies et al., 2012, p. 280). Additionally, in relation to gender, female teachers were found to be more orientated toward mastery than males. However, as Rubie-Davies et al. (2012) noted, the sample of male teachers were small and therefore a significant limitation.

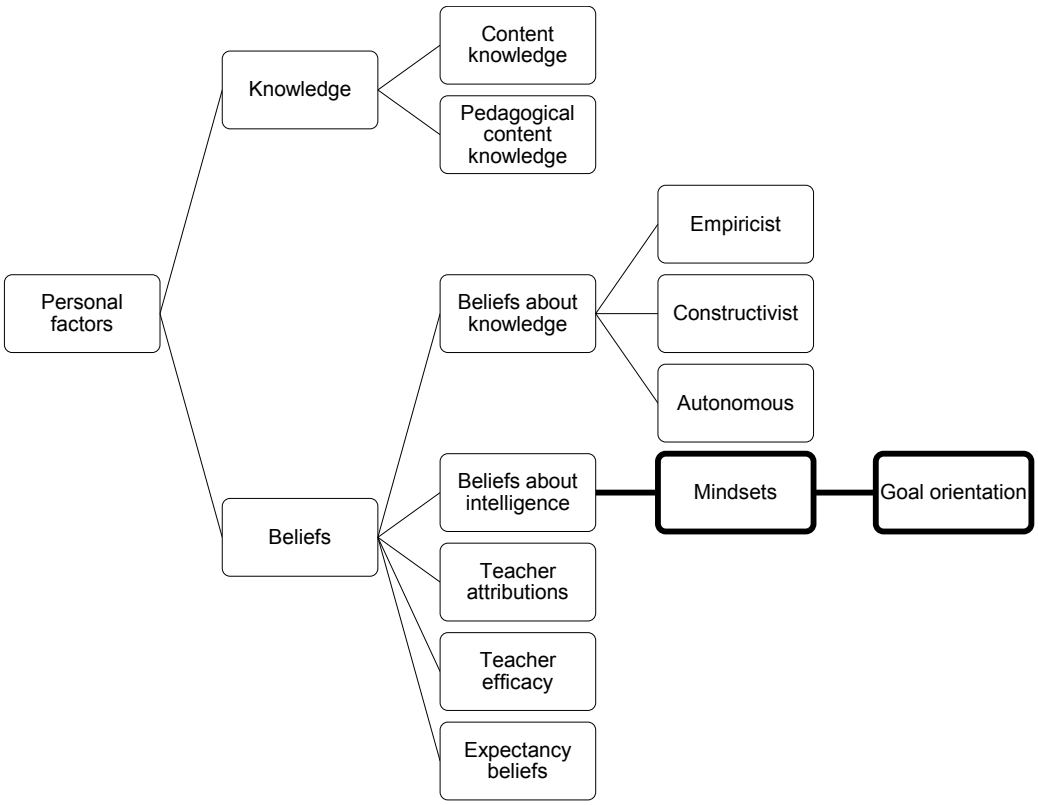

Figure 8: Emerging theoretical framework showing the addition of mindsets and orientations.

1.3.3 Teacher attributions

Among beliefs about intelligence, mindsets and orientations are how individuals attribute success or failure. Weiner (1985) proposed attribution theory; a theoretical framework to explain how individuals interpreted success/failure and how this in turn shaped their behaviour. According to Weiner, a student can attribute success/failure to factors such as ability, effort, strategies and/or luck. Each factor exists along three dimensions: locus of control (whether the cause was internal or external), stability (whether the cause was stable or unstable) and controllability (whether the cause was controllable or

uncontrollable). For example, a student who fails a science task and states, “I’m just no good at science”, may be attributing his/her failure to ability, an internal, uncontrollable and relatively stable factor. On the other hand, a student who fails a science task and states “I didn’t study hard enough” may be attributing the outcome of failure to effort, an internal, controllable and (in this case) unstable factor.

Attribution theory has also been applied to teachers. For example, an American study by Patterson, Kravchenko, Chen-Bouck, and Kelley (2016), that involved 73 preservice and 53 practicing teachers, investigated teachers’ beliefs related to student learning. Using a combination of different self-report measures and univariate analyses to explore the connections between beliefs about intelligence and attributions, Patterson et al. (2016) reported that science and mathematics teachers generally hold entity theories of intelligence/fixed mindsets ($p<0.001$) and suggested that fixed mindset teachers are more likely to attribute student success/failure to student ability. Therefore, the teacher attributes student success/failure to an external factor, implying that the teacher is taking less responsibility for the student outcome.

Wieman and Welsh (2016) investigated how university mathematics and science instructors attributed student achievement, and related this to the quality of instructional strategies utilized by the instructors. It was reported that instructors who attributed student failure to student ability or work ethic (causes that are internal to the student) used less effective instructional teaching strategies. On the contrary, instructors who attributed failure to factors internal to the teacher (e.g. quality of instruction) used more effective instructional strategies (Wieman & Welsh, 2016).

1.3.4 Teacher efficacy

At the core of teacher belief systems are the beliefs that teachers hold about themselves, particularly their self-efficacy, a concept that has been widely researched over the past three decades (Fackler & Malmberg, 2016; Klassen & Tze, 2014). According to Bandura (1997), self-efficacy is an individual’s belief that he/she has the necessary capabilities to successfully perform a specific task. For students,

a strong relationship between self-efficacy and behaviour has been documented (Bandura, 1997), and equally, a relationship has emerged between teachers' self-efficacy and teaching behaviours (Klassen & Tze, 2014; Tschannen-Moran & Woolfolk Hoy, 2001). Therefore, teacher self-efficacy, or simply teacher efficacy is a teacher's belief in his/her ability to perform a particular teaching action (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998), such as fostering SRL in the classroom.

A model of teacher efficacy put forward by Tschannen-Moran et al. (1998) and later used by Woolfolk Hoy et al. (2006) suggested that two interacting elements were the basis of teacher efficacy. The first was the teacher's "appraisal of the factors that make accomplishing a specific teaching task easy or difficult" (Woolfolk Hoy et al., 2006, p. 727). In other words, do teachers perceive an SRL teaching approach as easy or difficult? The second was the teacher's personal appraisal of his/her capabilities to achieve the specific teaching task (Tschannen-Moran et al., 1998; Woolfolk Hoy et al., 2006). For instance, do teachers believe they can implement an SRL teaching approach and therefore foster SRL in their classrooms? Woolfolk Hoy et al. (2006) referred to this as the teacher's self-assessment of competence. The outcome of these two interacting elements (perception of difficulty and self-assessment of competence) was the teacher's efficacy, a belief that correlates with a number of teacher and teaching variables.

In a study of 44,701 teachers in 2648 schools in 14 OECD countries, Fackler and Malmberg (2016) reported, "teachers who spend more time on various classroom activities (e.g. structuring, enhancing or student oriented ones), have a higher sense of self-efficacy than those who spent less" (p. 193). They found that highly efficacious teacher make different instructional choices and are more willing to try new instructional strategies. Additionally, teachers with high self-efficacy have also been found to apply greater levels of effort to particular teaching actions and they are more focussed on tasks that will support student learning (Ross, 1998), such as fostering SRL. If teachers do not believe they have the ability to foster SRL in the classroom, then it is highly unlikely that they will even attempt it (Bandura, 1997).

1.3.5 Expectancy beliefs

Among the vast array of beliefs that teachers hold, one of particular importance to the present study is teachers' expectations of students. It is commonly understood that teacher expectations are the "judgments teachers make about the amount of academic progress they believe students will make by the end of a specific time frame" (Rubie-Davies et al., 2012, p. 271). Teachers can hold expectations for how a student might learn a specific subject dependent on their individual ability, gender, prior performance etc. Equally, a teacher might hold expectations, high or low, for how a whole class might progress, dependent on the perceived ability, age, gender etc. (Fives & Buehl, 2016; Woolfolk Hoy et al., 2006).

Studies on this topic date back to the 1960s with the seminal work on the 'Pygmalion effect' by Rosenthal and Jacobson (1968). Rosenthal and Jacobson informed teachers that a group of students (randomly selected) were likely to make considerable cognitive gains given their ability. The authors found that the selected students achieved higher academic achievement in comparison to other students, simply as a result of the teachers' expectations. A number of studies have since reported results that support this claim (e.g. Rubie-Davies et al., 2012; Spruce & Bol, 2015). Some even argue that societal expectancy beliefs (e.g. women lacking innate ability for subjects such as mathematics and science; Fine, 2010) are the reason that there is a gender imbalance in the fields of science, technology, engineering and mathematics (Prinsley, Beavis, & Clifford-Hordacre, 2016).

In terms of teachers' beliefs about the capabilities of students in achieving SRL, Spruce and Bol (2015) reported that elementary and middle school teachers generally held positive beliefs about SRL; however, they found that there was "agreement amongst these teachers that students may not be ready to self-regulate at the middle school level" (p. 258). If teachers do not expect students at this level to be able to self-regulate, then it is unlikely that they will adopt instructional practices (e.g. strategy instruction) that teach students how to self-regulate their learning or provide opportunities for students to engage in SRL (e.g. constructivist learning environments).

Figure 9 is a final theoretical framework that draws together the literature discussed in this chapter. It demonstrates the hierarchy of key constructs related to teachers' knowledge and beliefs about SRL that will be considered in the present study.

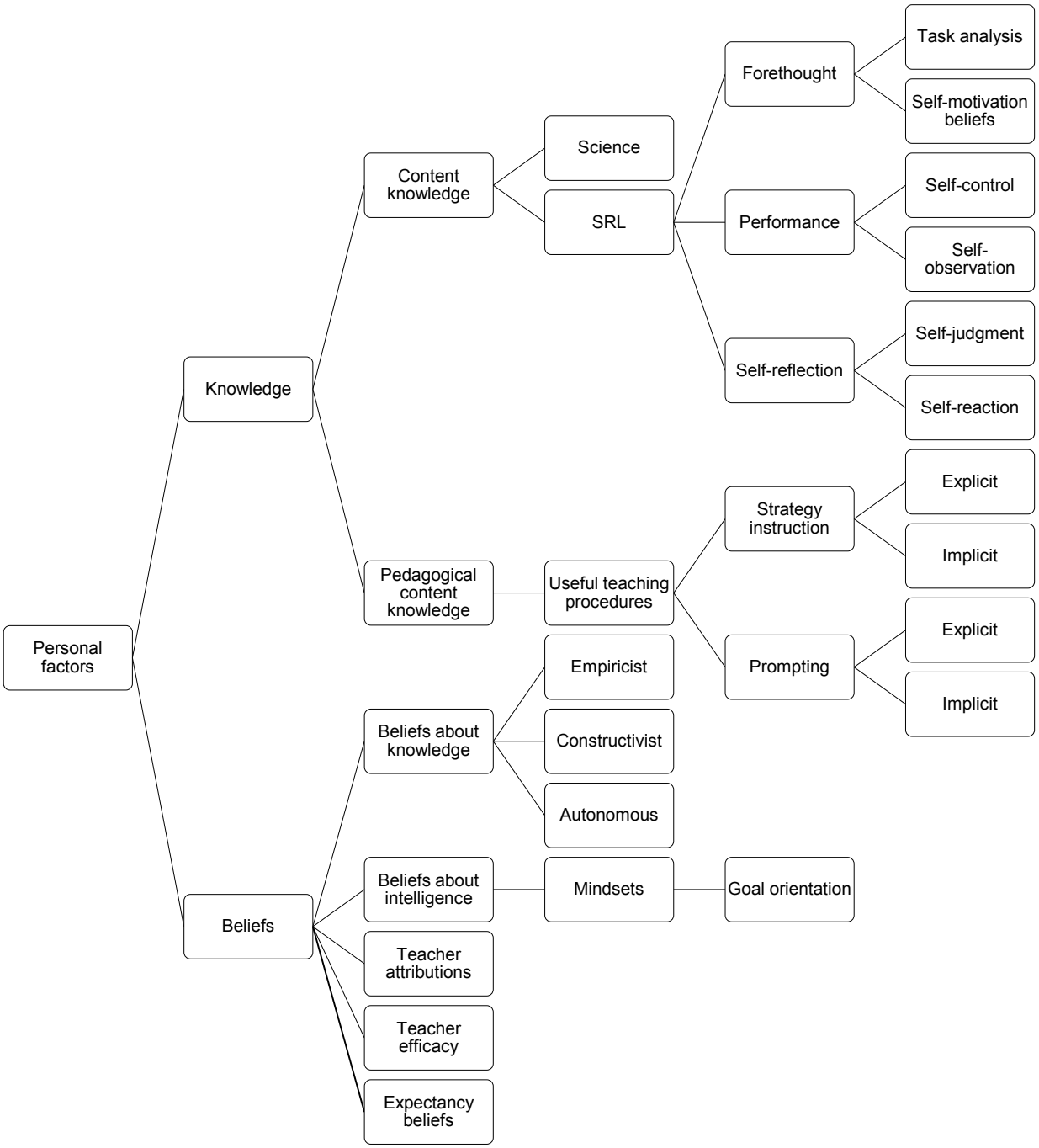

Figure 9: Final theoretical framework, representing a conceptual understanding of the connections between, and hierarchy of knowledge and beliefs about SRL relevant to the present study.

1.3.6 Beliefs and change

Fundamentally, teachers' beliefs are worth investigating given their perceived relationship with and influence on teaching practice, which in turn impacts on student learning outcomes (Kistner et al., 2015; Lee Bae, Hayes, Seitz, O'Connor, & DiStefano, 2016; Pajares, 1992; Rubie-Davies et al., 2012; Sinatra, 2001). However, beliefs are not easy to explore. Most common forms of research methods noted in the literature include self-report measures (e.g. interviews, questionnaires), but this begs the question – is what someone says the same as what they do (e.g. teaching practice)? Argyris and Schon (1974) argued this was not necessarily the case, and proposed the concepts of espoused theories and theories-in-use. Espoused theories are what the teacher believes is the course of action he/she will take. On the other hand, theories-in-use are the beliefs that govern his/her behaviour (Argyris & Schon, 1974) and therefore can only be inferred from a measure of behaviour/action. For example, a teacher may self-report that an SRL teaching approach is valuable and necessary in the classroom (espoused theory); however, a measure of the teacher's behaviour may indicate that the teacher did not actually implement the SRL teaching approach (theory-in-use). On the contrary, Bandura's social cognitive learning theory, particularly reciprocal determinism (Figure 1) suggests a change in personal factors will influence behavioural factors, such as teaching practice.

Beliefs can be extremely difficult to change, particularly beliefs that are implicit and have formed over a significant period of time (Woolfolk Hoy et al., 2006). Through a series of studies, Edwards (1990) suggested that in order to change a belief, one had to know whether the belief was originally formed through affective or cognitive means. If the belief was formed through cognitive means, then it could be changed through cognitive means but was unlikely to be changed in using an affective approach. Others (e.g. Fives & Buehl, 2016) suggest beliefs need to be made explicit for teachers, and time for reflection is crucial if teachers are to shift maladaptive beliefs. One approach that is consistently represented in the literature (e.g. Ross & Bruce, 2007; Yoo, 2016) includes presenting teachers with contradictory evidence, such as new knowledge that illustrates that existing beliefs are unsatisfactory, and can motivate individuals to revise their beliefs (Woolfolk Hoy et al., 2006). A good

example of this is the recent study by Yoo (2016) that considered the change in teacher efficacy (i.e. example of teacher belief) as 148 K-12 teachers and school educators experienced an online professional development program. Utilising the Teacher Self-Efficacy Scale as a pre- and post-measure, Yoo (2016) reported that the online professional development program increased teacher efficacy, and "the descriptive self-analyses of teacher efficacy in this study have shown that gaining new knowledge was generally positively related to teacher efficacy" (p. 91). Other studies (e.g. Blömeke et al., 2014; Ross & Bruce, 2007) in the field of teacher knowledge and beliefs have supported the claim that professional development programs and the presentation of new information can lead to changes in beliefs such as teacher self-efficacy (Desimone, 2011).

1.4 Professional learning communities – a method for change

Today, the development of teacher professional competence (e.g. teacher knowledge and beliefs) is not something static that only occurs during initial teacher education, but is ongoing, as a result of the professional development activities and experiences that occur throughout a teacher's career (Grosemans, Boon, Verclairen, Dochy, & Kyndt, 2015; Santoro et al., 2013). The AITSL professional standards are a good example of this as they are divided into four progressive stages of teacher professional competence (AITSL, 2012).

For many years professional development occurred in silos (Ronfeldt, Farmer, McQueen, & Grissom, 2015), a single day, "espresso shot" of inspiration, knowledge etc., that had very little long-term impact on teaching and learning (Bowe & Gore, 2016; Mockler, 2005). DuFour and Eaker (1998) presented a new model – the professional learning community. A professional learning community was a school that cultivated certain characteristics: (1) shared mission, vision and values, (2) collective inquiry, (3) collaborative teams, (4) action orientation and experimentation, (5) continuous improvement and (6) results orientation. Dufour and Eaker's model existed at the school level; yet, the underlying notion of professional learning communities (i.e. collaborative groups of teachers engaging in professional development) has been researched since the early 1990s (e.g. Barth, 1990). In the past 15 years there has been an increasing body of literature supporting a shift toward ongoing and

extended professional learning communities (Vangrieken et al., 2017) where teachers engage in collaborative and reflective discussions, share ideas, practice and resources, and draw on real-world student examples of work to inform decisions about practice (Lee Bae et al., 2016; Munro, 2011; Vangrieken et al., 2017).

Researchers (e.g. Bowe & Gore, 2016; Desimone, 2011; Desimone & Garet, 2015; Peeters et al., 2014) have built upon the notion of professional learning communities, advocating that teachers require professional development opportunities that also consist of direct instruction, active learning (i.e. opportunities to practice new strategies), collective participation, and "the prerequisite tools to successfully implement the intervention" (Koster, Bouwer, & van den Bergh, 2017, p. 3).

Some authors (e.g. Desimone & Stuckey, 2014; Stodolsky, Dorph, & Feiman-Nemser, 2006) argue that the success of a professional learning community is also dependent on the duration or "dosage", the number of hours/sessions that a teacher is exposed to, and the general time span of the program. Furthermore, in a review of nine studies of professional development programs in elementary schools, Yoon, Duncan, Lee, Scarloss, and Shapley (2007) reported that teachers who received more than 14 hours of professional development showed substantial student achievement gains. However, Piasta et al. (2010) conducted a professional development intervention related to literacy with 85 pre-school teachers and found that an 11 hour in-school professional development program resulted in improved literacy teaching practices.

The effectiveness of professional development is also dependent on its focus (Desimone & Stuckey, 2014). In a review of 12 randomised controlled trials, Desimone and Stuckey (2014) indicated that professional development programs focussed on either content knowledge, pedagogy or teacher decision making. They argued that professional development programs that focussed on content knowledge resulted in very little (and insignificant) improvement in teacher content knowledge. A more effective method to improve teacher knowledge and beliefs is for programs to focus on teaching pedagogy (e.g. Piasta et al., 2010), and be more practice-based (Ball & Forzani, 2009)

whereby teachers are shown instructional techniques (e.g. explicit strategy instruction) or provided with resources (e.g. learning protocols) that can be used within the classroom (Darling-Hammond, 2006; Desimone & Stuckey, 2014; Stodolsky et al., 2006). However, earlier studies (e.g. Stodolsky et al., 2006) suggested that content should be connected with pedagogy, curriculum and resources.

According to Vangrieken et al. (2017) professional learning communities are "a structure for continuous school improvement through the building of teachers' competence for learning and change" (p. 48). Professional learning communities that are well planned and implemented have been shown to have significant and positive effects on instructional practice (Vangrieken et al., 2017). Professional learning communities can enable a shared language to develop amongst teachers, the social construction of both subject matter content knowledge and pedagogical content knowledge and can challenge any maladaptive teacher beliefs (Lee Bae et al., 2016; Yoo, 2016). Such opportunities are vital as the quality of teachers' knowledge and beliefs have a significant effect on the way they perceive new teaching practices and whether such practices will be adopted long-term (Woolfolk Hoy et al., 2006).

Figure 10 is an attempt at allocating key constructs discussed (e.g. knowledge and beliefs) within the model of reciprocal determinism (Bandura, 1997). As Bandura argued there is an interaction and shared influence between the three factors (personal, behavioural and environmental), Figure 10 suggests that by implementing a professional learning community about SRL, this will influence teachers' knowledge and beliefs about SRL and teachers' teaching practice.

1.5 The present study

Improving teachers' knowledge and beliefs about SRL has been shown to be a promising way toward developing teacher competence (Blömeke et al., 2014; Kramarski & Revach, 2009). Increased teacher knowledge about SRL, along with beliefs conducive to fostering SRL in the classroom, means that teachers will be better able to implement teaching methods conducive to SRL (Peeters et al., 2014), subsequently preparing students as self-regulated learners. The current level of knowledge and beliefs

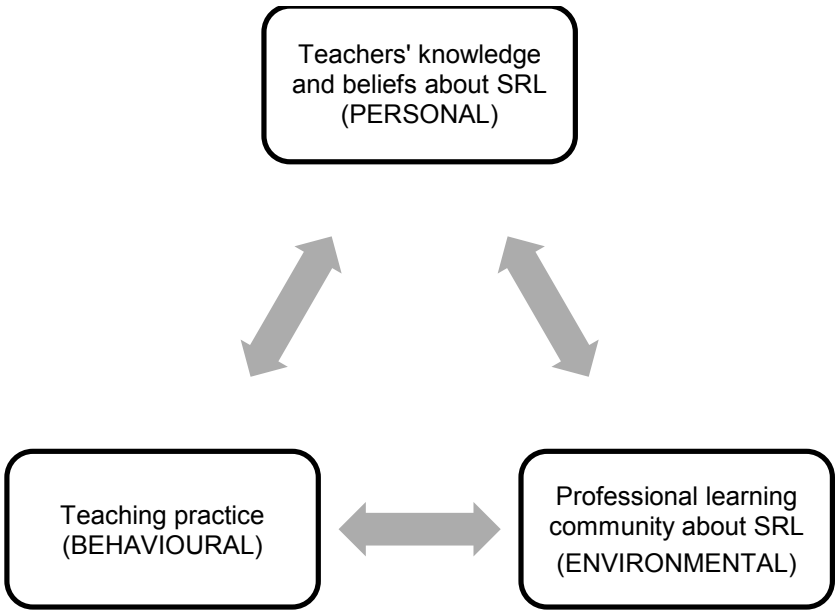

Figure 10: Relationship between a professional learning community, teachers' knowledge and beliefs, and teaching practice.

that teachers' possess about SRL (e.g. N. E. Perry et al., 2008; Spruce & Bol, 2015) creates concern as to whether schools will be able to adequately meet the needs of students and prepare them with the necessary skills to succeed (OECD, 2005, 2016). The present study responds to this concern.

Professional learning communities may be the solution; but, relatively few studies have investigated changes in teachers' knowledge and beliefs about SRL in response to a professional learning community (Dicke et al., 2015). The present study investigated this line of inquiry. Findings will contribute to the debate regarding teacher preparation and professional growth (Rowan et al., 2015). Mayer (2014) argued, the problem that exists is that university research "is often not recognised as relevant or useful by the schools, school systems and governments making policy decisions" (p. 470). The present study endeavored to bridge this gap. Attending closely to how teachers' knowledge and beliefs change as they engage in a professional learning community could also support sustainable implementation of SRL teaching approaches (i.e. teaching strategies) within regular secondary school classrooms (Boekaerts & Corno, 2005; Eilam & Reiter, 2014).

Aim:

The present study set out to explore how a guided professional learning community about SRL changed teachers' knowledge and beliefs about SRL, and teachers' perceptions of an SRL teaching approach. Specifically, it aimed to examine the effect of a professional learning community on:

i. Teachers' content and pedagogical content knowledge about SRL
ii. Teachers' beliefs related to SRL such as beliefs about knowledge (empiricist, constructivist or autonomous), beliefs about intelligence (mindsets, orientations and attributions), expectancy beliefs and teachers' self-efficacy
iii. Teachers' perceptions of the value, ease of implementation and likelihood of using the SRL teaching approach with their own students beyond the professional learning community

Research question (**RQ**):

RQ1. Does a professional learning community about SRL change teachers' content knowledge and pedagogical knowledge about SRL?

RQ2. Does a professional learning community change teachers' beliefs about knowledge, beliefs about intelligence, teachers' self-efficacy and expectancy beliefs?

RQ3. What are the participants' perceptions of the value, ease of implementation and likelihood of using the SRL teaching approach with their own students beyond the intervention?

The specific hypotheses (H) were:

H1. Teachers will demonstrate increased content and pedagogical content knowledge about SRL

H2. Teachers' will reflect greater constructivist beliefs about knowledge, make statements consistent with growth mindsets and mastery orientations, make functional attributions, report higher teacher self-efficacy and hold higher expectancy beliefs of their students.

H3. Teachers will report that the SRL teaching approach was valuable, easy to implement and likely to be adopted beyond the professional learning community.

Independent variable:

Engagement in a professional learning community about SRL

Dependent variables:

Teachers' knowledge and beliefs about SRL

2. METHOD

2.1 Sampling procedures

2.1.1 Setting

Participants were drawn from an Independent Girls Grammar School in the Melbourne metropolitan area. With the school changing its Year 9 program in 2017 to incorporate more opportunities for student independence, choice and self-management, the school expressed interest in participating in this research study as part of a commitment to ensuring that Year 8 students had the greatest chance of developing SRL skills prior to commencement of Year 9.

The school was chosen based on convenience (access and availability to me as a currently employed consultant and previous staff member of the school), my prior knowledge of the school, and an already existing positive relationship between the school community and myself. In this school, Year 8 is the final year of the Middle Years Program and students are expected to have adequate skills for SRL prior to starting in the Senior Years Program (Years 9-12). Due to the school's overarching interest in fostering SRL, all Year 8 science teachers participated and had their respective 6 classes involved in this research study. As I am also a qualified science teacher, I understand science teaching and as such I have focussed on the science department.

2.1.2 Recruitment procedure

Using a direct recruitment approach, I attended a Year 8 science teachers' team meeting in their regular meeting room at the school. At the end of the meeting agenda, face-to-face, I read the verbal script (Appendix A) to the four teachers and invited their participation. Each teacher was then provided with a letter of introduction (Appendix B), information sheet (Appendix C) and consent form (Appendix D). These documents outlined that participation was voluntary, that participants were able to withdraw from the study at any point without consequence, how data would be collected, what would happen to data collected, who would be given access to data and the level of confidentiality and anonymity that they could expect. All teachers were able to consider the information provided and speak with their families and/or friends prior to making a decision about participation. I emphasised that if they chose

not to have their data reported, they would still be able to engage in the professional development sessions about SRL. If they chose not to participate, their comments would not be collected or reported on.

Interviews and professional development sessions occurred in the regular science teachers' meeting room. This meeting room was considered a comfortable and familiar space. Participants implemented the SRL teaching approach with their classes in their regular science classrooms.

2.1.3 Ethics

Ethics approval was received from the Flinders University Social and Behavioural Research Ethics Committee (Project number: 7333; Appendix E) prior to the study commencing. Additionally, written approval for this research was also obtained from a delegate of the Principal of the school (see permission request email at Appendix F).

As a method of de-identification, participants have been listed under pseudonyms, and some participant demographic information has been omitted or reported as ranges. Any school-specific terms that would compromise the identity of the school have also been replaced with more generic school terms (e.g. homeroom).

There was no conflict of interest between supervisor, participants and myself. I am an independent education consultant currently working with the school and I have previously worked as a staff member at the school. However, my role is primarily providing professional education programs and supporting teachers with their instructional practice. The school has a professional development structure (including research involvement) that advocates individual teacher choice. All participants were informed of the research goals and procedures (as per Appendix A, B, C and D) prior to receiving an invitation to participate.

2.2 Research design

2.2.1 Overview

The study adopted a pre-post intervention research design as outlined below:

Phase 1: Before the implementation of a professional learning community

1. Each teacher participated in an in-depth individual interview with me (refer Appendix G).

Phase 2: Implementation of a professional learning community

2. Participants met with me on six occasions of approximately 40 minutes each. During each session, participants received professional development about the SRL teaching approach, and engaged in a reflective and collaborative process with me to improve the SRL teaching approach and to develop lesson plans for classroom implementation.

3. Participants used the lesson plans to guide instruction and implemented the SRL teaching approach in their respective Year 8 science classes, indicating on the lesson plan which steps were undertaken. I was not involved in the class lesson component.

4. Participants returned lesson plans to me.

Note: Steps **2-4** were repeated for each of the six sessions (over 12 weeks), with participants progressively refining and improving their SRL teaching approaches and lesson plans each time.

Phase 3: After the implementation of a professional learning community

5. Each teacher participated in an in-depth individual interview with me (refer Appendix G).

2.2.2 Methods used to collect data

Interviews

A semi-structured interview approach (refer Appendix G) was selected as a method to capture teachers' knowledge and beliefs about SRL before and after the intervention. All interview items were

adapted from interview items under development as part of a research project led by Emeritus Professor M. Lawson of Flinders University, and used with permission. In addition, some interview items were modifications of questions utilized in previous studies in the field of SRL (e.g. Dignath-van Ewijk & van der Werf, 2012; Lonka, Joram, & Bryson, 1996; Pressley et al., 1992). Similar to Lonka et al. (1996) “the questions were quite general in nature, with the intention of not leading the subjects toward an ‘acceptable’ answer” (p. 245).

A probing technique was used to allow participants to elaborate on their responses. The probing protocol resembled a similar strategy adopted by Van Meter, Yokoi, and Pressley (1994), whereby individuals were encouraged to elaborate on their responses. Drawing on the participants’ responses, I provided follow up questions or statements (e.g. tell me more about that or what makes you say that?) until it was clear that the participant had exhausted their response.

Each individual interview involved a single teacher participant and me. The interviews lasted approximately 45 minutes (Pre-intervention interview mean: 45.08 minutes; Post-intervention interview mean: 44.95 minutes; Mean: 45.01 minutes) and were audio recorded using a Zoom H4n Handy Recorder. Audio files were transferred from the Zoom H4n Handy Recorder to an Apple MacBook Air (2014), using an SD memory card. Once uploaded, audio files were opened with Apple GarageBand (Version 10.1.3) and the tempo of the audio files was slowed from 120 beats per minute to 55 beats per minute. While listening to the audio files, I transcribed the audio recordings into Microsoft Word for Mac 2011 (Version 14.6.9), pausing and repeatedly listening where need be.

In addition to audio recording of interviews, as a method to ensure accuracy in my understanding of the participants’ responses, I paraphrased and used member checking (Gamage, Tretiakov, & Crump, 2011). Paraphrasing is defined as the researcher “continuously reflecting to a participant what he believed the participant had said thus providing opportunities for the interviewees to correct any interviewer misperceptions” (Van Meter et al., 1994, p. 325). Following the interview, I checked each transcription against the audio recording to ensure accuracy. For member

checking, participants were provided the opportunity to review and verify their own transcriptions, make comments, and clarify any potential points of misunderstanding to ensure accuracy in my understanding (Creswell, 2012). Approximately 8 weeks after recording of pre-intervention interviews, I emailed the participants, indicating that I had completed the pre-interview transcriptions and provided participants with an opportunity for member checking (Appendix H). About 3 weeks after recording of post-intervention interviews, I provided the same opportunity for the post-interview transcripts (Appendix H). As per the Gamage et al. (2011) study, participants' comments were planned to be used as an additional form of data. No participant accepted the invitation to review her transcription, resulting in no additional data being collected during this step of the research process.

Furthermore, to standardize data collection across the pre- and post- time points, interview questions followed a consistent order. I endeavoured to start first and foremost by reading the question as it is listed in Appendix G. However, at times, I changed the language of the question slightly so that the interview process flowed more naturally. Then, depending on need, I repeated or rephrased the question, or utilised the probing technique to elicit further information; however, this probing was solely in response to the participants' answers. Deviation from the set questions was allowed as long as I felt I was still drawing out information related to the teachers' knowledge and beliefs about SRL. This varied for each individual interview.

Lesson plans

Lesson plans were constructed during each professional development session in collaboration between the participants and myself. Lesson plans incorporated three elements: (1) setting an appropriate learning objective, (2) explicit instruction related to content covered in the professional development sessions, and (3) the implementation procedure of the SRL learning protocol (discussed later in this chapter). Following each professional development session, each lesson plan was typed as a lesson plan checklist (refer Appendix K), printed and placed in each of the participant's pigeonholes. Lesson plan checklists served two purposes, first as a tool for use during lessons, and second, as a source of data about participants' teaching actions.

2.3 Intervention: Professional learning community

Drawing on the literature about professional learning communities reviewed in Chapter 1, I planned six professional development sessions about SRL (refer Table 1), that incorporated prompts for teacher reflection, direct instruction and collaborative discussion about implementation of the SRL teaching approach. Session outlines are attached as Appendix J.

Table 1: Overview of professional development sessions

Session	Topic	Brief description of each session	Supporting theory
1	An overview of SRL	This session introduced participants to a process model of SRL, highlighting the role of metacognition and introducing the SRL learning protocol.	SRL (Klug et al., 2011; Zimmerman, 2002, 2013)
2	Forethought phase: Self-efficacy	This session unpacked the notion of self-efficacy and introduced participants to evidence based strategies that enhance self-efficacy in the classroom	Self efficacy (Bandura, 1997; Fackler & Malmberg, 2016; Klassen & Tze, 2014; Tschannen-Moran et al., 1998; Woolfolk Hoy et al., 2006)
3	Forethought phase: Mindsets and orientation	This session considered the difference between fixed and growth mindsets, and performance and mastery orientations	Mindsets and orientations (Ames, 1992; Butler, 2007; Dweck & Leggett, 1988; Kaplan & Maehr, 2007)
4	Forethought phase: Goal orientation and goal setting	This session explored the importance of goal setting and the links between effective goal setting and student achievement.	Goal orientation (Ames, 1992; Butler, 2007; Dweck & Leggett, 1988; Kaplan & Maehr, 2007)
5	Forethought phase: Strategic planning Performance phase: Task strategies	This session focussed on the concept of "strategies" for learning, including implicit and explicit strategy instruction.	Strategy instruction (Festas et al., 2015; González-Pienda et al., 2014; Kiewra, 2002; Kistner et al., 2015)
6	Self-reflection phase: Attributions	This session looked at attribution theory and how the attributions a learner makes influences his/her future learning approach.	Attributions (Patterson et al., 2016; Weiner, 1985; Wieman & Welsh, 2016)

SRL learning protocol

Additionally, an SRL learning protocol (refer Appendix I) was developed using Zimmerman's (2002) triadic model of SRL as its theoretical framework (the components of the protocol are described in Table 2). The paper-based, written protocol was designed to prompt students to engage directly with

the SRL process as per Zimmerman's triadic model while running parallel to any normal classroom learning activity. The SRL learning protocol was constructed as a single page, three-section student worksheet with classroom implementation at the forefront of the author's mind. As such, the SRL learning protocol did not include prompts for all elements of each phase of the triadic model of SRL by Zimmerman (2002).

Table 2: Overview of the components of the SRL learning protocol

Phase of SRL	Elements of each phase as listed by Zimmerman (2002)	Examples of SRL learning protocol prompts
Forethought phase ("Before the task")	**Task analysis** (Goal setting and Strategic planning)	What do I want to achieve? What strategies do I plan to use?
	Self-Motivation Beliefs (Self-efficacy, outcome expectations, intrinsic interest/value, learning goal orientation)	My self-efficacy for this task is… My interest level for this topic is… I am focused on… (Explain)
Performance phase ("During the task")	**Self-Control** (Imagery, Self-instruction, Attention focusing, task strategies)	Are my chosen strategies working? Explain. Am I managing my time and distractions?
	Self-observation (Self-recording and Self-experimentation)	During the task, I am… Today I kept persisting, even when I found elements of the task difficult (Yes/No)
Self-reflection phase ("After the task")	**Self-judgement** (Self-evaluation and Causal attribution)	How did I go? What was the reason for my success OR lack of success?
	Self-Reaction (Self-satisfaction/affect, Adaptive/defensive)	How do I feel following this outcome? What can I do next time?

The SRL learning protocol consisted of three sections: before the task (forethought), during the task (performance) and after the task (self-reflection). The 'before the task' section was designed to be completed at the beginning of a task (e.g. after the student understands the task requirements, has analysed the task etc.), the 'during the task' section was designed to be completed mid-way throughout the task and required the teacher to stop the class and direct completion, while the 'after the task' section was designed to be filled out following task completion. The SRL learning protocol was primarily used as a tool for use during lessons; however, teachers were also prompted to refer to

completed SRL learning protocols during the professional development sessions as a method to reflect on the impact and value of the SRL teaching approach.

2.4 Data analysis

2.4.1 Qualitative analysis of interview data: Coding procedure

In the first coding cycle, interview transcripts were coded as they were collected (not waiting until all data was collected) in order to immerse myself in the data and its interpretations (Saldaña, 2016). Drawing on the theoretical framework (Figure 7), a set of starting themes were generated (refer Table 3), allowing a form of deductive coding (Miles, Huberman, & Saldaña, 2014) to take place. All transcripts were read through as a whole, along with listening to the audio recording for any nuances related to meaning, and any first impressions and pertinent annotations were marked. Afterwards, one transcript was read individually and carefully, allocating words, phrases or whole paragraphs to the categories derived from the theoretical framework.

At times, segments of interest did not fit within the theoretical framework and an inductive coding method (Creswell, 2012) was applied. Words, phrases or paragraphs that did not fit within the pre-determined themes were labeled by an alternative code that captured its meaning. Then, codes were either deleted if irrelevant, merged where possible, or left as individual categories. A preliminary index of codes was produced and applied to another transcription to assess viability of codes and a final index was established (refer Table 3). Using the final index, each individual transcript was read carefully, and codes were assigned to necessary segments.

To ensure coding accuracy, approximately ten days after completion of the first coding cycle, I carefully re-read and coded each transcript for a second time. NVivo for Mac (Version 11.3.2) software was utilized throughout both coding cycles.

Table 3: Index of Codes

Set of starting themes generated from theoretical framework	Preliminary Index	Final Index

• Content knowledge
  o Forethought
  o Performance
  o Self-reflection
• Pedagogical content knowledge
  o Implicit strategy instruction
  o Implicit prompting
  o Explicit strategy instruction
  o Explicit prompting
• Beliefs about knowledge
  o Empiricist
  o Constructivist
  o Autonomous
• Beliefs about intelligence
  o Mindset
  o Orientations
• Teacher attributions
• Teacher efficacy
• Expectancy beliefs
	• Content knowledge
	  o Forethought
	  o Performance
	  o Self-reflection
	• Pedagogical content knowledge
	  o Implicit strategy instruction
	  o Implicit prompting
	  o Explicit strategy instruction
	  o Explicit prompting
	• Beliefs about knowledge
	  o Empiricist
	  o Constructivist
	  o Autonomous
	• Beliefs about intelligence
	  o Mindset
	  o Orientations
	• Teacher attributions
	• Teacher efficacy
	• Expectancy beliefs
	
	Additional themes/codes;
	• Knowledge misconceptions about SRL
	• Perceptions about where and when SRL should be taught
	• Challenges associated with implementing an SRL teaching approach
		• Content knowledge
		  o Forethought
		  o Performance
		  o Self-reflection
		• Pedagogical content knowledge
		  o Implicit strategy instruction
		  o Implicit prompting
		  o Explicit strategy instruction
		  o Explicit prompting
		• Beliefs about knowledge
		  o Empiricist
		  o Constructivist
		  o Autonomous
		• Beliefs about intelligence
		  o Mindset
		  o Orientations
		• Teacher attributions
		• Teacher efficacy
		• Expectancy beliefs
		
		Additional themes added
		• Knowledge misconceptions about SRL
		• Perceptions about where and when SRL should be taught
		• Challenges associated with implementing an SRL teaching approach
		
		Theme following intervention:
		• Evaluation of the impact of the SRL teaching approach

Intra-rater reliability

Approximately six weeks after completion of the second coding cycle, I removed all participants' names from the interview transcripts, separated all the interviews into three page piles, and shuffled the piles upside down (i.e. blind shuffle). While the piles were upside down, I selected one pile and

recoded the selected three pages. Cohen's Kappa was conducted to ascertain if there was intra-rater agreement between two attempts at coding. There was good agreement between the two rating events, κ = .718, 95% CI [.493 to .943], *p< .001.*

Inter-rater reliability

Inter rater reliability was also calculated. A professional colleague with an educational background in SRL was invited to code three pages of a pre-intervention interview transcript and three pages of a post-intervention interview transcript. To minimise coding bias, the professional colleague was not informed which interview segment was pre- or post- intervention. I met with my professional colleague and trained her in the theoretical framework and approach to coding. I provided a definition of each theme and 2-3 examples of text segments that were coded to each category. Cohen's Kappa was conducted to ascertain if there was agreement between the two raters. There was moderate agreement between the two raters, κ = .573, 95% CI [.438 to .708], *p< .001.*

Agreement for intra and inter-rater reliability was assessed using parameters by Landis and Koch (1977; refer Table 4).

Table 4: Kappa values and strength of agreement as per Landis and Koch (1977)

Kappa value	Strength of agreement
< 0.20	Poor
0.21-0.40	Fair
0.41-0.60	Moderate
0.61-0.80	Good
0.81-1.00	Very good

McHugh (2012) suggested that the above guidelines allow for researchers to argue that agreement takes place without acknowledging the erroneous margin, with a number of texts recommending "80% agreement as the minimum acceptable inter-rater agreement" (p. 278). Although McHugh's suggestion may be suitable for larger scale studies conducted over a long period of time, the present study was

conducted over a very short period of time with a complex theoretical framework; therefore, moderate agreement level (as per Landis and Koch, 1977) was considered acceptable.

2.4.2 Quantitative analysis of lesson plan checklists

Participants' lesson plan checklists were used to evaluate participants' SRL teaching actions in their classrooms and also to measure dosage of the SRL teaching strategies (discussed in next chapter). Each lesson plan was scored for teacher actions (i.e. set an appropriate SRL learning objective, explicit teaching of SRL concept or strategy, and implementation of the SRL learning protocol). The scoring system was a range of 0 to 1 (0 = no action, 0.5 = partially completed, 1 = fully completed action).

2.4.3 Unit of analysis

In the current study, the first level of analysis is at the individual teacher level. The second level of analysis is at the professional learning community level (all four teachers as a group).

3. RESULTS

3.1 Participant demographics

Participant demographic information is recorded in Table 5. Participants were all VIT qualified, female secondary school science teachers of Years 5-12. However, participants varied in age, number of years of teaching experience, qualifications and prior professional development in SRL

Table 5: Participants' demographic information.

Teacher	Gender	Age range	Victorian Institute of Teaching (VIT) licence	Year levels taught or currently teaching	Number of years teacher experience	Highest qualification	Prior professional development in the field of SRL (or similar) or background in psychology
Abby	Female	20-30	Yes	5-12	1-5	Post graduate teaching qualification	Yes
Sarah	Female	30-40	Yes	5-12	6-10	Bachelor of Teaching	No
Isabella	Female	40-50	Yes	5-12	>10	Post graduate teaching qualification	Yes
Lisa	Female	40-50	Yes	5-12	>10	Master of Education	No

3.2 Intervention dosage

All participants attended the six professional development sessions (total of 4 hours) comprising the experimental intervention in this study. Dosage of the teaching actions implemented with participants' classes is recorded in Table 6. From Table 6, it can be seen that three of the four participants completed equal to or more than 83% of the planned SRL teaching actions documented on their lesson plan checklists, with only one participant (i.e. Sarah) completing approximately 42% of the planned SRL teaching actions. It was noted that Weeks 11 and 12 of the professional learning community coincided with report writing time for the teachers and may explain why teachers did not implement the SRL learning protocol in the final two weeks of the intervention.

Table 6: Tally of completed SRL teaching actions, as self-reported by participants in their lesson plan checklists.

Week	1 & 2			3 & 4			5 & 6			7 & 8			9 & 10			11 & 12				
Element of SRL teaching approach	Learning objective	Explicit teaching	SRL Learning Protocol	Learning objective	Explicit teaching	SRL Learning Protocol	Learning objective	Explicit teaching	SRL Learning Protocol	Learning objective	Explicit teaching	SRL Learning Protocol	Learning objective	Explicit teaching	SRL Learning Protocol	Learning objective	Explicit teaching	SRL Learning Protocol	Total: /18	Percentage
Abby	1	1	1	1	1	0.5	1	1	1	1	1	1	1	1	1	1	1	0	**16.5**	**92%**
Sarah	0	1	0.5	1	0	1	0	0	1	1	1	0	0	0	0	0	1	0	**7.5**	**42%**
Isabella	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	0	**15**	**83%**
Lisa	1	1	0.5	1	1	0.5	1	1	1	1	1	1	1	1	1	1	1	0	**16**	**89%**

3.3 Teacher knowledge

My first research question was to address whether there were any changes in teachers' content knowledge and pedagogical content knowledge following the professional learning community SRL experimental intervention.

3.3.1 Teachers' content knowledge about SRL

Text segments in the interview transcripts that indicated participants' SRL content knowledge were categorised into six groups as per Zimmerman's (2002) triadic model of SRL (e.g. forethought – task analysis, performance – self control, see index of codes in Table 3). Examples of text segments that were coded to each category are in Table 7 and show that at the post-intervention stage all participants demonstrated higher levels of content knowledge about SRL.

In order to assess the changes in SRL content knowledge between pre- and post- intervention interviews, text segments were tallied and recorded in Table 8, which shows that participants made the greatest gain in content knowledge within the forethought phase (both task analysis and self-motivation beliefs). There were substantially fewer text segments coded to both the performance phase (self-observation) and self-reflection phase (self-judgement). No text segments were coded to self-reaction at either time points. For each participant, change scores for all SRL content knowledge categories were totalled to determine the overall impact of the professional learning community intervention. Abby, Isabella and Lisa showed an overall increase in SRL content knowledge coded text segments, while Sarah showed an overall decrease in SRL content knowledge coded text segments.

3.3.2 Teachers' pedagogical content knowledge about SRL

Participants' SRL pedagogical content knowledge text segments were categorised into four categories (implicit strategy instruction, implicit prompting, explicit strategy instruction, and explicit prompting) drawn from research related to strategy instruction (e.g. Kistner et al., 2015; refer Table 9). As shown in Table 9, following the intervention, participants' statements moved from implicit methods to explicit

Table 7: Examples of participants' SRL content knowledge text segments for pre- and post- intervention time points.

SRL content knowledge category	Examples of pre-intervention text segments (**Name of participant**)	Examples of post-intervention text segments (**Name of participant**)
Forethought: Task analysis	"ability to recognise what their goals are" (**Isabella**) "Having goals so knowing what it is that they are working towards" (**Sarah**)	"step two is to know your strategies" (**Isabella**) "what is your outcome… what are your strategies" (**Lisa**) "setting real goals" (**Sarah**) "setting their goals" (**Abby**)
Forethought: Self-motivation beliefs	Nil coded	"at the beginning self-efficacy, how do you feel now, how do you feel at the end" (**Isabella**) "motivation, self-efficacy, growth mindset…" (**Abby**) "I think they are a bit sick of hearing about the fixed vs. growth mindset, but you know, just trying to encourage them to have that growth mindset" (**Lisa**)
Performance: Self control	"I like the bit about self-regulating their behaviours, because when I talk to them, a lot of them talk about the fact that they get distracted easily, or they get off task" (**Isabella**)	Nil coded
Performance: Self-observation	"and that they're monitoring… how effective they're being in their strategies I guess, whether they're wasting time, whether they're… asking questions to make sure they're on track" (**Isabella**) "being able to identify their needs, being able to source whatever it is that they need to address those needs" (**Sarah**) "awareness of the strategies they use whilst they are doing a task" (**Abby**)	"managing the strategies that they are using throughout whatever it is" (**Abby**) "adjusting your strategies" (**Sarah**) "during a task reflecting on whether those, um, those strategies are working" (**Lisa**) "students aware of themselves as a learner" (**Isabella**)
Self-reflection: Self-judgement	"another key feature of self regulation is that ability to adapt and evolve things yourself… it's that whole reflection and implementation cycle" (**Sarah**)	"and then the evaluation of those strategies feeding it back in" (**Abby**) "did I achieve my learning goal" (**Sarah**) "step three is to evaluate it" (**Isabella**) "reflecting on how they feel afterwards" (**Lisa**)
Self-reflection: Self-reaction	Nil coded	Nil coded

Table 8: Tally of participants' content knowledge text segments for pre- and post- intervention time points.

	Forethought						Performance						Self- reflection						Total change score
	Task analysis			Self-motivation beliefs			Self-control			Self-observation			Self-judgment			Self-reaction			
	Pre-	Post-	Change	Pre-	Post-	Change	Pre-	Post-	Change	Pre-	Post-	Change	Pre-	Post-	Change	Pre-	Post-	Change	
Abby	0	2	+2	0	3	+3	0	0	0	4	2	-2	0	4	+4	0	0	0	+7
Sarah	1	2	+1	0	0	0	0	0	0	8	2	-6	1	2	+1	0	0	0	-4
Isabella	1	17	+16	0	8	+8	0	1	+1	2	2	0	0	3	-3	0	0	0	+22
Lisa	0	5	+5	0	5	+5	0	0	0	0	2	+2	0	1	-1	0	0	0	+11
Total	2	26	+24	0	16	+16	0	1	+1	14	8	-6	1	10	-9	0	0	0	+26

Table 9: Examples of participants' SRL pedagogical content knowledge text segments for pre- and post- intervention time points.

SRL pedagogical content knowledge category	Examples of pre-intervention text segments (**Name of participant**)	Examples of post-intervention text segments (**Name of participant**)
Implicit strategy instruction	"I will explain my thinking process in order to help them" (**Lisa**) "it will be vague modelling, it won't be explicit" (**Abby**)	"get it from implied teaching or from modelling the practice" (**Sarah**)
Implicit prompting	"I wouldn't take the time to explicitly teach it…I would just mention it" (**Lisa**) "constantly reinforce, ask me when you need help" (**Sarah**) "I'll stop them every now and then and say 'where are we up to?" (**Isabella**)	"kind of slight prodding" (**Abby**)
Explicit strategy instruction	"around revision and upcoming assessments, it would be more explicit" (**Abby**)	"you need to originally teach those explicit strategies and to teach the process and then to apply it" (**Abby**) "a good strategy would be to watch this video twice" (**Isabella**) "teach kids to note take, if you can teach kids to use the… um… solutions to expand upon there own answers, if you can teach them to use questions under test conditions to test how they are doing" (**Isabella**) "setting real goals" (**Sarah**) "I do try to foster the girls taking home their booklets, reading through it, doing summaries" (**Lisa**)
Explicit prompting	"more ad-hoc, and depending on how particular students are doing, as to whether I have to remind certain students. Ok so you think you have done this task, but have you thought about this. Or you haven't used this strategy here" (**Abby**)	"whether it's something like the worksheets (SRL Learning Protocol) that we were doing, where they just fill it in to sort of guide them through the thought process" (**Sarah**) "it's not a test, so what's the first thing you are going to do" (i.e. questioning) (**Isabella**) "what do you think you should do first? Make some decision about what you are learning. Which ones are you going to do? Read and take notes first" (**Isabella**) "explicitly reminding them, of… you know, how to use the strategies and using the pro-forma (SRL Learning Protocol)" (**Abby**) "that you are always coming back to you know what is your outcome, what are your strategies, how are you feeling about this task" (**Lisa**)

methods, with large increases in both explicit-strategy instruction and explicit-prompting categories post-intervention. At the same time, a decrease in implicit-strategy instruction and implicit-prompting was noted. At the individual level, all participants followed this pattern of showing a shift toward explicit methods. Isabella stood out as an individual who particularly shifted her language to accommodate explicit teaching and prompting of strategies.

Table 10: Number of pedagogical content knowledge text segments per participant for pre- and post-intervention time points.

	Implicit –strategy instruction			Implicit –prompting			Explicit – strategy instruction			Explicit - prompting		
	Pre-	Post-	Change	Pre-	Post-	Change	Pre-	Post-	Change	Pre-	Post-	Change
Abby	8	0	-8	5	3	-2	1	5	+4	0	2	+2
Sarah	0	1	-1	2	0	-2	0	4	+4	0	3	+3
Isabella	0	0	0	1	1	0	0	6	+6	0	18	+18
Lisa	3	1	-2	0	0	0	0	3	+3	0	4	+4
Total	11	2	-9	8	4	-4	1	18	+17	0	27	+27

Due to the small sample size and the unlikely nature of generating a normal data distribution, a non-parametric Wilcoxon Signed-Ranks Test was calculated on participants' combined content knowledge and pedagogical content knowledge scores, indicating that post-intervention knowledge scores (*Median* = 21) were higher than pre-intervention knowledge scores (*Median* = 11). Although this result was not statistically significant, $z = -1.841$, $p = .066$, it showed a large effect size of $r = -.65$.

Effect size was assessed in accordance with Cohen (1992) criteria; .1 for a small effect, .3 for a medium effect and .5 for a large effect. The *p* value was not statistically significant as a result of the small sample size.

3.3.3 Changing misconceptions about SRL

In addition to assessing the quantity of SRL content and pedagogical content knowledge, I reviewed the transcripts of evidence of changes in the quality of participants' knowledge. Text segments that appeared to indicate misconceptions about SRL content knowledge (i.e. different from Zimmerman's triadic model of SRL) or SRL pedagogical content knowledge (i.e. different from strategy instruction or prompting) were coded to the category of "knowledge misconceptions about SRL". Only two participants recorded text segments of this type.

Firstly, in the pre-intervention interview, Abby queried whether SRL was a sub category of cognitive strategies that is specifically dedicated to learning strategies. In her opinion, Abby indicated that "cognitive strategies are the wider umbrella and then within that, specifically, in tasks, in lessons, they would be SRL strategies". Following the intervention, Abby indicated "my understanding of SRL was just about cognitive strategies, whereas now I have a greater understanding that actually it's more than just cognitive strategies, it's all about motivation and self-efficacy and mindset and everything else in between". In other words, Abby originally considered SRL strategies to sit beneath a cognitive strategies umbrella. Post-intervention, text segments indicated that Abby changed her conceptual understanding, viewing cognitive strategies within the umbrella of SRL strategies.

Secondly, in the pre-intervention interview, Sarah focussed a large number of statements on the importance of students having an online resource they could go to. For example, she stated "the first thing is you have to have a framework (e.g. online student learning portal) you can actually introduce them to, otherwise if that's not there, it's just chaos", "you have to have a framework (i.e. online resource) there in the first place", "all manner of different resources that will help them to guide their own learning" or "they know that they can go to (the student portal).. and find a practice assessment with solutions that they can complete and then correct themselves to gauge their progress". This was not a focus for Sarah in the post-intervention interview, indicating that Sarah had shifted her conceptual understanding away from that of an online framework.

3.4 Teacher beliefs

My second research question was to address whether there were any changes in teachers' beliefs about knowledge, beliefs about intelligence, teacher attributions, teacher efficacy and expectancy beliefs following the professional learning community intervention.

3.4.1 Beliefs about knowledge

Text segments related to beliefs about knowledge were categorised under categories titled empiricist, constructivist and autonomous drawn from the range of research considered in Chapter 1 (e.g. Johnson, 2010; Khaled et al., 2016; Olafson & Schraw, 2006; refer Table 11). There was some variance among teachers in terms of their beliefs about knowledge related to SRL. Generally, it seemed that teachers held constructivist beliefs; however, beliefs about the role of the teacher within a constructivist-learning environment were different for each participant. Initially, most teachers focussed on creating opportunities for independent learning as opposed to utilising strategy instruction to foster SRL. For example, Abby and Sarah advocated the role of the teacher was to create opportunities for students to be independent as opposed to teaching students how to self-regulate their own learning within an independent learning environment, and SRL was thought to develop naturally through the process of independent learning and experience. On the other hand, Lisa's statements were predominantly representative of autonomous beliefs pre-intervention, with the teacher's role being mainly to direct the activities at the beginning of the lesson.

Isabella, Sarah and Lisa also reported that as science teachers, the focus is often on teaching science content as opposed to fostering SRL. Particularly Isabella and Lisa referred to their own teacher training, explaining that when they were trained as teachers, there was a large focus on teacher control and transmission of science information from teacher to student.

In post-intervention interviews, all teachers indicated a belief that the teachers' role was important in fostering SRL, particularly with a focus on strategy instruction. Quantitative analysis of

Table 11: Examples of participants' beliefs about knowledge text segments for pre- and post- intervention time points.

Beliefs about knowledge category	Examples of pre-intervention text segments (**Name of participant**)	Examples of post-intervention text segments (**Name of participant**)
Empiricist (Teacher controlled, primarily focussed on teaching typical subject matter, little focus on development of SRL)	"the vast majority of my time is spent on teaching science in the traditional sense. No scratch that, I don't mean in the traditional sense, but teaching my subject content" (**Sarah**) "even when I was at teachers college it is about what are you doing to be in control of that class" (**Isabella**) "I think as teachers we are trained to be the leader" (**Isabella**) "I must admit I am struggling with it (fostering SRL), I just want to jump in and spoon feed them with my notes, but that's not going to set them up for next year" (**Lisa**) "the older you are and the more experienced, you were trained in the late 80s early 90s and it was teacher directed learning… Where as this philosophy is more about facilitating the girls to do the learning, and you are just the support" (**Lisa**)	"We get into the habit, particularly science teachers, of teaching content" (**Isabella**) "you know in year 12 a lot of my classes are… teacher focussed" (**Lisa**)
Constructivist (Teacher supports the development of SRL skills and provides scaffolded opportunities for SRL, including strategy instruction)	"we have been focussing a lot this term on being independent and working at their own paces" (**Abby**) "you really have to know your students and how each student is doing all the time with that task and with that freedom" (**Abby**) "so you are facilitating" (**Abby**) "I've tried to get them to work more collaboratively and also, at the same time, also more independently" (**Isabella**) "they like being able to learn at their own pace and do things in their own order and also the fact that then they could ask me questions when they came to it, rather than having to wait or waiting for me to direct the question, they could actually ask those questions" (**Isabella**) "I'm organised so that I can say to them you need to do umm, a, b, c and d, you can do them in any order, or you can do A first, then B" (**Isabella**) "You know, so I'm getting them to not just sit patiently chatting quietly to the person next to them while they wait for the sage on the stage" (**Isabella**)	"you need to originally teach those explicit strategies and to teach that process and then to apply it" (**Abby**) "by us explicitly teaching it (SRL strategies)" (**Abby**) "a simple experience that they could have within the space of a class or two that would just let them feel the difference of SRL so that they could feel the value of it for themselves, and then what we we're doing would make so much more sense to them" (**Sarah**) "you've used worksheets, you've explicitly taught concepts and you've provided them, from my understanding, experience opportunities for them to regulate their own learning to some degree" (**Sarah**) "It gives them ownership I think of their learning processes" (**Isabella**) "I think they are still in that sort of early stages where they are really owning it a bit more" (**Isabella**) "They are still on training wheels, still need us to guide them" (**Isabella**)

Table 11 continued: Examples of participants' beliefs about knowledge text segments for pre- and post- intervention time points

Beliefs about knowledge category	Examples of pre-intervention text segments (**Name of participant)**	Examples of post-intervention text segments (**Name of participant)**
Constructivist (Teacher supports the development of SRL skills and provides scaffolded opportunities for SRL)	"they would be largely independent of you. You would be a guide in their learning" (**Lisa**) "its less teacher centred and more students centred" (**Lisa**) "we are just going in and introducing the lesson with a title and a learning outcome, and instructing the girls as to what activities to do, but… they are responsible for recording their learning that lesson" (**Lisa**) "creating a safe supportive learning environment in the classroom, where they feel they can ask for help I think that enhances the SRL behaviour of the girls" (**Lisa**)	"So when you walk past my room, it is sometimes, its just you know there are kids doing prac, there are things there, someone's on the floor, someone's on the board doing something else, and I've got to explain to… (students name) how to do something on the board" (**Isabella**) "So the most important thing I think is explicitly teaching it (SRL strategies), in the context of your lessons." (**Isabella**) "Yeah, so make it explicit, so actually make it part of what you do." (**Isabella**) "they would be largely independent of you. You would be a guide in their learning" (**Lisa**) "but I've really turned it over to the girls, so we've had a couple of classes where um, we've discussed how they have studied" (**Lisa**) "I say it's letting go, um, of you being the master of all the learning and just encouraging in your students their belief and giving them the tools, um, to do it themselves, supported by you. It's really important" (**Lisa**)
Autonomous (Predominantly student controlled, with little to no support from teacher in the development of SRL skills)	"I think you can just with practice get quite skilled at self regulated learning." (**Abby**) "it will be vague modelling it won't be explicit, coz I think that is the whole point on independent learning that we are trying to get across" (**Abby**) "I just think it has to be experience based" (**Sarah**) "I'm just letting them go at the moment. Look the bright girls are flying with it; the weaker girls are starting to struggle" (**Lisa**) "I'm largely leaving them to it" (**Lisa**)	Nil coded

text segments per category for each participant for pre- and post- intervention time points are tallied in Table 12.

Table 12: Number of beliefs about knowledge text segments per participant for pre- and post-intervention time points.

	Empiricist			Constructivist			Autonomous		
	Pre-	Post-	Change	Pre-	Post-	Change	Pre-	Post-	Change
Abby	0	0	0	5	3	-2	1	0	-1
Sarah	2	0	-2	0	3	+3	1	0	-1
Isabella	4	1	-3	9	11	+2	0	0	-3
Lisa	4	1	-3	3	5	+2	2	0	-2
Total	10	5	-5	17	22	+5	4	0	-4

A non-parametric Wilcoxon Signed-Ranks Tests was calculated on participants' empiricist beliefs about knowledge scores, indicating that post-intervention empiricist beliefs about knowledge scores (Median = 5) were higher than pre-intervention empiricist beliefs about knowledge scores (Median = 3). Although this result was not statistically significant, z = -1.633, p = .102, it showed a medium effect size of r = -.58.

A non-parametric Wilcoxon Signed-Ranks Tests was also calculated on participants' constructivist beliefs about knowledge scores, indicating that post-intervention constructivist beliefs about knowledge scores (*Median* = 4) were equal to pre-intervention constructivist beliefs about knowledge scores (*Median* = 4). Although this result was not statistically significant, z = -1.134, *p* = .257, it showed a medium effect size of *r* = -.40.

Lastly, A non-parametric Wilcoxon Signed-Ranks Tests was calculated on participants' autonomous beliefs about knowledge scores, indicating that post-intervention autonomous beliefs about knowledge scores (*Median* = 0) were lower than pre-intervention autonomous beliefs about knowledge scores (*Median* = 1). Although this result was not statistically significant, z = -1.633, p = .102, it showed a large effect size of r = -.58.

Table 12 indicates that at the pre-intervention time point, teachers made a number of associations between the concept of SRL and the notion of autonomy and independence. This shifted substantially with no post-intervention statements coded to the autonomous categories. Generally, participants' demonstrated constructivist beliefs both pre- and post- intervention. There was also a notable decrease in statements coded to the empiricist beliefs category.

3.4.2 Beliefs about intelligence

Text segments related to beliefs about intelligence are reported in Table 13. Sarah was the only participant who made statements in her post-intervention interview that were interpreted as statements consistent with an entity theory of intelligence/fixed mindset, indicating that thinking is the result of ability, and that training one's brain to think in a certain way is not possible as it is the result of thinking patterns innate to that person. Therefore, Sarah appears to attribute success to internal, stable and uncontrollable factors such as ability.

3.4.3 Teacher attributions

Examples of text segments coded to the teacher attribution category are recorded in Table 14. Isabella attributed her students' success to her knowledge and ability to explain certain strategies. Therefore, Isabella appears to attribute success to an internal, unstable and controllable factor.

Generally, all participants indicated that without substantial knowledge about SRL they would be unable to adequately foster SRL in the classroom. A common thread among teachers' responses was that knowledge (or lack of knowledge) was attributed to professional development programs, resources or teacher education that they had been exposed to previously (e.g. insufficient study in the

Table 13: Examples of participants' beliefs about intelligence text segments for pre- and post- intervention time points.

	Examples of pre-intervention text segments (**Name of participant**)	Examples of post- intervention text segments (**Name of participant**)
Beliefs about intelligence	**Nil coded**	"I'd say probably 95% of that (things that change thinking) has been sort of automatic, not me intentionally going, 'I'm going to think this way instead of thinking that way', like when it comes to cognitive processes anyway. And I think for most human's beings, that's the case" (**Sarah**) "we spend most of our time, just the way our brain works, it's just the way it works, not the way we are trying to train it to work." (**Sarah**)

Table 14: Examples of participants' functional attribution text segments for pre- and post- intervention time points.

	Examples of pre-intervention text segments (**Name of participant**)	Examples of post- intervention text segments (**Name of participant**)
Attributions	"if we know the benefits of SRL and those strategies… then we are going to be more likely to implement it and help them to implement them (strategies)" (**Abby**) "And I think know-how as well" (**Sarah**) "I actually don't think we've had any professional learning on it…. I'd certainly be open to professional learning on SRL and I'd be open to explicitly teaching it to the girls" (**Lisa**) "you know I've been trained in science you know to quite high levels, I've been teaching for 25 years in the science maths domain, but largely the science domain, um and I haven't yet had any formal training in SRL" (**Lisa**)	"when I have looked at my students and, ah you know they don't believe in themselves, or they are just a ball of anxiety, I think that I previously didn't really know what to do with that…Whereas actually having the knowledge of SRL and all of the strategies that we have discussed, it allows me to give some solutions to that." (**Abby**) "I think that the knowledge base would have helped the time, you know when you feel more confident in something you don't need to spend so long getting your head around it" (**Sarah**) "I studied science for 6 years total, if you include VCE. And I studied teaching for really only like 3. And we did not do SRL, because it was 10 years ago, so that body of knowledge specifically that set of terms, wasn't being used… So I haven't been studying it for as long. And then yeah, again, I've been teaching for seven years, but I've got text books and exams and colleagues on science that has continued to hone and refine my science knowledge, I've taught learners all of that time… but I've got no books on that (SRL)" (**Sarah**) "it's (goal setting) the bit I struggle with and as a consequence, because I still struggle with it I think the girls still struggle with it a bit too" (**Isabella**) "no I don't have the same depth of knowledge in terms of this sort of stuff because I haven't done psych" (**Isabella**)

Table 15: Examples of participants' teacher self-efficacy text segments for pre- and post intervention time points.

	Examples of pre-intervention text segments (**Name of participant**)	Examples of post- intervention text segments (**Name of participant**)
Teacher efficacy	"I would have a greater depth of knowledge in science" (**Abby**) "most of us (teachers) don't know the theory behind it (SRL) as to why it is effective and how to get students back on track" (**Abby**) "I think the only strategy I use consistently is to, and its pretty crap, is to constantly reinforce, ask me when you need help, ask me when you don't know what to do, ask me when you don't even know what to ask and I say that many times" (**Sarah**) When asked do you have a similar depth of knowledge in SRL as you do in Science, Sarah responded "No way! I didn't study SRL for all of those years at university, I didn't teach it every day to 6/7 different year levels for all those years, so absolutely not. Although even as I think about it I want to change that because I have a pretty in depth understanding of learning, because I teach people every day. But yeah, I suppose just more from that specific SRL" (**Sarah**) When asked do you have a similar depth of knowledge in SRL as you do in Science, Isabella responded "I don't' think I do, maybe I do; but, I don't know that I do" (**Isabella**) When asked do you have a similar depth of knowledge in SRL as you do in Science, Lisa responded "No" (**Lisa**)	"I would say that my depth of knowledge is much greater than it was previously (re. SRL), in learning the theory, in applying it in the classroom, but I would say that I still have a much greater depth of knowledge about science" (**Abby**) "when I have looked at my students and, ah you know they don't believe in themselves, or they are just a ball of anxiety, I think that I previously didn't really know what to do with that. I could see the problem, but I didn't necessarily know how to fix it. Whereas actually having the knowledge of SRL and all of the strategies that we have discussed, it allows me to give some solutions to that." (**Abby**) "the biggest challenge was I didn't have the knowledge base" (**Sarah**) "I think now I can do so with a much better vocabulary and more specific ideas that will actually help the students to do it" (**Sarah**) "What strategies are you going to use? You know. We can do that. Um how do you regulate, how are you going with that, what strategies have you changed and have you used some and not others. That sort of thing, once you get beyond that it seems to flow reasonably easily, but that first bit of choosing what your outcome is…is the hardest bit."(**Isabella**) "it's (goal setting) the bit I struggle with and as a consequence, because I still struggle with it I think the girls still struggle with it a bit too" (**Isabella**) "At the beginning um, I was a little bit more challenged by it than I am now. Um but, um you know with each different lesson, I've always come back to that framework (SRL triadic model) so I've been revisiting you know earlier aspects of it" (**Lisa**) When asked do you have a similar depth of knowledge in SRL as you do in Science, Lisa responded, "um, certain aspects I guess. You know as you know, as a science teacher, at year 10 and below, you have to be a jack of all trades, um so teaching astronomy at year 10 this year was certainly a challenge, I probably know more about SRL than astronomy at year 10 (laughs), you know that's not to say I didn't teach it well, but a lot of work went into teaching it well. Where as if you ask me about biology and chemistry, I'd know more about biology and chemistry than SRL. So it just depends." (**Lisa**)

field of SRL). Post intervention, all participants attributed a higher level of knowledge about SRL to the professional learning community.

3.4.4 Teacher efficacy

Text segments related to teacher efficacy are reported in Table 15. All participants made statements post-intervention that indicated increased levels of self-efficacy. However, it was noted that Sarah made a comment that indicated some discrepancy between her self-efficacy for SRL as opposed to learning, suggesting that Sarah viewed SRL and learning as different entities.

3.4.5 Expectancy beliefs

Examples of participants' student expectancy beliefs text segments are reported in Table 16.

Table 16: Examples of participants' expectancy belief text segments for pre- and post intervention time points

	Examples of pre-intervention text segments (**Participant**)	Examples of post-intervention text segments (**Participant**)
Expectancy beliefs	"…they are in Year 8… So, in terms of my global view of the students, they are kids, little kids and in terms of where they are for their emotional and mental maturity and development and stages in life… My counter thought to that is that it can be OK" (**Sarah**) "At my old school, I had them all trained, they would come in and just pick up where they left off from last time and they would just go" (**Isabella**)	"some of them did it really well. And not necessarily the students that I thought would do it well." (**Abby**) "I kind of expect that the students at the senior years to already be self regulated learners. I kind of have the expectation that they are already doing those things." (**Abby**) "I've got the mid band who are kind of OK at it, but are probably were I would expect a 13 or 14 year old to be" (**Sarah**) "Whereas, this sort of stuff, you can teach it to little kids" (**Isabella**) "these girls in year 8 this year, they need to be taking it on board for next year" (**Lisa**)

Referring to Table 16, Abby, Isabella and Lisa indicated high expectancy beliefs, expecting students at Year 8 level to be able to self-regulate their learning. Sarah was the only participant who expressed statements that were deemed low expectancy beliefs, indicating that due to "emotional and mental maturity" of students in Year 8, she did not expect Year 8 students to be able to self-regulate their

learning. No substantial changes to participants' expectancy beliefs were noted as a result of the professional learning community intervention.

3.5 Teachers' evaluation of the SRL teaching approach

The third research question that I set out to explore was participants' evaluation of the value, ease of implementation and likelihood of using the SRL teaching approach with their own students beyond the study.

3.5.1 Evaluation of the impact of the SRL teaching approach

Participants' text segments related to their evaluation of the SRL teaching approach is reported in Table 17. As an evaluation of the SRL teaching approach, only post-intervention text segments were coded to the category of "impact of SRL teaching approach".

Referring to Table 17, all participants made statements that indicated that they were, as a group, extremely positive toward the SRL teaching approach that they implemented with their classes and the impact this had on their students. Equally, all participants valued the SRL teaching approach. In terms of ease of implementation, three participants indicated it was simpler than expected, particularly as it was grounded in a framework (i.e. Zimmerman's triadic model of SRL). However, Sarah felt that it was relatively complex, not necessarily the approach, but teaching "something that is innate". Additionally, three of the four participants made statements that signified that they would continue with implementing strategy instruction in their classroom. Abby was the only participant who showed a preference for the explicit teaching of strategies to occur external to her class time, but still indicated that she would support (through prompting) strategy use in class time. In terms of application to other contexts, Isabella had incorporated some of the language and strategies into student exam packs for Year 9s (a set of resources to support student success in Year 9), indicating that she had applied her new learning to new contexts.

Table 17: Examples of participants' text segments that were coded to impact of SRL teaching approach for each individual participant

Theme	Examples of text segments (**Name of participant**)
Student progress	"they are still better than they were. Much, much, better than they were" (**Abby**) "I have seen some differences in just the conversation that we are having and some differences in some of the one on one work where I have a chat to them… I think just the idea that there are tools… maybe starting to take root with a couple of them" (**Sarah**) "it's really early stages so I haven't seen that flow on effect in the test that I just marked, or the grades that they are getting or any of those kind of more concrete measurements" (**Sarah**) "they have improved their understanding of how they control it and what the strategies are. Like when I talk to them about the strategies they are much better." (**Isabella**) "much better at determining what… they need to do, what their learning needs to be about and what strategies they need to put in place." (**Isabella**) "I think that its (student SRL ability) changed, um, for some girls" (**Lisa**)
Value	"yeah, it's valuable teaching them the strategies" (**Abby**) "I think that it (the SRL teaching approach) is really important." (**Isabella**) "the school explicitly teaching them aspects of SRL has been invaluable to them" (**Lisa**)
Ease of implementation	"I feel as if we've made it much simpler than I originally thought it was going to be… I think that, for the starting level that we were going for we had pitched it right" (**Abby**) …in what ways is it simple? "well the framework breaks it down into the three phases, and there are you know, the set elements that we have discussed within those three phases" (**Lisa**) "So although I am saying that is it fairly simple to teach and introduce into your dialogue with your students, I can see that it is a large and complex body of knowledge" (**Lisa**) "To try and teach something that is innate, like how we think, no matter how we think, the way that we do it is innate and then its like, so then to try and teach something and modify something that we do every second of the day whether we are awake or asleep, to try and tackle that and shift that and modify that, that's never going to be simple" (**Sarah**)
Application to other or future contexts	… this is part of their exam packs? "Yeah" (**Isabella**) "I think I would take them through the whole lot. I'd take them through the framework of it all, you know" (**Lisa**) …do you see yourself explicitly teaching the students about SRL beyond the current intervention (SRL teaching approach)? "Yep definitely" (**Sarah**) "I will definitely continue to use that (SRL teaching approach) with those students, because I don't have to take out that massive chunk of time to explicitly teach those strategies to them again" (**Abby**)

3.5.2 Challenges associated with implementing an SRL teaching approach

Participants' text segments related to challenges associated with implementing an SRL teaching approach are reported in Table 18.

All participants viewed time as a significant challenge. Generally, participants indicated that finding the time within lessons to teach SRL while also teaching science was difficult. However, it was

Table 18: Examples of participants' text segments about the challenges associated with implementing an SRL teaching approach.

Theme	Examples of post-intervention text segments (**Name of participant**)
Time	"I think my VCE classes I question marked because we are very time poor in terms of content" (**Abby**) "And it's time consuming as well" (**Sarah**) "just the time, you know trying to um find the time to implement the SRL aspect to the lesson" (**Lisa**) "only the variation of the timetable in terms of time" (**Isabella**)
Student motivation	"The only challenge is the challenge of the adolescent that they don't necessarily want to do it" (**Isabella**) "but for others bringing them around to seeing that they need to be adopting these strategies um, yeah it isn't easy for some girls" (**Lisa**) "So probably the biggest challenge though, theoretically was actually getting the girls to really stop and think, and not just kind of brush over the process" (**Abby**)
Student culture	"I still had I reckon 20 different scenarios where the student would come up to me and basically ask me if what they wanted to put down as an answer was ok" (**Abby**) "yet still a bunch of them will always come in and just sit there neatly with there books in front of them waiting for me to tell them what to do" (**Isabella**) "particularly the weaker students they like the notes, they like going through the booklet, they like me working through questions before they do" (**Lisa**)
Integrating explicit teaching about SRL with science curriculum	"if I am doing, I don't know, say if I'm doing a lesson on sedimentary rocks, that might not fit into whatever the strategy was that we were doing on that particular week, whereas I might have had to like wait an extra three lessons to fit it in with the next area of content" (**Abby**) "It's not an addition, but an incorporation into, and that's the hardest thing" (**Isabella**) "I can't say that some lessons have leant themselves better to it, but I've thought you know it would be better placed in some lessons than others" (**Lisa**)
External pressures	"giving myself permission to teach differently" or "to be the person not doing the same thing is where you get criticised" (**Isabella**) "that negative ramification of when you feel like you are being value-judged by the number your kids get on an assessment and your focus inevitably shifts to content and nothing else" (**Sarah**) "it's a but, whether the practicalities of the 5000 things we are already doing each day, where that comes in the list" (**Abby**)
Shifting from teacher control to student control	Only one text segment coded to this theme: "what's a challenge for me, as I alluded to before with SRL, it's hard, it's not so much giving up the control, but it's giving up the teacher centred nature of my lessons" (**Lisa**)
Resources	Only one text segment coded to this theme "finding and having the right examples" (**Isabella**)

also the time required to plan and prepare lessons that incorporate strategy instruction, or for Isabella, it was the time limitation of the lessons (e.g. 50 minutes was not enough time to have students engage in the SRL learning protocol so she would have students complete half in one lesson, and the other half in the following lesson).

Additionally, a number of challenge themes related to student and school culture were reported. For example, participants stated that students themselves presented a challenge. There were two key student themes that participants discussed. The first was student motivation, in other words, whether or not students were actually motivated to engage in learning about SRL. Secondly, participants made statements that reflected a student culture of dependency on the teacher leading the lesson. This expectation on teachers from students made it difficult for teachers who were trying to foster SRL in the classroom. At the school culture level, participants felt that there were a number of external pressures that resulted in teachers prioritising other important teacher tasks above that of teaching SRL. One particular external pressure was how other teachers were conducting their classes (greater teacher control) and a concern from participants for how their lessons may be perceived if they were to provide students with more control.

Furthermore, having the appropriate resources and integrating SRL strategy instruction with the content so that students did not perceive it as an add-on was also considered a challenge.

3.5.3 Perceptions of where and when SRL should be taught

Participants' text segments for where and when SRL should be taught are recorded in Table 19. Following the intervention, the majority of participants indicated that adopting the SRL teaching approach within their own classes would be beneficial. Isabella even stated that it should be explicitly taught within each class and therefore across different context. On the other hand, Abby queried whether the initial explicit strategy instruction could occur in an alternative setting (e.g. pastoral care lesson) and then as the science teacher, she could just prompt the strategies where need be. This was primarily related to a perception of lack of time within the science classroom (as listed previously

in section 3.5.2). Participants also expressed a need for the teaching about SRL to be an ongoing process. However, there was some variance amongst the year levels in which participants would implement the SRL teaching approach.

Table 19: Examples of participants' post-intervention interview text segments related to beliefs about where and when SRL should be taught as organised by theme.

Theme	Examples of post-intervention interview text segments (**Name of participant**)
External to class	"doing it constantly in different contexts" (**Isabella**) "if say, in homeroom time, or in some other subject that the process was being used, and again I could just whip that out of my toolbox and they knew what I was talking about if I was referring to growth mindset or particular strategies or you know whatever it is with SRL, I would definitely use it" (**Abby**)
Internal to class	"I thought it would be better placed in homeroom. I have since realised that to place it in a certain context, particularly science, is so much better than doing it in isolation" (**Lisa**) "the most important thing I think is explicitly teaching it, in the context of your lessons." (**Isabella**) "if say, in homeroom time, or in some other subject that the process was being used, and again I could just whip that out of my toolbox and they knew what I was talking about if I was referring to growth mindset or particular strategies or you know whatever it is with SRL, I would definitely use it" (**Abby**)
Static	Nil coded
Ongoing	"I think it is important that it is not a one off lesson" (**Lisa**) "I think I would explicitly teach the concept, um to different degrees form year 6 to year 12 and at the beginning on the year. Um and then I'd just reflect on how the girls are going during the year." (**Lisa**) "doing it constantly in different contexts" (**Isabella**) "if say, in homeroom time, or in some other subject that the process was being used, and again I could just whip that out of my toolbox and they knew what I was talking about if I was referring to growth mindset or particular strategies or you know whatever it is with SRL, I would definitely use it" (**Abby**)
Year levels	"explicitly teaching it in science?... so again, year 8 and down, I would." (**Abby**) "I think middle years it could be really good just to teach those, yeah to teach the protocol and really get it kind of embedded in their toolbox. But further up the school I kind of see my focus a little bit more on other things (i.e. content)" (**Abby**) "I think I would explicitly teach the concept, um to different degrees form year 6 to year 12" (**Lisa**)

4. DISCUSSION

This study explored how teachers' knowledge and beliefs about SRL changed as teachers engaged in a guided professional learning community (i.e. intervention). It was hypothesised that following the intervention, teachers would demonstrate increased content and pedagogical content knowledge about SRL (H1). Secondly, it was anticipated that teachers' would reflect greater constructivist beliefs about knowledge, make statements consistent with growth mindsets and mastery orientations, indicate functional attributions, report higher teaching efficacy and indicate higher expectancy beliefs of their students (H2). Lastly, as knowledge and beliefs form the lens for how one perceives an SRL teaching approach, it was hypothesised that teachers would report that the SRL teaching approach was valuable, easy to implement and likely to be adopted beyond the intervention (H3). All hypotheses were supported or partially supported.

4.1 Teacher knowledge

Findings indicate that following engagement in a guided professional learning community the majority of teachers showed increases in content and pedagogical content knowledge about SRL, supporting H1.

Analysis of interview transcripts demonstrated that teachers' knowledge about SRL consists of the categories, content knowledge and pedagogical content knowledge, two of the seven categories of teacher knowledge put forward by Shulman (1987). Further research is required to assess the position of SRL within Shulman's remaining five categories, but this initial evidence supports the argument that SRL, as a starting point, should be considered equal to a typical subject that spans Shulman's scheme. Additionally, this is evidence to suggest that SRL should not fall within a separate eighth category such as "knowledge of learning", advocated by Lawson et al. (2009), but also begs further consideration and clarity around the professional standards for teachers in Australia. As argued in Chapter 1, failing to recognise SRL as its own domain means that teachers are unlikely to value it as equal to typical subject matter. The present study demonstrates that when a professional learning community considers SRL as

its own subject the majority of teachers (75%) increased content and pedagogical knowledge about SRL, and valued the notion of SRL and the SRL teaching approach.

Findings are in line with previous studies (e.g. Dignath-van Ewijk & van der Werf, 2012; N. E. Perry et al., 2008), demonstrating that teachers lack both content knowledge and pedagogical content knowledge about SRL. Similar to the study by Spruce and Bol (2015) who found teachers were not clear on SRL strategies and how to teach the strategies to students, the present study demonstrates that this was the case before the intervention but not afterwards. Participants moved from implicit methods to explicit methods, with large increases in both explicit strategy instruction and explicit prompting. Additionally, results imply that teachers not only added explicit strategy instruction to their pedagogical toolkits, but also the SRL learning protocol; two tools that have been shown to have positive effects on student SRL (Eilam & Reiter, 2014; González-Pienda et al., 2014). Combined with the increase in teacher content knowledge about SRL, this is evidence that a guided professional learning community about SRL is an effective method to rectifying the "lack of knowledge" problem that researchers have reported (e.g. Dignath-van Ewijk & van der Werf, 2012; Spruce & Bol, 2015).

Results from pre-intervention interviews are also consistent with findings from observational studies in the field of SRL (e.g. Bolhuis & Voeten, 2001; Dignath & Buttner, 2008; Dignath-van Ewijk et al., 2013). Teachers who reported promoting strategy use tended to do so in implicit ways and focus on cognitive strategies as opposed to motivational or metacognitive strategies (Dignath & Buttner, 2008; Dignath-van Ewijk et al., 2013). However, following engagement in a professional learning community, teachers indicated a greater focus on motivational strategies associated with the forethought phase such as goal setting and self-efficacy.

Teachers have already been shown to develop knowledge through interventions of professional development and teacher training (Kunter et al., 2013; Lonka et al., 1996) and this study was no exception. Still, it extends research from the field of professional development/teacher education to the field of SRL and responds to concerns related to teachers' knowledge about SRL. The quality of a

teacher's knowledge is the initial building block for teaching well (Adoniou, 2015), and Ball et al. (2008) argued that without the appropriate knowledge, teachers inadequately teach and address topics outside of their qualified field. The current study shows that a professional learning community about SRL is an effective method to enhancing teacher knowledge about SRL, enabling teachers to foster SRL in the classroom alongside teaching a typical subject such as science. In order to ensure that future generations are equipped with the necessary "how to learn" skills (Hattie & Donoghue, 2016), teacher education and professional development programs need to provide opportunities such as a professional learning community for teachers to increase their knowledge about SRL.

4.2 Teacher beliefs

Teacher beliefs were also an area of interest, and thematic analysis of pre- and post- interview responses demonstrated that, changes in teacher beliefs varied substantially. Therefore, the second hypothesis was partially supported.

4.2.1 Beliefs about knowledge

When considering teachers' beliefs about the source of knowledge (Schommer, 1990), findings indicate that teachers generally held constructivist beliefs about SRL both pre- and post- intervention, suggesting that they saw content as malleable and as a context for the teaching of learning skills (Khaled et al., 2016). This is a positive finding as teachers with constructivist beliefs are more likely to provide active teacher support around the development of SRL, such as strategy instruction (Kistner et al., 2015), and promote student autonomy (Turner et al., 2009).

Investigating teachers' constructivist beliefs further, substantial changes were noted in teachers' statements about strategy instruction. Similar to findings of previous studies (e.g. Bolhuis & Voeten, 2001; Dignath-van Ewijk & van der Werf, 2012), as previously stated, teachers moved from implicit strategy instruction to more explicit forms of strategy instruction and prompting. In the Dignath-van Ewijk and van der Werf (2012) study, it was reported that, "teachers refer more to explicit strategy instruction when they think of 'learning to learn'" (p. 7). Results indicate that two of the four participants

(Sarah and Lisa) viewed SRL as different to learning to learn. A researcher assumption was made prior and during the study that as the term SRL is often used at the school, teachers would understand the term and its associations. However, even at schools where SRL is considered normal language, using “learning to learn” in place of SRL may elicit different responses.

4.2.2 Beliefs about intelligence and teacher attributions

In relation to teachers’ beliefs about intelligence, findings indicate that teachers who hold an entity theory of intelligence/fixed mindset (e.g. Sarah) attribute student success/failure to factors external to the teacher such as student ability. These findings are similar to those put forward by Patterson et al. (2016), but, are different to those reported by Dweck and Leggett (1988) in relation to students; fixed mindset individuals are likely to attribute success/failure to internal, uncontrollable causes, resulting in lower levels of effort and persistence. Therefore, the notion of growth and fixed mindsets may be different when applied to teachers. Only one participant (i.e. Sarah) made statements consistent with a fixed mindset and findings of previous studies (Patterson et al., 2016; Wieman & Welsh, 2016). Rattan et al. (2012) claimed teachers who hold entity theories of intelligence/fixed mindsets “more readily judged students to have low ability” (p. 731). The present study supports this claim as Sarah also reported that she perceived her students to have a much lower SRL ability than the other participants.

On the other hand, teachers (e.g. Isabella) who attribute student success/failure to factors internal to themselves (e.g. teacher knowledge) can be considered growth mindset individuals, and have been shown to use more effective instructional teaching strategies with their students (Wieman & Welsh, 2016; refer Table 5). This connection between growth mindsets and strategies is consistent with findings of previous studies (e.g. Fives & Buehl, 2014; Yeager & Dweck, 2012) that have compared teacher mindsets to student mindsets, suggesting that those with growth mindsets focus on strategies. Isabella (i.e. growth mindset) achieved 83% of the SRL teaching actions when compared with Sarah (i.e. fixed mindset) who only achieved 42% of SRL teaching actions. Perhaps this connection between mindset and strategies is further compounded by the idea that growth mindset teachers might value professional development opportunities more than fixed mindset teachers (Fives

& Buehl, 2014). It can be argued that Isabella also showed greater growth in level of knowledge about SRL than Sarah, suggesting that Isabella benefitted more from the professional learning community. Further investigation into teachers' mindsets is needed in order to confidently determine the relationship with a professional learning community about SRL.

Jonsson et al. (2012) suggested that teachers from science and mathematics disciplines show a preference for a fixed mindset; however, this was not necessarily the case with the present study as both fixed and growth mindsets were present. Additionally, Jonsson et al. (2012) argued that "(1) older and more experienced teachers and (2) younger and less experienced teachers, had a stronger preference toward entity theories of intelligence" (p. 397). All participants fell into one of these two categories; yet, only one participant made statements that were coded to fixed mindset (stemming from an entity theory of intelligence). Although findings suggest an inconsistency to those reported to Jonsson et al. (2012), due to the limited number of statements available for coding to the beliefs about intelligence category, findings must be heeded with caution.

In general, it appears that teachers attribute their ability to foster SRL in the classroom to professional development programs, resources or teacher education, similar to findings reported by Yoo (2016). No matter which mindset, all participants strongly attributed the increase in their knowledge about SRL and self-efficacy to engagement in the professional learning community. This further supports the benefits of implementing a professional learning community in secondary school settings.

4.2.3 Teacher efficacy

Teacher efficacy is a teacher's belief in his/her ability to perform a particular teaching action (Tschannen-Moran et al., 1998), such as fostering SRL in the classroom. Results suggest that as a participants' knowledge about SRL increased, so too did their belief (i.e. teacher efficacy) that they could foster SRL in the classroom. There is a sound research base to suggest that growth in

professional knowledge leads to increased teacher efficacy (e.g. Ross & Bruce, 2007; Yoo, 2016) and analysis of participants' interview responses support this relationship.

According to Fackler and Malmberg (2016), highly efficacious teachers make different instructional choices and are more willing to try new instructional strategies. Participants who made statements consistent with higher levels of teacher efficacy (refer Table 15) also completed higher number of teaching actions (refer Table 6). Similarly, Sarah showed lower levels of teacher efficacy for SRL and also reported only implementing some elements of the SRL teaching approach. Bandura (1997) proposed that teachers who do not believe they have the ability to achieve a particular teaching action are highly unlikely to even attempt it. This is a potential explanation for Sarah's lack of action. The primary concern here is that a teacher with low self-efficacy for SRL may resort to traditional practices over creating an environment that fosters SRL.

4.2.4 Teacher expectancy beliefs

In addition to teacher efficacy, this study explored whether teachers' expectancy beliefs of their students changed following engagement in a professional learning community. Generally, in this sample, teachers held high expectancy beliefs of Year 8 students and their ability to self-regulate their learning. There was substantial agreement that students entering the Senior Years Program (Years 9-12) would have the required skills to manage themselves and their learning (i.e. SRL). According to previous studies (e.g. Rubie-Davies et al., 2012), high expectancy beliefs correlate with high student achievement; therefore, it is reasonable to suggest that those participants that had high expectations of students to self-regulate their learning may have seen greater gains in student SRL. This is inconsistent with the findings of the Spruce and Bol (2015) study that reported that among middle school teachers there was "agreement that students may not be ready to self-regulate at the middle school level" (Spruce & Bol, 2015, p. 258).

Sarah was the only participant who held low expectancy beliefs for her whole class based primarily on their age (Fives & Buehl, 2016; Woolfolk Hoy et al., 2006), even though indicating some of

her students were actually already self-regulating their learning. A key limitation of the present study is that no achievement data on the participants' classes was collected and it is therefore difficult to ascertain whether Sarah's low expectancy beliefs correlate with the general achievement levels of her class or whether it is solely low expectancy beliefs associated with age.

No changes were noted in expectancy beliefs following teacher engagement in the professional learning community intervention. Unlike previous studies (e.g. Rosenthal & Jacobson, 1968) that have investigated expectancy beliefs, no information was provided to the teachers about what a Year 8 student should and can achieve in terms of SRL, although there may have been a subliminal message about capabilities given the intervention. Providing teachers with a clear idea of what Year 8 students can achieve (in terms of SRL) may shift teachers' expectancy beliefs and influence their implementation of an SRL teaching approach.

4.3 Teacher perceptions of an SRL teaching approach

As knowledge and beliefs form the lens for how one perceives an SRL teaching approach, it was hypothesised that with higher levels of knowledge about SRL, and beliefs conducive to fostering SRL in the classroom, teachers would report that the SRL teaching approach was valuable, easy to implement and likely to be adopted beyond the professional learning community. Data revealed that following engagement in a guided professional learning community about SRL, teaches were very positive about the SRL teaching approach, and valued it as an effective method to foster SRL in the classroom. Furthermore, teachers indicated that an SRL teaching approach grounded in a framework such as Zimmerman's (2002) triadic model of SRL, made it easier for teachers to grasp and ultimately implement. A large number of studies in the field of SRL teaching approaches often consider the impact of the SRL teaching approach on the student; however, the present study illuminates the teachers' experience.

4.4 Professional learning community – a method for change

Researchers (e.g. Desimone & Stuckey, 2014; Stodolsky et al., 2006) have argued that the success of a professional learning community is dependent on the duration or "dosage"; the number of hours/sessions that a teacher is exposed to, and the general time span of the program. Participants experienced a dosage of approximately 4 hours over a 12-week period. According to Yoon et al. (2007) a dosage of 14 hours or more was necessary, while Piasta et al. (2010) suggested 11 hours was sufficient. The present study suggests that 4 hours of engagement in a professional learning community will yield positive changes. The problem lies in the measurement of changes and therefore success of each individual study. Yoon et al. (2007) measured student achievement, Piasta et al. (2010) measured literacy teaching practice, and the present study measured changes in teachers' knowledge and beliefs about SRL. Given the different methods or measurement listed, dosage cannot be compared across studies. However, when measuring changes in teachers' knowledge and beliefs about SRL, the present study is evidence that 4 hours will produce substantial gains in level of knowledge about SRL and teacher efficacy.

In addition to dosage, focus of the professional learning community is another important factor. Desimone and Stuckey (2014) argued that professional development programs that focus on content knowledge actually result in very little (and insignificant) improvement in teacher content knowledge. A more effective method to improve teacher knowledge and beliefs is for programs to focus on teaching pedagogy (e.g. Piasta et al., 2010), and be more practice-based (Ball & Forzani, 2009); whereby teachers are shown instructional techniques (e.g. explicit strategy instruction) or provided with resources (e.g. learning protocols) that can be used within the classroom (Darling-Hammond, 2006; Desimone & Stuckey, 2014; Stodolsky et al., 2006). In line with these recommendations, the present study adopted a focus on a combination of content knowledge and pedagogical content knowledge about SRL, along with instructional techniques such as strategy instruction.

Grounded in social cognitive learning theory, the present study suggests that implementation of a professional learning community (environmental factors) changes teachers' knowledge and certain

beliefs about SRL (personal factors). Subsequently, these changes can shape teaching practice (behavioural factors; refer Figure 11).

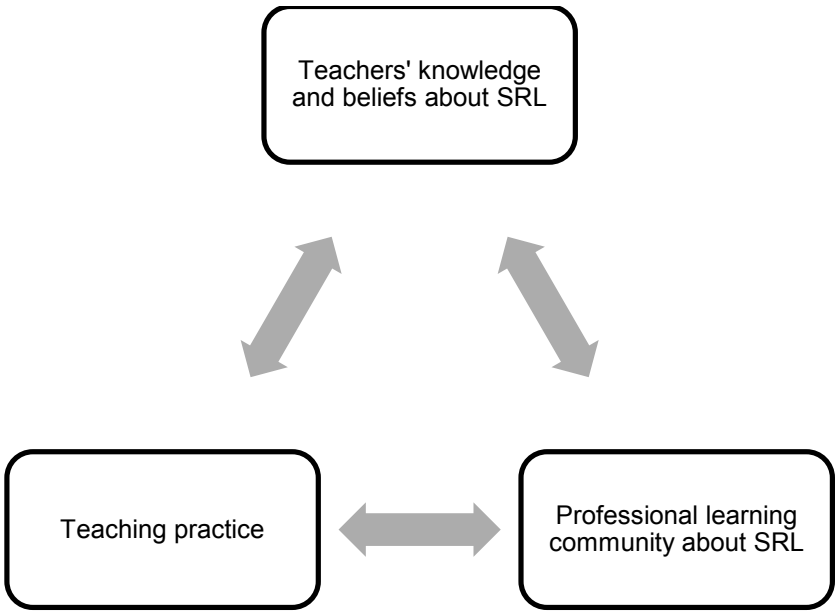

Figure 11: A suggested model for change. Drawing together findings from the present study and previous research, this model suggests that a professional learning community can influence key teaching variables (i.e. teachers' knowledge and beliefs, teaching practice).

4.5 Limitations

There are clear benefits and pitfalls to a 12 week pre-post intervention research design when compared with other designs (e.g. true experiment). Some may criticise the present study on the grounds of inability to prove causality; however, given the proximity of pre- and post- interviews, I argue that the changes noted in teachers' knowledge and beliefs are the result of the professional learning community as opposed to chance or other external variables (e.g. other professional development, expected growth in teacher knowledge).

A convenience sample of four does not easily allow generalizability. Teachers who participated in the present study had demonstrated interest in learning about SRL prior to the implementation of the professional learning community. Therefore, reported changes may present an inflated view of the

changes that can be expected in teachers' knowledge and beliefs about SRL when teachers participate in a guided professional learning community. Still, the increase in teacher knowledge about SRL occurred across all participants allowing for the assumption that secondary school science teachers generally possess limited knowledge about SRL but improve this knowledge following engagement in a guided professional learning community.

A common problem with studies in this field is the use of qualitative methods; particularly those that are dependent on self-report measures (Dignath-van Ewijk et al., 2013; Zimmerman, 2008). The concern with self-report measures such as semi-structured interviews, are the potential teacher and researcher biases (e.g. response bias: a teacher responding with a perceived desired response, over an honest response) that could influence results and analyses. Additionally, the simple act of a researcher asking questions "about the effectiveness of an innovation may lead to an inflation of the effects" (Hattie, 2009, p. 6). On the contrary, conducting interviews with teachers also provides an opportunity for the clarification of terminology, probing questions to elicit further information and even paraphrasing as a form of member checking. It was these elements that resulted in the use of semi-structured interviews.

Other biases can also exist when conducting qualitative research and must be minimised. In the current study, a potential limitation was noted in the process of coding by the second rater as part of calculating the inter-rater reliability score. Although the second rater was not informed of which interview transcript segments were pre- or post- intervention, it is possible that the second rater would have been able to ascertain this information from the participants' responses within the transcripts. This may have caused a second rater coding bias when rating the interviews depending on whether the second rater perceived the interview as pre- or post- intervention.

In reference to teacher efficacy, Bandura (1997) advocated that measurements of self-efficacy should be domain specific (e.g. SRL) as opposed to global measures (e.g. general teaching ability). The interview questions in the present study did not directly address self-efficacy and it would be beneficial to include questions that addressed this gap (e.g. "How confident are you in teaching SRL?"). For instance,

Tschannen-Moran and Woolfolk Hoy (2001) developed a Teacher Self-Efficacy Scale that is still used (e.g. Yoo, 2016) and could act as a starting point when formulating questions to the domain of SRL. Moreover, the present study may also benefit from a broader approach beyond that of self-report measures. Perhaps the inclusion of a non self-report measure such as classroom observations may lead to better and more holistic assessments of teacher professional competence about SRL.

4.6 Implications and future directions

Findings from the present study can contribute to the discourse about teacher quality, effectiveness and education (Mayer, 2014; Rowan et al., 2015), suggesting a shift from a 'crisis discourse' toward a solution. Results also clarify the current picture of teacher knowledge and beliefs about SRL, particularly that teachers require support in developing their knowledge about SRL that can be achieved through engagement in a professional learning community. In general, teachers already hold constructivist beliefs that support student autonomy and are positive about fostering SRL in the classroom, but lack the appropriate knowledge to effectively implement it. Guided professional learning communities about SRL could offer a solution.

Future studies interested in extending on the present study could do so by including external measures of teaching practice (e.g. observation tool or video analysis) beyond that of dosage or internal measures (e.g. self-report). It's as Dignath-van Ewijk et al. (2013) stated, "(o)bservations have the advantage of assessing behaviour, not just the opinion of someone" (p. 341). With an overarching aim to support the development of student SRL, although teachers in the present study indicated positive evaluations of the SRL teaching approach, other studies (e.g. Dignath-van Ewijk & van der Werf, 2012) have suggested "an inconsistency between teachers beliefs and teacher practice" (p. 8). There can be a difference between what people say (espoused theory) and what they do (theory in action) (Argyris & Schon, 1974). If teachers are not actually implementing SRL teaching approaches with students, then there is likely to be little change in student SRL. A combination of measures would enable further investigation of how knowledge and beliefs change, but additionally how they influence practice over time.

A large portion of research in teacher beliefs has been of white, middle class, female teachers (Woolfolk Hoy et al., 2006) and this study fits this mould. In order to generalise research in the field of teacher knowledge and beliefs, larger and more diverse samples need to be considered. Furthermore, the majority of SRL studies have been conducted in the domains of mathematics and recently science, with few studies concerning other domain areas. Why this is the case is unclear. Again, increasing the breadth of subject areas exposed to professional learning communities about SRL could lead to the adoption of SRL teaching approaches at a wider school level.

Additionally, it would be beneficial to provide teachers with an understanding of where their responses sit within a theoretical framework so that they may "consider their beliefs and evaluate how their beliefs facilitate or hinder their current practice" (Fives & Buehl, 2016, p. 119). In order to enhance their practice, teachers need opportunities to develop awareness around their own knowledge and beliefs about SRL. Professional learning communities present a fantastic opportunity for this type of reflection.

5. CONCLUSION

Beyond the students themselves, teachers are the most influential factor on learning (Government, 2016; Hattie, 2009; Klassen & Tze, 2014; Ladwig & Gore, 2005; Munro, 2011; OECD, 2005). The current study extends on previous research in the field of SRL (e.g. Dignath-van Ewijk & van der Werf, 2012), and demonstrates that professional learning communities about SRL are an effective method to improving teachers' knowledge and beliefs about SRL. Findings contribute to the discourse about teacher quality, effectiveness and education (Mayer, 2014; Rowan et al., 2015), the current picture of teacher professional competence about SRL, and where future professional development efforts should focus. Moreover, reported analyses suggest professional learning communities are a viable way for schools to implement an evidence-based SRL teaching approach that incorporates both strategy instruction and a learning protocol. High quality teachers and teaching practice will ensure that students are prepared as life-long and self-regulated learners (Eilam & Reiter, 2014; Klug et al., 2011; Wirth & Leutner, 2008), ready to adapt to the rapidly changing job landscape (Zhao, 2010), cope with this information-rich world, and embrace the exponential development and growth of technology (OECD, 2005, 2016; Rowan et al., 2015; Wilson & Bai, 2010). If ensuring the success of future generations is valued, then future research should extend the present study to broader samples of teachers and consider the addition of a non self-report measure of teaching practice.

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7. APPENDICES

APPENDIX A: Verbal script for requesting participation

Verbal script for requesting participation from informal networks

I am undertaking a Master of Education Degree at Flinders University. As part of my degree I am investigating teachers' experiences of a Self Regulated Learning (SRL) program.

Over the next 12 weeks, I will ask you to help me with my research into this SRL program by:
Engaging in six professional development sessions related to the SRL program
Collaborating with me to consider the method of implementation of the SRL program with your classes
Co-constructing lesson plans to guide the implementation of the SRL program in your classes
Implementing the SRL program with your respective Year 8 Science class
Participating in two individual interviews (before and after the SRL program period) regarding your experience (knowledge, beliefs and perceptions) of the SRL program.

Later, I will write a report about my research and give it to my Flinders lecturer to mark.
If any publications arise from my research, no individuals or sites will be named, nor recognisable.
All participation is voluntary and confidential.

Today, I am going to give you a letter of introduction, an information letter regarding my research and a consent form that you will be able to fill out in order to participate. It is entirely up to you whether you choose to participate in my research project. By signing the consent form, you will be allowing me to use your data/results as part of my investigation.

APPENDIX B: Letter of introduction

LETTER OF INTRODUCTION

Dear Year 8 Science Teachers at Melbourne Girls Grammar School

This letter is to introduce Shyam Barr who is a Master of Education student in the School of Education at Flinders University. He will produce his student card, which carries a photograph, as proof of identity.

He is undertaking research leading to the production of a thesis or other publications on the subject of teaching and learning.

I would like to invite you to assist with this project by agreeing to be involved in the following elements: The project will consist of 6 x 40 minute professional development sessions over a period of twelve weeks (one session per fortnight) related to a Self-Regulated Learning (SRL) program. These sessions will be incorporated into your regular Year 8 Science team meetings. In between each session, you will be required to implement the SRL program in your respective class, in one lesson per week. The six sessions will include a group discussion whereby Shyam will seek your reflections about your experiences of the weekly trialled in-class program. You will also be asked to contribute suggestions for improvement to the SRL program for delivery to your class in the following weeks. Before and after the program period, you will participate in an individual interview with Shyam in order for him to further understand your experience of an SRL program in secondary school science classrooms. Each interview will take approximately 45 minutes. He will take notes of your responses during all sessions. In addition, your permission will be sought to audio record your individual interviews. Participants will be able to check all notes and transcriptions to ensure accuracy and clarify any potential researcher misunderstandings.

Shyam intends to document the interview responses in preparation of his practical project report on condition that your name or identity is not revealed. He will seek your consent on the attached form. Be assured that any information provided will be treated in the strictest confidence and none of the participants will be individually identifiable in the resulting report or other publications. You are, of course, entirely free to discontinue your participation at any time or to decline to answer particular questions.

Any enquiries you may have concerning this project should be directed to me at the address given above or by telephone on 08 8201 5671 or e-mail helen.askell-williams@flinders.edu.au

Thank you for your attention and assistance.

Yours sincerely

Associate Professor Helen Askell-Williams

Associate Dean of Research

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee (Project number: 7333). For more information regarding ethical approval of the project the Executive Officer of the Committee can be contacted by telephone on 8201 3116, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au

APPENDIX C: Information sheet for teachers

INFORMATION SHEET FOR TEACHERS

Title: 'Teachers' knowledge, beliefs and perceptions of a Self-Regulated Learning (SRL) program'

Researcher:
Mr Shyam Barr
School of Education
Flinders University
Ph: 0421 479 959
Email: shyam.barr@flinders.edu.au

Supervisor:
Associate Professor Helen Askell-Williams
School of Education
Flinders University
Ph: (08) 8201 5671
Email: helen.askell-williams@flinders.edu.au

Description of the study:
The project will investigate the teacher experience of an SRL program in secondary school science classrooms. 'Experience' in this study will be measured by the changes in the teachers' knowledge, beliefs and perceptions of the SRL program over time. This project is supported by Flinders University School of Education.

Purpose of the study:
This project is designed to test whether a reflective, collaborative, teacher-researcher revised program changes teachers' knowledge, beliefs and perceptions of an SRL program in secondary school science classrooms.

What will I be asked to do?
You are invited to attend 6 x 40-minute Professional development sessions over a period of twelve weeks (one session per fortnight) related to a SRL program. These sessions will be integrated with your regular Year 8 Science team meetings. In between each session, you will be required to implement an SRL program in your Year 8 science class(es), in one lesson per week. The six sessions will include (in addition to professional development about the SRL program) a group discussion where I will seek a reflection of your experience of the weekly trialled in-class SRL program. Together, we will create a step-by-step lesson plan for the following lesson implementation. Before and after the professional development period, you will participate in an individual interview with me in order for me to further understand your experience of SRL in secondary school science classrooms. This will be a one-on-one interview and I will ask you a few questions about your experience (specifically focussing on your knowledge, beliefs and perceptions) of the SRL program. Each interview will take approximately 45 minutes. I will take notes of your responses during all sessions. With your permission, the interview will be recorded to ensure accuracy in my notes. Additionally, you will be able to check the transcriptions of your own interviews to ensure accuracy.

What benefit will I gain from being involved in this study?
You will receive professional development related to an SRL program that draws on recent studies in the field of SRL. Additionally, the sharing of your experience will improve the planning and delivery of future SRL programs.

Will I be identifiable by being involved in this study?
No part of the reports on this project will allow identification of any participant. Your interview responses will be recorded and transcribed, but all transcriptions will be de-identified and will not be able to be linked to you.

Are there any risks or discomforts if I am involved?
I don't anticipate any risks will arise from your involvement in this study. There will be a commitment of time for the interviews and teacher-researcher sessions. I will schedule these at times that are suitable for you.

How do I agree to participate?
Participation is voluntary. You may answer 'no comment' or refuse to answer any questions and you are free to withdraw from any project activity at any time without effect or consequences. A consent form accompanies this information sheet. If you agree to participate please read and sign the consent form and hand it back to me at the school.

How will I receive feedback?
Outcomes from the project will be summarised and provided to you if you would like to see them.

Thank you for taking the time to read this information sheet and we hope that you will accept our invitation to be involved.

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee (Project number 7333). For more information regarding ethical approval of the project the Executive Officer of the Committee can be contacted by telephone on 8201 3116, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au

APPENDIX D: Consent form for teacher participation in research

CONSENT FORM FOR TEACHER PARTICIPATION IN RESEARCH
(by interview)

I ….....

being over the age of 18 years hereby consent to participate as requested in the project by attending 6 x 40 minute sessions (as part of my regular Year 8 science team meetings and professional development program), including sharing my reflections of the SRL program and collaborating with the researcher to develop step-by-step lesson plans for in-class implementation. Additionally, I will implement the SRL program as per the lesson plans and participate in two interviews (before and after the SRL program) related to my experience (specifically focussing on my knowledge, beliefs and perceptions) of the SRL program.

1. I have read the information provided.
2. Details of procedures have been explained to my satisfaction.
3. I agree to audio recording of my information and participation.
4. I am aware that I should retain a copy of the Information Sheet and Consent Form for future reference.
5. I understand that:
   - I may not directly benefit from taking part in this research.
   - I am free to withdraw from the project at any time and am free to decline to answer particular questions.
   - While the information gained in this study will be published as explained, I will not be identified, and individual information will remain confidential.
   - I may ask that the recording be stopped at any time, and that I may withdraw at any time from session or the research without disadvantage.
6. I have had the opportunity to discuss taking part in this research with a family member or friend.

Participant's signature……Date……...

I certify that I have explained the study to the volunteer and consider that she understands what is involved and freely consents to participation.

Researcher's name……SHYAM BARR…….....

Researcher's signature……..Date…….

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee (Project number: 7333). For more information regarding ethical approval of the project the Executive Officer of the Committee can be contacted by telephone on 8201 3116, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au

APPENDIX E: Ethics approval notice

FINAL APPROVAL NOTICE

Project No.:	**7333**
Project Title:	Teachers' knowledge, beliefs and perceptions about a Self-Regulated Learning (SRL) program in secondary school science classrooms
Principal Researcher:	Mr Shyam Barr
Email:	shyam.barr@flinders.edu.au
Approval Date:	6 July 2016
Ethics Approval Expiry Date:	**16 December 2017**

The above proposed project has been **approved** on the basis of the information contained in the application, its attachments and the information subsequently provided.

APPENDIX F: Permission request email

PERMISSION REQUEST
(by email)

Dear Catherine Misson (Principal of Melbourne Girls Grammar School)

Shyam Barr is currently a Master of Education student in the School of Education at Flinders University. He can produce his student card, which carries a photograph, as proof of identity should you require.

Shyam is undertaking research leading to the production of a thesis or other publications on the subject of teaching and learning.

I would like to request your permission for Shyam to approach the Year 8 science teachers and upon their consent conduct the following study at Melbourne Girls Grammar School during Semester 2 of the 2016 school year. The study will consist of 6 x 40-minute professional development sessions over a period of twelve weeks (one session per fortnight) related to a Self-Regulated Learning (SRL) program. These sessions will be incorporated into the teachers' regular Year 8 Science team meetings. In between each session, each teacher will be required to implement the SRL program in her respective class. The six sessions will include a group discussion where Shyam will seek a reflection of their experiences of the weekly trialled in-class program. The teachers and Shyam will co-construct lesson plans for implementing the SRL program in their classes. Before and after the professional development period, each teacher will participate in a 45-minute individual interview with Shyam in order to further understand her experience of the SRL program in secondary school science classrooms. Shyam will take notes of all responses during all sessions. In addition, he will seek permission from each teacher to audio record the individual interviews. Participants will be able to check their interview transcriptions to ensure accuracy.

Shyam intends to document the interview responses for preparation of his thesis on the condition that no names or identities are revealed. He will seek formal consent from each of the teachers.
Be assured that any information provided will be treated in the strictest confidence and none of the participants will be individually identifiable in the resulting report or other publications.

Any enquiries you may have concerning this project should be directed to Shyam by telephone 0421 479 959 or by email shyam.barr@flinders.edu.au; or to me at the above address.

I ask that you kindly respond to this email indicating your permission and support of this study.

Thank you for your attention and assistance.

Yours sincerely

Helen Askell-Williams

Associate Dean of Research

School of Education

APPENDIX G: Interview approach

Date: _____

INTERVIEW QUESTIONS (Page 1 of 3)

1. (a) How would you describe 'self regulated learning'?

Probe response

(b) How would you describe the self-regulated learning behaviour of your Year 8 students at this moment?

Probe response
On a scale of 1-10 (10 being self-regulated learner), how would you rate the majority of students in your class? Why?

2. (a) What are the best ways to enhance the self-regulated learning behaviours of students

Probe response

(b) Which of these have you been able to implement in your classroom?

Probe response

(c) What have been the challenges?

3. In your Year 8 science lessons do you explicitly teach your students about self-regulated learning?

If answer is "NO"
Why not?

If answer is "YES"
What is it that you do?
Why do you do that?
How often do you do that?

INTERVIEW QUESTIONS (Page 2 of 3)

4. Do you see the process of explicitly teaching self-regulated learning as simple or complex, or is it both simple and complex?

If answer is "SIMPLE" ask
In what ways is it simple?
Probe each response

If answer is "COMPLEX ask
In what ways is it complex?
Probe each response

If answer is "SIMPLE AND COMPLEX" ASK:
In what way is it simple?
Probe response

In what way is it complex?
Probe each response

5. In your teaching you teach students about subject matter – a complex body of detailed knowledge about a curriculum area like science.

(a) Is there a similarly complex body of knowledge about self-regulated learning?

If 'YES" ask: What are some of the key areas of knowledge about self-regulated learning? Where do we find that knowledge?

If "NO" ask: Why do you think there isn't such a complex body of knowledge about self-regulated learning?

(b) Do you have a similar depth of knowledge in these two areas – of science and self-regulated learning?

Ask Why? or Why not?

(c) Do your students have a similar depth of knowledge in these two areas – of science and self-regulated learning?

Ask Why? or Why not?

(d) Do you think students need the same DEPTH OF knowledge about these two areas to learn effectively in your lessons?

Probe the response, asking why for whatever answer is given.

INTERVIEW QUESTIONS (Page 3 of 3)

6. When we have talked with teachers about self-regulated learning strategies, some of them say that spending time in class lessons teaching self-regulated learning strategies is not as useful for the students as spending the time teaching them about subject matter content.

What is your view on this? Do you agree with the view put by that group of teachers? Explain why you agree or disagree.

DEMOGRAPHICS

Years of teaching experience	
Year level	
Gender	
Age	
Position description	
Curriculum area (s)	
Study background	

APPENDIX H: Emails to participants inviting member checking

EMAILS TO PARTICIPANTS INVITING MEMBER CHECKING

Pre- intervention Interviews

Hi everyone

I hope this email finds you well. Good news, I have finally finished transcribing the pre-interviews we did last term! Phew! it was quite the tedious task but all done.

As part of the research process, participants have the option to look over their transcripts and to clarify any potential ideas that i may interpret incorrectly. If this is of interest to you, then you have a few options;

Option 1: I can print off a copy of your transcript, you can take it away and annotate and then return to me.

Option 2: We can organise a 20 minute meeting and go through it together.

Option 3: You don't review the transcript and trust me to interpret using my own devices.

Either option is absolutely fine. I think option 2 is probably the most beneficial for me if you can spare the time. I'm in tomorrow (Wednesday) and Friday - let me know!

Shy

Post Intervention Interviews

Hi everyone

I hope this email finds you well. Good news, I have finally finished transcribing the post-interviews! Phew! it was quite the tedious task but all done.

As previously explained, and as part of the research process, participants have the option to look over their transcripts and to clarify any potential ideas that i may interpret incorrectly. If this is of interest to you, then you have a few options;

Option 1: I can print off a copy of your transcript, you can take it away and annotate and then return to me.

Option 2: We can organise a 20 minute meeting and go through it together.

Option 3: You don't review the transcript and trust me to interpret using my own devices.

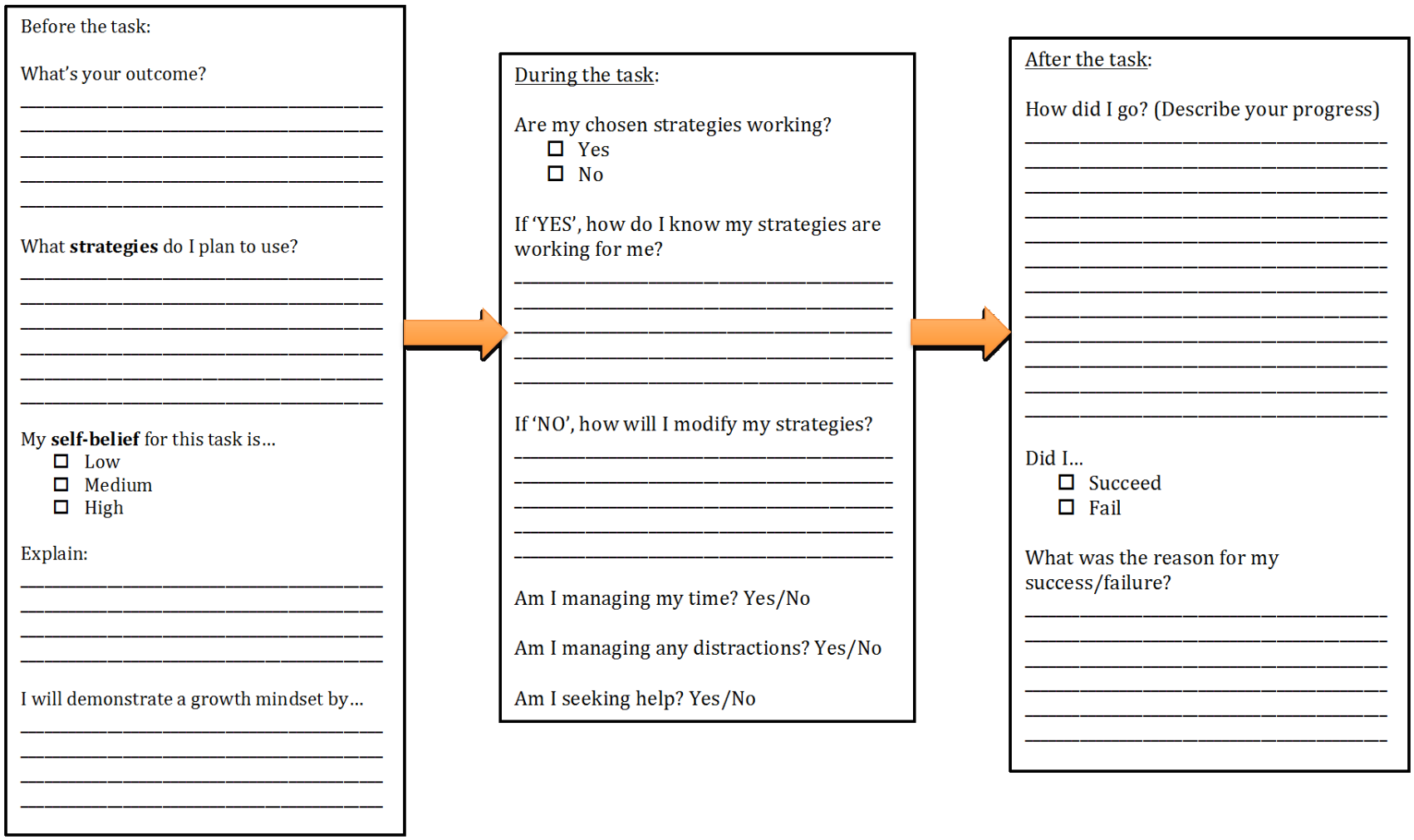
Either option is absolutely fine. I think option 2 is probably the most beneficial for me if you can spare the time. I'm in tomorrow or next week - let me know!

Shy

APPENDIX I: Final SRL Learning Protocol

Name: _____ **DATE:** _____

Task: _____



Constructed by Shyam Barr in collaboration with participants of the present study. Based on Zimmerman's triadic model of SRL

APPENDIX J: Professional development sessions plans

Professional development session 1: SELF-REGULATED LEARNING, An overview

Learning objectives:	• Know and understand the triadic model of self-regulated learning • Understand the benefits of self-regulated learning • Understand how to use the SRL Process Protocol as a metacognitive tool within the classroom	5 mins
Success criteria:	• Verbally justify why self-regulated learning is important • Draw the triadic model of self-regulated learning • Label and describe the corresponding sections • Plan the SRL Process Protocol against two activities (one per week)	
Starter:	Provide context for SRL Why SRL? (Justify) Discuss	10 mins
Main:	Direct instruction – 1. What is Self-regulated learning? 2. Go though each phase of the triadic model of SRL (providing copies of Figure 2 to participants) 3. The role of metacognition and learning protocols (Appendix I) 4. Implications for the classroom (learning protocols, Appendix I)	15 mins
Plenary:	Planning for the classroom – How will we implement the learning protocol?	10 mins
Resources	Texts: Cognitive Psychology and Instruction (Bruning, Schraw, & Norby, 2011), Classroom Instruction that works (Dean, Hubbell, Pitler, & Stone, 2012) Key articles: Becoming a Self-Regulated Learning- An overview (Zimmerman, 2002), Self-regulation of learning- Process approaches to personal development (Zimmerman & Labuhn, 2012)	

Professional development session 2: FORETHOUGHT PHASE (Motivation): Self-efficacy

Learning objectives:	• Know and understand the notion of self-efficacy • Understand how to improve self-efficacy in the classroom	5 mins
Success criteria:	• Be able to explain self-efficacy • Be able to identify students who have low or high self-efficacy • Be able to increase student self-efficacy using evidence based strategies	
Starter:	Activate prior knowledge **'What is self-efficacy?' (Prompting question)** Think, pair, share activity – Individuals will record their response to the listed question, then each person will share her response with a partner, and finally she will share her response with the group.	10 mins
Main:	Direct instruction – 1. Self-efficacy – what is it? How does it impact students? 2. Overview of current research in the field 3. Implications for the classroom (teaching strategies)	15 mins
Plenary:	Planning for the classroom – How will we implement these strategies?	10 mins
Resources	Texts: Cognitive Psychology and Instruction (Bruning et al., 2011), Classroom Instruction that works (Dean et al., 2012) Self-efficacy: The exercise of control (Bandura, 1997)	

Professional development session 3: FORETHOUGHT PHASE (Motivation): Learning goals/orientations (and mindsets)

Learning objectives:	• Know and understand the difference between performance and mastery orientation (including fixed and growth mindset) • Understand the benefits of a mastery orientation and the pitfalls of a performance orientation • Know and understand the strategies that teachers can use to shift a student's orientation.	5 mins
Success criteria:	• Explain the difference between performance and mastery orientation • Be able to identify students who have a learning or performance orientation • Suggest strategies on how to shift a student's orientation	
Starter:	Activate prior knowledge Hand out post-its. **"Can I change my intelligence?"** Reflect for 30 seconds and then, write down your response on your post-it. With a partner, discuss your response – do you both have the same opinion? Discuss.	10 mins
Main:	Direct instruction – 1. Difference between growth mindset and fixed mindset 2. Benefits of adopting a growth mindset/mastery orientation 3. Implications for the classroom	15 mins
Plenary:	Planning for the classroom – How will we implement these strategies?	10 mins
Resources	Texts: Cognitive Psychology and Instruction (Bruning et al., 2011), Classroom Instruction that works (Dean et al., 2012) Classrooms: Goals, structures, and student motivation (Ames, 1992) Mindset: How you can fulfil your potential (Dweck, 2012)	

Professional development session 4: FORETHOUGHT PHASE (Motivation)- Task analysis and Goal setting

Learning objectives:	• Understand why goal setting is important for student learning • Develop a deeper understanding of effective goal setting • Explore strategies for developing goal setting skills of students	5 mins
Success criteria:	• Be able to explain and justify the importance of goal setting for student learning • Be able to explain the difference between mastery and performance goals – is one better than the other? • Demonstrate a goal setting process	
Starter:	Prompting questions for discussion: 'What is goal setting? And what does it look like?'	10 mins
Main:	Direct instruction – 1. Goal theory (difference between learning/mastery goals and performance goals) 2. Benefits of getting students to actively set learning goals 3. Implications for the classroom	15 mins
Plenary:	Planning for the classroom – How will we implement these strategies	10 mins
Resources	Texts: Cognitive Psychology and Instruction (Bruning et al., 2011), Classroom Instruction that works (Dean et al., 2012)	

Professional development session 5: FORETHOUGHT PHASE (Cognition): Strategic planning & PERFORMANCE PHASE (Metacognition): Task strategies

Learning objectives:	• Know and understand the difference between maintenance and elaborative learning techniques • Understand the benefits of adopting elaborative techniques (from a memory perspective)	5 mins
Success criteria:	• Be able to explain the difference between maintenance and elaborative learning techniques • Be able to list 3 benefits of adopting elaborative techniques (from a memory perspective)	
Starter:	Activate prior knowledge "When learning, what cognitive strategies do you use?" "And what do your strategies do your students use?" Develop an initial list of current strategies	10 mins
Main:	Direct instruction – 1. Difference between maintenance and elaborative learning techniques and connections to memory 2. Benefits of adopting elaborative learning techniques (e.g. concept maps, summarising and note taking etc.) 3. Implications for the classroom (teaching strategies)	15 mins
Plenary:	Planning for the classroom – How will we implement these strategies	10 mins
Resources	Texts: Cognitive Psychology and Instruction (Bruning et al., 2011), Classroom Instruction that works (Dean et al., 2012)	

Professional development session 6: SELF REFLECTION PHASE (Motivation): Attributions

Learning objectives:	• Understand the notion of attributions and attribution theory • Know the dimensions of Weiner's attribution theory • Understand attributional retraining	5 mins
Success criteria:	• Be able to explain attributions and the attributional process • Be able to draw a table demonstrating the three dimensions of Weiner's attribution theory • Be able to engage in attributional retraining	
Starter:	Short reading related to attribution theory, page 116 – taken from Bruning et al. (2011)	10 mins
Main:	Direct instruction – 1. Attribution theory and attributional process 2. Three dimensions of Weiner's attribution theory 3. Implications for the classroom (teaching strategies) – specifically the process of attributional retraining	15 mins
Plenary:	Planning for the classroom – How will we implement these strategies	10 mins
Resources	Texts: Cognitive Psychology and Instruction (Bruning et al., 2011), An attributional analysis of personal and interpersonal motivation for collaborative projects (Peterson & Schreiber, 2006)	

APPENDIX K: Lesson plan checklists

Weeks 1 & 2 of Year 8 Research Project (following SRL PD Session 1)

Teacher name: _____

Checklist	Please tick if completed	Comments
1. In one (or more) of your lessons, please include a learning objective related to SRL (e.g. Understand the notion of a self-regulated learner, be able to describe a self-regulated learner)		
2. Explicitly introduce the concept of SRL. You may choose to use some of the following activities to discuss; • Think, Pair, Share - What is "self regulated learning"? (and why is it important for Science?) • Self-Regulated Learning PPT (student version - attached) • Discuss the idea of three phases of learning (what we bring to the task, what we do during the task and what we do after the task). • You could include an example on the board of the three phase model for a student doing their homework, conducting an experiment etc. • Get the students to think of a time when they self-regulated their learning - what happened? (Discuss the benefits) Then, segue to the SRL Process Protocol.		
3. Introduce the SRL Process Protocol		
4. Have students complete the SRL Process Protocol twice before the next PL session (preferably once per week). Please collect SRL Process Protocols and bring to the next session. From our discussions, one will be completed along side the Poster task, whilst the second is to be conducted with a shorter activity (to be decided by each individual)		

Weeks 3 & 4 of Year 8 Research Project (following SRL PD Session 2)

Teacher name: _____

Checklist	Please tick if completed	Comments
1. In one (or more) of your lessons, please include a learning objective related to self-efficacy (e.g. Understand the notion of self-efficacy, understand how self-efficacy impacts learning)		
2. Explicitly teach the concept of self-efficacy (linking back to notion of self-regulated learning). You may choose to use some of the following activities to discuss; • Maybe use a prompt (e.g. "if you think you can or think your can't, you're right") for discussion • Self-efficacy rating sheet • Discuss the correlation between self-efficacy and achievement (awareness precedes choice, choice precedes results) • Students could provide examples when they have held high self-efficacy beliefs and how this has impacted their performance Then, segue to the updated SRL Process Protocol.		
3. Introduce changes to SRL Process Protocol (inclusion of prompt for self-efficacy)		
4. Have students complete the SRL Process Protocol twice before the next PL session (preferably once per week). Please collect SRL Process Protocols and bring to the next session.		

Weeks 5 & 6 of Year 8 Research Project (following SRL PD Session 3)

Teacher name: _____

Checklist	Please tick if completed	Comments
1. In one (or more) of your lessons, please include a learning objective related to mindset (e.g. Understand the notion of mindset, understand how mindset impacts science learning)		
2. Explicitly teach the concept of mindset (linking back to notion of self-regulated learning). You may choose to use some of the following activities to discuss; • Maybe use the mindset quiz • Show the students a mindset video (there are plenty on YouTube- plenty!) • Share a time (e.g. story) when you had a fixed mindset and the impact this had on your achievement. Share a time when you had a growth mindset and the impact this had on your achievement • Model the language 'not yet/yet' (or get students to use this language) E.g. I don't get it… yet, I'm no good at science… yet, I can't do it… yet • Clarify the connection between effort/strategies and achievement. These are controllable factors (as opposed to ability, or external factors such as the teacher) Then, segue to the updated SRL Process Protocol.		
3. Introduce changes to SRL Process Protocol (inclusion of prompt for mindset)		
4. Have students complete the SRL Process Protocol twice before the next PL session (preferably once per week). Please collect SRL Process Protocols and bring to the next session.		

Weeks 7 & 8 of Year 8 Research Project (following SRL PD Session 4)

Teacher name: _____

Checklist	Please tick if completed	Comments
1. In one (or more) of your lessons, please include a learning objective related to the concept of outcomes/goal setting.		
2. Explicitly teach the importance of 'knowing your outcomes' (linking back to notion of self-regulated learning – this is part of the forethought section). You may wish to use some of the following; • Guide students to set specific but flexible outcomes. You may choose SMART (Specific, Measureable, Attainable, Relevant, Time-based). • Help students set challenging outcomes, rather than do your best outcomes, relative to the students' present competencies. • Provide students with a sentence stem such as "I know…", "I want to know…" or "I want to know more…" • Ask the student to clarify the reasons why he/she has set this particular target (purpose). Then, segue to the updated SRL Process Protocol.		
3. Introduce changes to SRL Process Protocol (Note: I have changed the language in the first prompt to 'what's your outcome?')		
4. Have students complete the SRL Process Protocol once before the next PL session. Please collect SRL Process Protocols and bring to the next session.		

Weeks 9 & 10 of Year 8 Research Project (following SRL PD Session 5)

Teacher name: _____

Checklist	Please tick if completed	Comments
1. Discuss with students the sheet of strategies… do they use any of them already? How effective are they for each student?		
2. Many of us implicitly teach strategies, but are there opportunities within our lessons to increase the explicit teaching of strategies? **Try the following;** • Use a prompting question; What strategies do you use… o When you are trying to get focused to do homework o To prepare for a test o To deepen your understanding of a text o To manage your time o To increase your self-efficacy o Etc. • Direct students to use a particular strategy (e.g. today we're going to talk about highlighting… I want you to use this strategy today and then reflect on if/how it helped you?) • Have students brainstorm strategies and commit to 2-3 of the most effective (open a dialogue about why they believe they are effective) • Provide students with a specific personal example when you set an outcome and then used strategies to achieve it (what strategies did you use?) • When giving students homework/task, ask students to report back on what strategy they chose to use, why they chose it and its effectiveness. Then, highlight the importance of strategies as part of the SRL Process.		
3. Have students complete the SRL Process Protocol once before the next PL session. Please collect SRL Process Protocols and bring to the next session.		

Weeks 11 & 12 of Year 8 Research Project (following SRL PD Session 6)

Teacher name: _____

Checklist	Please tick if completed	Comments
1. In one (or more) of your lessons, please include a learning objective related to the concept of 'attributions'		
2. Explicitly teach the concept of attributions to your students **Try the following;** • At the end of a task, Use a prompting question; Did you succeed or fail? (this may be in relation to their own perception, or a set of standards e.g. rubric or a finite set of answers) • Ask the students **what was the reason for your success/failure? Why did you succeed/fail?** • Explicitly discuss the concept of attributions (you may wish to use the table from the worksheet to explain the concept). Focus on the controllable vs. uncontrollable causes. • Help students shift attributions from uncontrollable to controllable causes. You can achieve this by prompting students to consider the strategies they employed, the effort they put in, etc. • Provide an example when you succeeded/failed… what did you attribute to this outcome? Then, segue to updated SRL Process Protocol		
3. Introduce changes to SRL Process Protocol (Note: I have added some prompts in the 'after the task' phase related to attribution		
4. Have students complete the SRL Process Protocol once before the interview.		