Eliminating the “Robotic” Idea of an Unmotivated Student:
How Ontario Junior Secondary School Science Teachers Foster
Students’ Self-Regulated Learning Skills

By

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Abstract

This study qualitatively explored, through semi-structured interviews, how Ontario junior secondary school science teachers seek to foster students’ self-regulated learning (SRL) skills. The sample of participants included three Ontario junior secondary science school teachers who teach in the GTA and have supported students who lacked motivation, engagement, and/or metacognitive awareness. The data analysis revealed four major themes: teacher definitions of students’ self-regulated learning; reported factors that influence students’ SRL skills; teachers’ perspectives on and general beliefs about student learning; and reported methods used by teachers seeking to foster students’ SRL skills. With these themes in mind, it was found that these teachers could successfully define and report on their teaching methods which cover aspects of self-regulated learning, such as *motivation* and *engagement*. However, it was more difficult for when defining and discussing *metacognitive awareness*, one of the major aspects of SRL. A few broad implications that arose from this study include: some teachers may not be educated or trained enough on how to assess, monitor or even foster students’ SRL skills in the classroom; they may not be aware of the importance of students’ acquiring SRL skills or what the outcome is if they are fostering these SRL skills; and finally, students, teachers, and parents all may not be modelling appropriate, effective or even important SRL skills for the students to learn or adapt themselves. The final results indicate that replications and modifications of this study need to be conducted to better understand how Ontario junior secondary school science teachers are fostering students’ SRL skills and the effects of these on students’ academic achievement and metacognitive practices.

**Key Words:** Self-regulation, Self-regulated learning, Teachers, Junior Science, Secondary Schools, Motivation, Engagement, Metacognition
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Chapter 1: Introduction

1.0 Introduction to the Research Study: Research Context and Problem

In Ontario, students are required to complete both Grade 9 and 10 general science courses in order to graduate and receive their Ontario Secondary School Diploma (Ontario Ministry of Education [OME], 2015). Senior science courses in Grades 11 and 12 are optional electives for students. Junior secondary students include those in Grade 9 and 10 or generally those between the ages of 14 and 16. The general science courses are a combination of chemistry, biology, physics, and Earth and space science. According to the Ontario curriculum (OME, 2008), the main goal of science education is that all students, by the end of Grade 10, are scientifically and technologically literate; this refers to “one who can read and understand common media reports about science and technology, critically evaluate the information presented, and confidently engage in discussions and decision-making activities regarding issues that involve science and technology” (OME, 2008, p. 3). Three goals of the Ontario junior science programs are: “(1) to relate science to technology, society, and the environment; (2) to develop the skills, strategies, and habits of mind required for scientific inquiry; (3) to understand the basic concepts of science” (OME, 2008, p. 16). There are two course levels for students to take. The first develops students’ “knowledge and skills through the study of theory and abstract problems” and is known as academic (OME, 2008, p. 11). In the second, students “focus on the essential concepts of a subject, and develop … knowledge and skills through practical applications and concrete examples” and is known as applied (OME, 2008, p. 11). In order for students to take the Grade 10 general science course, they must successfully complete the Grade 9 general science course.

When looking at Ontario students’ academic performance in science, there has been a notable decline over the last decade (Brochu, Deussing, Houme, & Chuy, 2012; EQAO, 2012).
The Trends in International Mathematics and Science Study (TIMSS) assessment measures trends in math and science achievement for students in Grades 4 and 8. In 2003, 81% of students in Grade 8 reached the intermediate science benchmark in Ontario, which fell to 77% of students in 2007 and 76% of students in 2011. The scores for Grade 4 students in science declined as well. The average Ontario science test scores for both grades were at the intermediate international benchmark. Overall, Ontario students in Grades 4 and 8 have declined in science achievement from 2003 to 2011 (EQAO, 2012). Another test known as PISA (Programme for International Students Assessment) measures 15-year-old students’ performances in reading, math and science. From 2006 to 2012, Canadian PISA results for science decreased 9 points. In 2012, Ontario’s results showed a ‘B’ score for basic science skills and a ‘C’ score for high-level science skills. While Ontario PISA scores remain within the Canadian average for science, there has been a notable decline in students’ science skills since 2006 (Brochu et al., 2012). Although there are no recent statistics on junior secondary students’ performance in science, it is evident from these findings that students’ science grades and skills are declining.

A few studies have looked at the potential reasons for the decline of students’ science grades, skills and interest. A study (Potvin & Hasni, 2014) in Montreal QC – a city very close to Ontario where the present study is sited – found that students from Grades 5 to 11 decreased in in-school science and technology interests and increased in out-of-school science and technology interests. Science and technology are seen as being increasingly difficult (Potvin & Hasni, 2014). Students in Grade 11 at a middleclass suburb school in Montreal, Canada, who had a high-interest in science were found to use more cognitive learning and metacognitive learning strategies (McWhaw & Abrami, 2001). Students’ attitudes toward and interests in science are indicators of their academic achievement (Häussler & Hoffmann, 2000) and use of
metacognitive strategies (McWhaw & Abrami, 2001).

To appreciate metacognitive strategies used by students in science, it is important to understand self-regulation. Self-regulation refers to the process one uses to activate and sustain their thoughts, behaviours, and emotions in order to reach set goals (Zimmerman & Schunk, 2011). Paris and Winograd (1999) noted for teacher educators that, self-regulated learning is the way students’ approach problems, apply strategies, monitor performance, and interpret their outcomes with reference to their efforts. Self-regulated learners understand and control their own learning environment and behaviours (Zimmerman, 2000). They set their own learning goals, are accountable for their learning and continually invest effort into their learning to achieve their set goals (Schunk & Zimmermann, 2003). There are three main components of self-regulation. The first component is cognition, which refers to the mental action or process of obtaining knowledge. Cognition includes specific skills that are needed to encode, memorize and recall information. The three types of learning skills of cognition include: cognitive strategies – i.e., individual tactics used to improve learning, problem solving strategies – i.e., ways to solve specific problems, and critical thinking skills – i.e., the analysis and evaluation of new information with prior knowledge (Schraw, Crippen, & Hartley, 2006; Zimmerman 2000). The next component of self-regulation is metacognition, which refers to the understanding and awareness (Dinsmore, Alexander, & Loughlin, 2008), as well as the control (Thomas & Anderson, 2014) and monitoring (Schraw et al., 2006) of one’s cognition.

There are two elements of metacognition. The first component is knowledge of cognition, which refers to what one knows about their own cognitive processes and the way they assess their learning prior to and after. The next is regulation of cognition, which refers to the way one controls and monitors their learning: i.e., planning, revising, testing, and evaluating (Baker &
Brown, 1984; Dinsmore et al., 2008; Kaberman & Dori, 2009). The final component of self-regulation is *motivation*, which refers to one’s general desire or willingness to do something. One’s beliefs and attitudes can alter one’s use and development of their cognitive and metacognitive skills (Schraw et al., 2006; Zimmerman 2000). The two subcomponents of motivation are self-efficacy and epistemological beliefs. Self-efficacy is the degree that an individual is confident they can perform a specific task. Epistemological beliefs are either distinct or world views about the origin and nature of knowledge (Schraw et al., 2006).

Self-regulation in a learning or academic environment is known as *self-regulated learning* (Dinsmore et al., 2008). Self-regulated learning (SRL) focuses on how learners plan, monitor and control their learning processes on a given task (Kostons, Van Gog, & Paas, 2012; Zimmerman, 1990). The three factors involved in SRL are context and knowledge of learning, motivation to learn (Dinsmore et al., 2008) and volition (Corno, 2001). These three factors play a role in the cycle of self-regulated learning. There are three phases in the SRL cycle. Phase 1 is known as the *Forethought Phase* which involves task analysis and self-motivational beliefs. One needs to set clear and reasonable goals as well as plan strategic ways to accomplish the task. The second phase is known as the *Performance or Volitional Control Phase* which involves practicing self-control (i.e., self-instruction, task strategies, focus, and effort enhancements) and self-observation (ranking performance, surrounding conditions and effects). The third and final phase is the *Self-Reflection Phase* which involves looking at one’s performance in regard to the original set goal and reflecting on what occurred. Both self-judgment and self-evaluation are used. Each of these three phases flow into the next creating a cyclical nature of self-regulated learning (Schunk & Zimmerman, 1998).
Many studies focusing on students’ academic performance have shown the importance of students possessing self-regulatory skills (Eilam & Reiter, 2014; Kostons et al., 2012; Ning & Downing, 2012) and metacognitive practices (Kaberman & Dori, 2009). Teachers who gear their lesson plans and classroom activities towards promoting metacognitive awareness and self-regulative skills have been found to improve their students’ content knowledge (Kostons et al., 2012) and academic grades (Ning & Downing, 2012). Self-regulated learners have both academic learning skills and self-control skills; in turn, allowing students to be more productive in school and academically motivated (Murphy & Alexander, 2000). Further studies (Kostons et al., 2012; Ning & Downing, 2012; Schraw et al., 2006) show the importance of promoting SRL in science classrooms. These will be discussed in detail in the following chapter.

With the knowledge of both what self-regulated learning is along with how SRL and metacognitive awareness positively impacts student learning and academics – as noted above, it would be expected to be a focal point in education. An in-depth analysis of ‘The 2008 Ontario Curriculum Grade 9 and 10 Science’ found little mention of promoting or encouraging students’ self-regulatory skills in the classroom. It would be anticipated to find this language of SRL in the ‘Roles and Responsibilities in the Science Program’ section of the curriculum document under the teacher subsection. In this section, it states that teachers are required to use:

A variety of instructional, assessment, and evaluation strategies, teachers provide numerous hands-on opportunities for students to develop and refine their investigation skills, including their problem-solving skills, critical and creative thinking skills, and communication skills, while discovering fundamental concepts through inquiry, exploration, observation, and research (OME, 2008, p. 8).
The segment from the Ontario Ministry of Education documents quoted above highlights the use of problem-solving and inquiry skills, which are also instructional strategies for improving SRL. There is no further mention of encouraging other important self-regulated skills such as planning, monitoring and evaluating learning or stimulating self-efficacy and personal beliefs (Schraw et al., 2006). Teachers should arguably foster students’ SRL skills in order to aid students in completing the required science courses, increase academic success and generate motivation to continue taking science in order to open up the possibility of a potential science career.

In sum, the OME (2015) requires students to successfully complete the Grade 9 and 10 general science courses. However, over the last decade, there has been a decline in students’ science interest (McWhaw & Abrami, 2001; Potvin & Hasni, 2014), grades (EQAO, 2012) and scientific skills (Brochu et al., 2012). These declines may be due to students lacking SRL skills. Contemporary science education has also greatly declined in student achievement, interest and enrollment in science courses around the world. A reformation of the current focuses of science education needs to happen in order to attract and engage students in science learning (Osborne & Dillon, 2008). Whilst junior science secondary school teachers are required to create lessons that adhere to the curriculum standards set by the Ontario Ministry of Education, there is no specific reference to teachers fostering students’ SRL skills in their Grades 9 and 10 science classrooms. The absence of curricular directives does not necessarily mean that Ontario junior level science teachers are not, in fact, explicitly teaching and stimulating students’ self-regulatory skills in the classroom. Furthermore, while there has been an increasing trend of quantitative studies on self-regulated learning, there have been very few qualitative studies that focus on SRL, especially in a science classroom, at the junior secondary school level.
1.1 Purpose of the Study

The purpose of this qualitative study was to explore how Ontario junior secondary science teachers reportedly seek to foster students’ self-regulated learning skills. I explored this topic by interviewing a sample of these teachers about their reported efforts to include SRL skills in their lesson plan design and perceived learning outcomes; and their beliefs and understandings about self-regulated learning along with the importance of promoting these skills in the classroom. I aimed to share these findings with the educational research community in order to further inform teachers of the importance of SRL in junior science classrooms and share best practices. I also intended to discover and understand how to implement SRL skills – especially in science classrooms, and the importance of doing so in the classroom.

1.2 Research Topic and Questions

The primary question guiding this qualitative research study was: How are Ontario junior secondary school science teachers seeking to foster students’ self-regulated learning (SRL) skills? Sub-questions to further guide this inquiry include:

1. What are junior secondary science teachers’ perspectives and general beliefs about promoting self-regulated learning in their classrooms/lessons?

2. What do junior secondary science teachers define as self-regulated learning?

3. How are junior secondary science teachers reportedly implementing SRL in their classrooms/lessons and what are their perceived outcomes?

1.3 Background of the Researcher

Science has always been the school subject that I enjoyed most and received my greatest marks in. It is widely known that STEM fields are generally more accessible to men and people of privilege. As a female student who comes from a middle-class family comprised of bankers
and blue collar workers, science was not either of my parents’ forte. Although science was not an interest of my parents or step-parents, it was definitely one for my biological brother and me. With continuous efforts and countless hours of studying science – specifically chemistry – I was able to achieve honour roll marks that opened many post-secondary school doors. It was this motivation to do well along with the continuous support and encouragement from my brother and family that allowed me to take my interest in science to the next level. In Winter 2015, I completed an Honours Bachelor of Science double degree in Chemistry and Psychology at Wilfrid Laurier University (WLU).

For seven semesters, I had the privilege of being an Instructional Assistant (IA) for the Chemistry Department at Wilfrid Laurier University for Year 1 chemistry students. During this, I noticed a great decline in students’ grades and effort. I also noticed a greater number of students each semester not handing in assignments or submitting them incomplete. After realizing this decline in both effort and grades – similar to the decline in Ontario for science students (Brochu et al., 2012; EQAO, 2012) – I developed a strong interest in learning the methods teachers use to encourage and improve students’ motivation (i.e., SRL skills) in science.

During my final year of university, I completed a thesis in Chemical Education. I looked at the effect of specific learning tools used by Year 2 University Organic Chemistry students on metacognitive practices. It was found that these students were aware of what they did and did not know, with this being the awareness of metacognition; however, they did nothing about it, with this being poor self-regulation. This finding enticed me to look further into SRL in the sciences at a younger age. Determining if junior secondary school science teachers promote SRL in the classroom and how they do so interests me as my goal is to become a secondary school science teacher. I strongly believe that SRL is very important for students’ knowledge and academics.
As mentioned, STEM education gears towards those who are both male and privileged. Despite this, I completed a university science degree and earned a spot on the Deans Honour Roll list in my final two years. Having a science background will allow me to connect with other female science teachers and research ways to implement the development or enhancement of students’ SRL skills in their lesson plans and classroom. Being a female in the sciences may hinder or challenge me when seeking participants since majority of science teachers are males and may not want to engage in my interviews. However, I will remain aware of this to the best of my ability.

1.4 Overview of the Whole MTRP

To respond to the research questions, I conducted a qualitative research study using purposeful sampling to interview three Ontario junior secondary school science teachers on how they seek to foster students’ self-regulated learning skills in the classroom. In chapter 2, I reviewed the literature on the known effects of SRL in secondary school classrooms, teaching strategies used to promote SRL (focusing on science classrooms), and teachers’ beliefs of SRL. Next, in chapter 3, I elaborated on the research design. In chapter 4, I reported my research findings and discussed their significance in light of the research literature. In chapter 5, I identified the implications of the research findings for my own teacher identity and practice, and for the educational research community more broadly. I also articulated a series of questions raised by the research findings and point to areas for future research.
Chapter 2: Literature Review

2.0 Introduction

In this chapter I review literature in areas concerning the definition of self-regulated learning (SRL). Next, I discuss the important findings of SRL in junior and senior secondary classrooms. Finally, I will review some of the key features of a high SRL environment and common teaching practices that have been tested and implemented which have been found to improve students’ self-regulatory skills in the classroom.

First, however, I will briefly review the definition and important features of self-regulated learning from Chapter 1. More specifically self-regulation, self-regulated learning, and the self-regulated learning cycle which have all been described in greater detail in the previous chapter.

To reiterate, self-regulated refers to setting goals and taking responsibility in one’s learning process (Asikainen, Parpala, Virtanen, & Lindblom-Ylänne, 2013). Self-regulation involves self-control, self-managements, self-discipline, and self-directed behaviours (Zimmerman & Kitsantas, 2014). Self-regulated learning is the concept of self-regulation in a learning environment, such as a classroom. Self-regulated learning (SRL) encompasses metacognition – being aware of what you do/do not know (Sindhwani & Sharma, 2013), cognition – what you actually do/do not know, and motivation, or the drive to do something (Dinsmore et al., 2008). SRL is a goal-directed learning, where one is aware of their learning processes and knowledge, plans, monitors and evaluates their learning process, and seeks cognitive challenges and varying learning goals (Pino-Pasternak, Basilio, & Whitebread, 2014; Zimmerman & Schunk, 2011). Self-regulated learners understand that they are learners (Zimmerman, 1990), take on challenging tasks, thoroughly understand every aspect of their learning materials, and exert their efforts to strategically implement tactics that acquire the skills and knowledge to successfully
complete a specific learning task (Kan’an & Osman, 2015; Zimmerman, 1998). As well, self-regulated learners set their own learning goals, are accountable for their learning and continually invest effort into their learning to achieve their set goals (Schunk & Zim-mermann, 2003). Students who are self-regulated engage in the self-regulated learning cycle involving three stages: Forethought, Performance and Self-Reflection. Students’ strategies are coined self-regulated when they are metacognitively monitoring how they are using their learning strategies. Self-satisfaction is also an important subprocess (DiBenedetto & Zimmerman, 2013). Self-regulation skills are known to influences students’ achievement and engagement in their learning (Boekaerts & Cascallar, 2006).

2.1 Methods for Assessing Students’ Self-Regulated Learning

There are many methods used in educational studies to measure students’ self-regulated learning. These can be either qualitatively or quantitatively measured and can be obtained either from the teacher or directly from the student. A few of the most commonly used methods for assessing students’ SRL skills include: student surveys, observations, interviews, logs or diaries, think-aloud methods, and microanalysis (DiBenedetto & Zimmerman, 2013). There are many pros and cons to varying measurements when used alone. Student surveys are the most used method for assessing SRL since they are very cost effective; however, they are limited to what students report which depends on students’ memory (Winne & Perry, 2000). Direct observation and interviews allow researchers to examine students naturally yet these are very time-consuming to analyze and students may alter their answers to what they believe the research is expecting to hear (Wolters, Benzon, & Arroyo-Giner, 2011). Another method used for assessing students’ SRL is diaries and logs. These are structured and written by the participant themselves. In diaries and logs researchers can identify key processes of SRL such as time management, self-
satisfaction and goal setting. Unfortunately, in diaries or logs, students may alter their responses, forget to include key components of SRL or fail to include negative incidents that occurred in their learning. Trace logs can be completed online and the researcher can track students’ learning methods (Winne & Perry, 2000). It is best if trace logs are combined with other assessment tools. During learning a method called think-aloud has been used during a science task where students verbalize their thought process to a researcher (Greene & Azevedo, 2007). The cons to this method are that students may have difficulty trying to verbalize how they are thinking and the researcher’s prompts can intrude on the students’ learning. A final method used to measure students’ SRL is microanalysis. This is where students receive probes for self-regulation processes and are tested before, during and after their learning experience with context specific questions. During microanalysis students’ self-regulated thoughts, behaviours and feelings can be obtained; however, students’ personal biases may alter results (Zimmerman, 2008). As discussed in this section there are many methods used in educational studies to measure students’ self-regulated learning. Now, I will discuss specific research studies on students applying their self-regulated learning skills in both junior and senior secondary classrooms.

2.2 Research Studies on Students Applying Their Self-Regulated Learning Skills

Recent studies both inside and outside of the science classroom have emphasized the importance of students possessing self-regulated learning skills in junior, senior or post-secondary classrooms. I review findings on each of these in turn.

2.2.1 Junior secondary students

In an Israeli study (Eilam & Reiter, 2014), grade nine science students who were taught in a self-regulated learning focused classroom significantly outperformed students who were taught in a teacher controlled classroom. Both self-reported and enacted SRL improved over time
when students were taught self-regulation techniques. Learning these SRL techniques correlated positively with students’ science knowledge and academic achievement. Self-regulated students are more conscientious, construct greater knowledge, and can understand and apply their knowledge more than non-self-regulated students (Eilam & Reiter, 2014). Teaching students SRL skills aid them in promoting awareness of their learning strategies, thinking skills, learning behaviours, and the appropriate ways to apply them. Self-regulated learning can be promoted both in-class and online. An online science learning study focused on Grade 8 and 9 inquiry skills and self-regulative processes. Higher level inquiry skills correlated with greater self-regulated activities. In this same study, during the online learning, students were given various forms of support to guide their learning. These included task specific goals, progress monitoring, reflections, and feedback with correct answers from peers. Giving students the opportunity to reflect at particular stages during their learning fostered self-regulative activities and enhanced students’ inquiry skills during activities. Overall, for this study, evaluation had the strongest effect on students’ inquiry and self-regulation skills while the monitoring and reflection stage helped students increase their awareness, time management and quality of planning. Students also improved in formulating research questions and hypotheses, and drawing conclusions (Pedaste & Mäeots, 2012). Students gaining self-assessment and task-selection skills are important in self-regulated learning. Training these self-assessment and task-selection skills enhanced students’ knowledge and academic performance (Kostons et al., 2012). Another study of Grade 10/11 science classes focused on self-directed learning which encompasses motivation, self-regulation and metacognition. Self-directed learners make their learning more meaningful by displaying a greater responsibility to learning and monitoring their learning independently. Self-directed learning readiness scores predicted high achieving national science exam scores in
Qatar. Self-directed learning skills are essential for students to succeed to their fullest potential academically (Kan’an & Osman, 2015). Self-regulation significantly predicts both students’ and teachers’ measures of students’ academic achievement in science courses and accounts for over half of the variance in students’ increased GPA (Zimmerman & Kitsantas, 2014). Students who use their metacognitive abilities, such as monitoring and self-reflection, allow them to strategize ways to achieve their set goals and ultimately improve their learning process and outcomes (Brown & Pressley, 1994).

2.2.2 Senior and post-secondary students

Recently there have been a few studies that concentrate on nurturing students’ SRL skills in senior and post-secondary classrooms with varying methods of assessment. Self-regulation and motivation mediate the effects of students’ learning experiences. Students who rate their learning experience to be negative had an increase in their academic performance when both self-regulation and motivation were enhanced (Ning & Downing, 2012). Microanalysis subprocesses such as strategic planning, metacognition, task strategies and self-evaluation standards significantly correlate with teacher’s reports of their students’ self-regulated learning and measures of achievement. Teacher ratings of students’ SRL outcomes, along with microanalysis measures of students self-scoring tests (in the moment, in person or online) at each of Zimmerman’s three phases of the SRL cycle, revealed that students’ self-reports of SRL are valid predictors of students learning even more so than teacher rating measures (DiBenedetto & Zimmerman, 2013). Effective use of strategies can positively influence students’ performance and learning (Wolters et al., 2011) which is found in Zimmerman’s second phase of SRL cycle – performance phase. Higher achieving science students use a greater number of self-regulated learning processes, with the greatest use in metacognitive monitoring and self-evaluations. Self-
regulated students are able to form more strategic plans and study strategies. They also have higher self-evaluative standards and metacognitive awareness. Students’ responses to specific questions regarding their study plans highly predict their academic performance (DiBenedetto & Zimmerman, 2013). Students who received more metacognitive strategies in class were able to pose more complex questions on current chemical literature, elaborate on their previously asked chemistry questions, and use said strategies to improve their metacognition. Students who are aware of their own cognitive processes and possess greater metacognitive knowledge display successful learning outcomes (Kaberman & Dori, 2009). Similarly, high interest goal-oriented students use more metacognitive strategies and select more main ideas than low-interest goal-oriented students. Rewarded students outperformed learning goal-oriented students when selecting main ideas (McWhaw & Abrami, 2001). Students that complete self-monitoring exercises, receive immediate feedback on their performance and can self-reflect during their learning show improvements in their performance predictions, self-efficacy and self-satisfaction. Students receiving this support improved their science exam scores and performance along with improvements in their self-monitoring skills (Leggett, Sandars, & Burns, 2012). Many high achievers learn and understand course content better than low achievers. They tend to have more motivation to learn and better time management skills. Some high achievers may resort to poor learning skills depending on the format the exam and where to emphasize their time and effort. Organizing studying, managing effort and time, and utilizing self-regulated skills effectively are important approaches to learning that will aid students at varying levels of achievement to succeed in a science course (Asikainen et al., 2013). Students who practiced their SRL skills and promoted related self-regulative abilities showed an increase in their academic achievement and mental flexibility, allowing for learning adaptations (Eilam & Reiter, 2014).
2.3 Teachers’ Role in Fostering Students’ Self-Regulated Learning Skills

Each student’s self-regulation is unique; how they plan and monitor their learning depends on their desires, perspectives, personal reflective habits and awareness of their learning (Paris & Paris, 2001; Paris & Winograd, 1999). Every student, regardless of their academic abilities, can improve their SRL skills and academic achievement (Kiewra, 2002). Teachers can educate their students on ways to become more strategic, motivated, and independent learners to improve their SRL skills (Paris and Paris, 2001). Teachers need to plan and implement effective pedagogical strategies, in science, to increase students’ motivation and self-regulation (Velayutham & Aldridge, 2013). When teachers use language that promotes more in depth processes that targets students’ metacognitive knowledge, there is an enhancement in their metacognition (Thomas & Anderson, 2014). For learning to be effective, teachers need to nurture self-regulated learning in order to meet the rising demands of present-day science education goals (Schraw et al., 2006).

2.3.1 Common teaching practices used to foster students’ SRL skills

Recent studies on and around self-regulated learning have identified various common teaching practices that have been found to effect student learning and self-regulated behaviours. I review the methods and ideas teachers use for self-regulated learning, self-evaluation and management, and motivation in the classroom.

2.3.1.1 Methods and ideas for SRL

Investigating students’ self-regulated learning behaviours – such as planning, monitoring, problem-solving and evaluating, shows the importance of the nature and degree of support needed for students to successfully self-regulate (Perry, VandeKamp, Mercer, & Nordby, 2002). Pedagogical practices and classroom arrangements that foster SRL contribute to positive
academic outcomes. Some techniques that are known to significantly promote students’ SRL skills include: formative evaluation, teaching cognitive/metacognitive strategies, encouraging self-questioning and verbalization, problem solving techniques, cooperative learning and peer tutoring. Understanding students’ perceptions and their interpretations of classroom activities are key in understanding their engagement in self-regulated learning (Hattie, 2009; Pino-Pasternak et al., 2014).

At all stages of inquiry learning, self-regulatory skills are needed to support students’ cognitive and metacognitive processes, along with generating greater understandings of new content knowledge (Pedaste & Mäeots, 2012). Teachers need to incorporate metacognitive experiences into their classrooms to support students in their responding and understanding of their metacognitive knowledge, strategies and goals (Flavell, 1979). Providing students with time to find main ideas and properly understand these can improve their metacognitive strategies (McWhaw & Abrami, 2001). Students need to understand self-regulated and metacognitive strategies in order to guide and direct their learning. Being able to orient oneself prior to a learning task, collecting relevant information and views to integrate, and assessing one’s comprehension and progress are all important concepts to encourage in the classroom (Boekaerts & Corno, 2005). Self-regulated volitional strategies are important to have in a classroom where obstacles may arise that requires one to comply with social expectations and rules (Corno, 2001). Teaching students how to enact metacognitive strategies positively effects their SRL skills (Leidinger & Perels, 2012).

Teachers can directly promote SRL by using explicit instruction, reflection, and metacognitive discussions or indirectly by modelling self-regulated behaviours, discussing personal growth and including time for reflection (Paris & Paris, 2001; Paris & Winograd, 1999).
Overall, some meaningful suggestions for teachers to engage students’ SRL skills are by providing them with learning options, chances to take full control of their learning, and allotting time during class for self- and peer- learning evaluations (Perry et al., 2002). Giving students detailed handouts with simple diagrams or tables, supplementary resources, examples that link content to internal/external connections and opportunities for self-explanations can all help to increase students’ content knowledge and assists them in their learning (Kiewra, 2002).

Classroom instruction should extend beyond factual knowledge to implement students’ SRL (Moos & Ringdal, 2012). Providing students with instrumental support through questions, corrections, clarifications, and modelling are all found to improve students’ SRL skills, enable higher levels of thinking, and develop independent learners (Perry et al., 2002).

2.3.1.2 Self-evaluation and management of learning

Students have a deeper understanding when self-appraisal and self-reflection are involved in their learning. Focusing students’ awareness on personal learning strategies and evaluating themselves as well as others learning processes and outcomes expands their self-efficacy and problem solving skills (Paris & Paris, 2001; Paris & Winograd, 1999). Self-assessment and task-selection skills can be taught through observation or modelling. Instructing students on how to evaluate their performance, the rules for assessment and task-selection, and allowing time to practice these are beneficial to their students on future learning tasks (Kostons et al., 2012).

Evaluations allow students to look at personal progress and errors as opportunities to learn (Perry et al., 2002) and lets the learner know if they met their goals and ways to improve them. Students who continuously monitor their progress improve in their awareness of strategies, applications, quality of planning and inquiry skills (Pedaste & Mäeots, 2012). Gaining self-assessment skills enhances students’ content knowledge, improves their academic performance, and overall
enhances their effectiveness to self-regulate (Kostons et al., 2012). Self-management is also important for problem solving. Students need to know how to set attainable goals, effectively plan and monitor their time and resources, and assess their learning (Paris & Paris, 2001; Paris & Winograd, 1999). Refining time management skills improves quality of planning. Reflection improves students’ regulative skills of evaluation, planning and monitoring (Pedaste & Mäeots, 2012).

2.3.1.3 Motivating students to learn

Self-regulated learning is cognitively demanding on students; they need to be motivated to invest this effort into their learning. Students need to use motivational strategies to aid their learning and the amount of effort required (Paris & Paris, 2001). Providing students with clear task goals and requirements, and opportunities to investigate, construct, and analyze their learning can improve their self-regulation and motivational skills. Psychosocial features of the classroom environment and student cohesiveness can also influence students’ motivation (Velayutham & Aldridge, 2013). Although motivation differs between students, it is affected by the social and academic features of the learning environment. Altering teaching styles, curricula, and school and classroom policies can directly enhance students’ motivation to learn (Urdan & Schoenfelder, 2006). A way to enhance the motivation of students is by providing “attention to the features of the learning environment, both social and academic, that affect motivation and a willingness to view motivation as more than an individual-difference variable” (Urdan & Schoenfelder, 2006, p. 346). Teaching students in ways that are both motivating and self-regulating are found to improve students’ academic performance (Ning & Downing, 2012).
2.3.2 Classroom environments that promote SRL

Classrooms that promote SRL have students whose attitudes and actions align with learners who are both independent and academically effective (Zimmerman, 1990). The classroom environment and instruments used can act as indicators when monitoring changes associated with students’ metacognition (Thomas & Anderson, 2014). Self-regulated learning environments facilitate students to make decisions about their learning and their learning environment, promote respect for individual views, and encourage students to create and achieve mastery goals (Jang, Reeve, & Deci, 2010). The classroom environment has a strong association with students’ academic efficacy (Dorman, 2001), therefore teachers need to challenge students without threatening their self-efficacy. Self-regulated learning environments help students to react purposefully as they create greater awareness of self, social context and environmental cues (Eilam & Reiter, 2014).

Learning environments that relate new knowledge to already existing knowledge, have real-life applications, and are open to cooperative learning all aid students in furthering their understanding of course material (Dignath-van Ewijk, Dickhäuser, & Büttner, 2013) and fosters new knowledge. The teacher’s behaviours, instructions and expectations are some environmental cues that trigger self-regulating strategies. Social interactions between the learner and their teacher or peers plays a significant role in the development of self-regulatory skills (Boekaerts & Cascallar, 2006). Teachers need to focus on their own SRL skills, so that they can reflect on their teaching practices and discover ways to improve them for their students (Moos & Ringdal, 2012). For experienced teachers to support self-regulated learning environments, they need to be willing to experiment with new teaching techniques and reflect on their effectiveness (Winne & Perry, 2000). Teachers need to give students feedback to guide students in their learning and
receive feedback from students to guide them in ways to effectively teach and self-regulate (Dignath-van Ewijk et al., 2013).

2.3.3 Testing students’ SRL

To better students’ learning, teachers need to understand the underlying reasons for the changes in students’ SRL and the ways to identify them (Boekaerts & Cascallar, 2006). There are many questionnaires available that measure students’ self-regulated learning and metacognitive practices. Researchers tend to use student questionnaires. In order for teachers to better understand their students’ learning, they need to assess their students’ metacognitive strategies and self-regulation through observations and student ratings (Dignath-van Ewijk et al., 2013). Gathering both motivational and self-regulated learning information from students, specifically in science classrooms, can help develop how teachers set up their classroom and deliver the content and curriculum. A questionnaire comprised of 30 questions that assess students’ goal orientation, self-efficacy, task value, and self-regulation is known as a SALES (Students’ Adaptive Learning Engagement in Science) questionnaire. The SALES questionnaire is known to have high content, face, convergent, discriminant, predictive and concurrent validity (Velayutham, Aldridge, & Fraser, 2011). This questionnaire is made for science classrooms to help teachers understand ways to develop students’ motivational beliefs and self-regulation. To deeply understand what students think, feel and undertake, teachers must combine different assessment tools to assess their students’ learning, self-regulation and motivation. These assessment tools help to show how self-regulation changes over time based on students’ perceptions, beliefs, and psychological needs (Boekaerts & Cascallar, 2006).

2.3.4 Teachers’ perspectives on and beliefs about SRL

Teachers’ beliefs are predictors of their behaviours (Dignath-van Ewijk & van der Werf,
2012) and willingness to promote SRL in the classroom. Teachers need to formulate beliefs that incorporate methods of promoting students’ SRL and their own self-regulation in the classroom (Winne & Perry, 2000). The way teachers perceive situated learning can affect how their students self-regulate (Dignath-van Ewijk et al., 2013). Many teachers assume that SRL and student autonomy go hand in hand. They are aware of creating learning environments that allow students to self-regulate and they have positive beliefs towards SRL; however, they are not aware of ways to foster students’ SRL skills into their classroom. Teachers should provide students with a constructivist learning environment and learning strategies that emphasize students’ self-regulated learning (Dignath-van Ewijk & van der Werf, 2012). Secondary teachers noted that the ‘development of students’ and ‘pedagogy’ are important goals of their teaching. Social activities, personal involvement, positive atmospheres, and students’ study environment were thought to be the most important factors for student learning. Secondary teachers also believed that regulated learning is done by both the teacher and the learner. Secondary teachers focus more on the variation between their students rather than the content itself. It is important for teachers to incorporate both the content and student focus into their classrooms to prepare their students for post-secondary education (Oolbekkink-Marchand, van Driel, & Verloop, 2006).

2.4 Conclusion

In this literature review I examined research related to self-regulated learning in general and science classrooms, common teaching practices that have been tested and implemented to “improve” students’ self-regulatory skills, and some of the key features of high self-regulated environments and the teaching methods that go along with them.

By focusing on the importance of implementing self-regulated learning skills into the
classroom and the positive effects that come with it, I hope to contribute further to the teaching and research community on the methods teachers use in their classrooms. As well, the current beliefs and understandings science teachers have on SRL. This research study approaches the issue of self-regulated learning in junior science classrooms using semi-structured interviews with junior secondary educators in Ontario, Canada. The study looks at how teachers foster students’ SRL skills within their classrooms, the teaching methods they use to promote SRL, and their understanding and beliefs associated with SRL. By identifying these, through educators’ responses, it is my hope to identify the ways of educating students in self-regulated environments in Ontario, and from there enlighten the importance of including SRL in the Ontario curriculum and appropriate pedagogical training on improving students’ SRL skills in the classroom.
Chapter 3: Research Methodology

3.0 Introduction

In this chapter I describe the research methodology. I begin with a discussion of the general research approach, procedures and instruments of data collection used in my research study. Next, I will describe my participant recruitment and sampling strategy along with the data analysis techniques and ethical review procedures related to my study. Following this, I consider the methodological limitations and strengths of the study. I conclude the chapter with a brief overview of everything discussed in Chapter 3, complemented with a rationale for my research decisions, and a preview of the following chapter.

3.1 Research Approach and Procedures

In my study, I used a qualitative approach, along with a literature review on the approaches and procedures of my study topic. My study also included in-person semi-structured interviews with three junior science secondary school teachers. Qualitative research is a type of research that “helps us understand the nature, strengths, and interactions of variables” (Black, 1994, p. 425) as well as “address[es] questions concerned with developing an understanding of the meaning and experience dimensions of humans’ lives and social worlds” (Fossey, Harvey, McDermott, & Davidson, 2002, p. 717). A qualitative researcher is one who “stud[i]es things in their natural settings, attempt[s] to make sense of, or interpret, phenomena in terms of the meanings people bring to them” (Denzin & Lincoln, 2005 qtd. in Creswell, 2007, p. 3). The aim of qualitative research is to know and understand people’s perspectives, beliefs and attitudes (Arksey & Knight, 1999, p. 7). Researchers use qualitative methods to develop knowledge in poorly understood areas (Fossey et al., 2002) or ones that are complex and require direct communication with or observation of a specific context or group. Qualitative methods that are
complex and require direct communication, typically evolve from stories that a researcher elicits using interview questions developed from an extensive literature review. Qualitative research is also used when researchers want to understand the contexts or settings experienced as problematic by their participants (Creswell, 2007, p. 56). There are several criteria available in qualitative research that evaluate the quality of the research. These are methodological rigour – i.e., good practice in conduct of the research – and interpretive rigour, or the trustworthiness of interpretations (Fossey et al., 2002). Although one can focus on these criteria to enhance the quality of their study, there are still challenges that a researcher may face when conducting a qualitative study. A few known challenges include: the quality criteria focusing on superficial techniques, the use of quantitative criteria to interpret, the explanation and support of qualitative research findings, and the various epistemological and ontological standpoints that are not always compatible with fixed universal procedures and standards (Meyrick, 2006).

Although qualitative research is similar to quantitative research in that they involve observation and interpretation of events, the two research approaches differ in that quantitative seeks to answer what questions while qualitative seeks to answer how often and why questions (Black, 1994). Being able to describe how often and why something happens – instead of simply what occurred – is valuable in research (Black, 1994). Qualitative research also differs from quantitative research as qualitative typically expresses findings in words while the other expresses results in numerical form (Stiles, 1999). Qualitative research is often used as a follow-up to quantitative research as it aids in elaborating more in-depth explanations of specific mechanisms or linkages in causal theories or models (Creswell, 2007) and elicits contextual data by improving the validity of quantitative measurement tools, like surveys or questionnaires (Fossey et al., 2002). It is important to note that studies can involve qualitative and quantitative
research methods; this is known as mixed methods and some feel that these studies are more likely to provide a rigorous and methodologically sound study design (DiCicco-Bloom & Crabtree, 2006).

Given both my research purpose and questions, qualitative research was a suitable approach for my study as it allowed me to dive into real-life experiences of junior science secondary school teachers in classrooms where students lacked self-regulated skills. My main goal was to identify the methods teachers use to foster their students’ self-regulatory learning skills in the classroom. Therefore, identifying how/how often and why teachers motivated and aided their students in becoming more metacognitively aware of their learning in the classroom, via a semi-structured interview, was answered in the teachers’ responses. Since my target sample was teachers it would not be as ideal to do a quantitative study as some of the teachers’ methods for fostering SRL skills in the classroom could be lost or not thought of without qualitatively probing their responses and memory during an interview.

3.2 Instruments of Data Collection

Common approaches to qualitative data gathering include interviewing, focus groups, participant observations (Fossey et al., 2002) and interpretation of textual material (Black, 1994). The most commonly used approach for qualitative research is interviews, the same approach that I used for this study. The goal of interviews is to elicit participants’ views of their lives through their responses and stories along with exploring their feelings about and experiences in the social world (Fossey et al., 2002). Of the three interview styles available (structured, semi-structured, and unstructured), I chose to use semi-structured interviewing. In semi-structured interviews the “main questions and script are fixed, but interviewers are able to improvise follow-up questions and to explore meanings and areas of interest that emerge” (Arksey & Knight, 1999, p. 7). A
semi-structured interview protocol, or interview guide, is one where a researcher typically has a list of pre-determined questions or topics to be covered. There is a lot of fluidity and flexibility available in the structure of the interview protocol for semi-structured interviews; this includes both when and how each of the questions are discussed, and the way the participant responds to the questions. There is no sequence or time-restriction for these protocols (Edwards & Holland, 2013, p. 29).

Typical interview guides contain six to 20 questions that have an open-ended question format. Closed or yes/no questions are not found in these interviews as the goal is to stimulate participant’s reflection and exploration (Davies & Hughes, 2014, p. 28). Following the open-ended questions are prompts designed to keep the interview focused while still allowing room for flexibility (Fossey et al., 2002). These interviews typically take place in person; however, they can be done over the phone, internet (e.g., on Skype), or via text-based discussion. The variety of methods for conducting these interviews can significantly broaden the range of people to interview (Davies & Hughes, 2014, p. 28). Semi-structured interviews can be conducted either in groups or on an individual basis, and the time and location must be scheduled in advance to ensure they occur outside of everyday events (DiCicco-Bloom & Crabtree, 2006).

The language a researcher uses in semi-structured interviews is also important as they do not want to come off as too knowledgeable in the topic, as this may hinder the participants’ likeliness to cooperate and share. If the language used is not professional enough the participants may lose interest and refrain from spending any more energy on the interview. Also, if the language used is not respectful or in a sensitized manner, the participants – especially if elderly – may refuse to answer accordingly (Kane & O’Reilly-De Brún, 2001, p. 264). Thus, the data collection must be sensitive to the participants’ language (Fossey et al., 2002).
Using semi-structured interviews was both advantageous and appropriate for my study as they allowed the participants and I some freedom within the structure and flow of the interview. Especially when I interviewed these teachers about their students’ self-regulated learning skills, it required more probing at times before they reported how and if they fostered these skills in their classroom. As my topic and questions may have limited what I was exploring due to their in-depth detail and wording, I was able to adjust accordingly to ensure I maximized the interview process and interview time. At times, subjects or topics came up during the interviews that I did not think about in-depth prior to the interview, using the semi-structured format allowed me to investigate further how or if the teachers were in fact fostering students’ SRL skills in their junior science classrooms. Since I followed a semi-structured interview protocol, I could explore these benefits. It was important that I knew about the need to deviate at times from my proposed interview protocol in order to gain more information from the participants. The time and location of my interviews were always pre-determined, in person, and conducted individually.

I organized my semi-structured interview protocol (found in Appendix B) into five main sections. The first section involves the opening script where I described the purpose of the interview and the ethical procedures. The second section confirms the consent form was given to and signed by the participant. I obtained the demographics of the participant referring to the number of years they have taught junior science grades and the length of time they have taught in Ontario. The fourth section includes the interview questions. In this section, there are five subcategories that contain questions addressing their perspectives/beliefs, teaching practices, supports and challenges, next steps, and a section for any additional information that potentially emerged during the interview. These questions were built from the information in Chapter 2, the literature review. A few of the questions were adapted from Oolbekkink-Marchand et al. (2006).
interview guide as they were good indicators to determine if teachers are fostering students’ self-regulated learning skills in their classroom. The final section is the closing script where the participants were thanked for their time and considered responses, and asked if there were any further questions they had about the study. Some sample questions that were used in the interview include:

- Could you walk me through a particular lesson/activity where you felt students took control of their learning experiences?
- Do you feel teaching students the ways to plan, monitor and evaluate their learning is important for their learning? Why or why not?
- What is challenging about motivating students in your junior general science classrooms?

3.3 Participants

For a qualitative research study to be considered sound, there is a need to provide sufficient detail about the sampling techniques used along with the rationale (Meyrick, 2006). In this section I am going to discuss the sample criteria that I used to identify the participants, the sampling procedures used to obtain these participants, and the specific demographics and information collected from each of the participants interviewed.

3.3.1 Sampling criteria

The following criteria was applied to teacher participants:

1. Teachers must have taught Grade 9 and/or 10 Applied and Academic general sciences, in Ontario, for at least two years.
2. Teachers will have supported students who lack motivation, engagement and/or metacognitive awareness.
3. Teachers will have been teaching or enrolled in pre-service teaching education program
for a minimum of five years.

4. Teachers will be employed in schools in the Greater Toronto Area (GTA).

The purpose of my study was to explore teachers’ reported efforts to foster SRL skills. Given that any Ontario teacher might be a suitable candidate for such a broad study, I used my sampling criteria to target teachers who may have more and more complex experiences with fostering student motivation. First, these teachers must have taught Grade 9 and/or 10 Applied and Academic general sciences because these science courses are mandatory for students to take in order to graduate in Ontario. Students do not self-select into them, and upon completion students are not required to take any more science courses. I have noted for a minimum of two years as I was seeking participants who have experience teaching with both streams. The reason that I chose to include both Applied and Academic classes were to observe if the teachers would focus on one level compared to the other and if they would voluntarily compare and contrast them as well. For my next sampling criteria, I am interested in interviewing teachers who worked with students who lack self-regulated learning skills – this referring to students who have lacked motivation, engagement and/or metacognitive awareness. These teachers were also required to work in the greater Toronto area (GTA) for sampling convenience. Finally, it is important that teachers were teaching or enrolled in pre-service teaching program for several years (at least five as mentioned in my sampling criteria) to aid in guaranteeing their teaching methods and techniques are well-developed, adapted and meet the Ontario teaching requirements.

3.3.2 Sampling procedures

Qualitative research is theoretically driven by prior research on the topic. This incorporates the sample construction and selection (Edwards & Holland, 2013). Researchers need to identify appropriate and adequate participants for their sample. There is no minimum
number of participants when conducting a qualitative study. However, it is important to have sufficient depth of information in order to fully describe the phenomenon being studied. The major sampling procedures in qualitative studies are purposive and theoretical. Purposive sampling is when one looks for exemplary information sources to find meanings. It is a strategy designed to maximize the representation of a range of perspectives on a given topic or issue. (Fossey et al., 2002). These participants are significant as they are unique or dissimilar from the study’s purpose and including them in the sample is essential (Robinson, 2014). Meanwhile, theoretical research is when people, situations or processes are selected on their relevance to the theory in order to look into new ideas or build on previous theories (Fossey et al., 2002).

There are additional techniques available to researchers when gathering study samples. A researcher may use a technique known as snowball sampling – where one participant identifies other potential participants that have direct knowledge relevant to the study (Fossey et al., 2002) – or convenience sampling, which locates a source that is easily accessible for potential participants who fit the sampling criteria (Robinson, 2014). For this study, purposive sampling was initially used to locate the most suitable teachers followed by snowball sampling that lead to more appropriate participants. Convenience sampling was also used to find teachers who fit the sampling criteria in the section above; although this is not the most ideal sampling method, I relied on it as the sample size was undeniably small and the interviews were required to be completed within a specific time frame (i.e., either in May or June of 2016).

Some strategies for sourcing a sample includes phone calling, in-person requests and study advertising online or in public. A form of sampling known as organization recruiting refers to sampling participants through an organization that advertises the study on group emails, intranet, notice boards and internal mail. Unfortunately, this can pose a problem as a researcher
would need to locate an individual in an organization who has access to these communication channels (Robinson, 2014). To recruit suitable participants, I provided information on my study via e-mail to potential candidates after visiting science departments in schools in the GTA. Due to the restrictions of the MTRP ethical review, sample recruitment was strictly voluntary and non-remunerated.

Ethical skills and sensitivity are required when sourcing out a sample. Some ethical considerations include: the participant must be informed of the study’s aims and requirements, if there is compensation, how the information and their identity will be protected, and further information that may need a consensual decision prior to participation (Robinson, 2014). These were all considered when sourcing my study’s sample.

3.3.3 Participant bios

The participants in the current study were ones who met the sampling criteria. The participants included three Ontario qualified teachers in the Greater Toronto Area (GTA). All of the participants were teaching in the same board and secondary school. The participants were: teachers who have taught for a minimum of five years (average 16.33 years) and with at least two years of experience teaching junior secondary school applied and academic science classes. The final sampling criterion was also met by all participants, as they reported to have supported and taught a student that lacked either motivation, engagement and/or metacognitive awareness in their junior secondary applied science classroom. Once again, the participation in the study was voluntary and participants were not offered any incentive for completing the interview.

The first participant, Sky, has been teaching for 18 years and has always taught in the GTA. Sky at the time was teaching two sections of grade 9 academic general science and one section of grade 11 university biology. Sky has taught grade 9 applied general science for
numerous years, specifically since the beginning of their teaching career.

The second participant, Jules, has been teaching for 11 years and has always taught in the GTA. Jules noted that they remained at that same school their entire teaching career. Jules at the time was teaching grade 10 general science and grade 12 biology. Jules has taught grade 9 and 10 applied general science for a couple of years; however, Jules has not taught it within the last few years.

Finally, the last participant, Hayden, has been teaching for 20 years and has always taught in the GTA. Hayden at the time was teaching grade 11 university chemistry and grade 12 college chemistry. Hayden has taught grade 9 academic and grade 10 applied general science on and off for numerous years.

3.4 Data Analysis

In qualitative research, data analysis is a “process of reviewing, synthesizing and interpreting data to describe and explain the phenomena or social worlds being studied” (Fossey et al., 2002). Data analysis and collection ideally happens concurrently in order for researchers to understand their research question and the effect it has on the sampling and the interview protocol. Data collection and data analysis typically continues until there are no further emerging themes or categories identified (DiCicco-Bloom & Crabtree, 2006).

Qualitative data analysis can be grouped into content-, discovery- and meaning- focused approaches. A discovery-focused approach looks for established patterns and connections in the data. A meaning-focused approach looks at the participants’ meaning ascribed to experiences and situations, linking themes both in and across the data (Fossey et al., 2002). A content-focused approach looks at what exactly was said and relies on counting and comparing key words while creating interpretations of the underlying context (Hsieh & Shannon, 2005).
The three approaches mentioned above follow a similar analytic procedure. The data analysis approach is inductive and allows the qualitative researcher to find patterns or themes (Creswell, 2007, p. 53). This procedure involves observing the data, coding segments of the transcript, and grouping these into categories that are then used to create themes (DiCicco-Bloom & Crabtree, 2006). For my study, the data analysis involved transcribing interviews and coding the data in terms of my research purpose, questions, and existing research. While completing this, I identified themes in the data and categorized them. When appropriate, I synthesized themes from these categorizes, cited discrepancies, and discussed null data and the significance of the study.

3.5 Ethical Review Procedures

According to DiCicco-Bloom and Crabtree (2006) there are four ethical issues related to the interview process, these are: reducing the risk of unanticipated harm, protecting the participant’s information, effectively informing participants about the nature of the study, and reducing the risk of exploitation. A person can be unintentionally harmed when participating in a research study on a personal (i.e., embarrassment or humiliation), psychological (i.e., loss of self-esteem) and social (i.e., loss of trust in others) level. Researchers need to inform participants if there are any reasonable or foreseeable risks or discomforts prior to the conducting the study. They must screen out participants who may be harmed by the study’s procedures, and assess the participant after the study if potential harm or stress is known (Singleton, Straits, & Straits, 1993, pp. 476-478) in order to provide the appropriate psychological support (DiCicco-Bloom & Crabtree, 2006). The present study had no known risks.

The second ethical issue to be considered is the confidentiality and anonymity of the participant and their information. If information shared by the participant has a potential to
jeopardise their position in a system, it is required that they remain anonymous and the information is protected unless the failure to share will place someone in a dangerous situation (DiCicco-Bloom & Crabtree, 2006). All participants must have the right to privacy, this being the right to decide “when, where, to whom and to what extent his or her attitudes, beliefs, and behaviour will be revealed” (Singleton et al., 1993). All information shared by the participants in this study was given the opportunity for a member check – where the participant looks over their transcripts and removes anything they feel influences their position in society, prior to data analysis. Their identity, along with any identifying markers, was either kept completely anonymous (i.e., pseudo name), confidential or if needed excluded from the study.

Researchers should obtain both explicit and implicit informed consent from their participants (Singleton et al., 1993, p. 479). This ethical issue involves informing participants about the nature of the study. Although what a researcher will uncover from a study is not always known, it is recommended to receive participants’ verbal consent to potentially participate in on-going interviews. Nonetheless, participants have the right to disengage from the study at any point (DiCicco-Bloom & Crabtree, 2006). A problem with informed consent is that the researcher must know possible effects before the study is conducted; however, this is often too hard to predict in qualitative studies (Shaw, 2003).

In this particular study, participants were required to sign a consent form (See Appendix A) prior to starting the interview. Information about the nature of the study was also disclosed verbally at the start of the interview. The consent form and introductory section of the interview included information on the right to withdraw from the study, risks of participation, study expectations (i.e., 60-minute interview, audio recorded), confidentiality of data collected and data storage. The data for this study was kept on a password protected laptop that was stored in a
locked room until the study was completed and thus was transferred to a USB and stored in a locked room. After five years, all of the data and study information will be destroyed in full.

The issue of deception is another area of ethical concern. Deception is widely used and frequently involves misleading the participants about the purpose of the study in order to keep the study’s purpose unknown. If deception is used, researchers must debrief their participants at the end of the study of the true purpose and use of their data (Singleton et al., 1993, p. 418-483). In the current study, deception was not used; however, self-regulated learning was not explicitly mentioned as it was to prevent participants from researching this topic in advance. Participants were also reminded at the end of the study of the purpose of the study.

Finally, it is important to not exploit the participant for personal gain. Interviewers must acknowledge the participants’ contributions to the success of the research study and give credit where appropriate for their effort (DiCicco-Bloom & Crabtree, 2006) and time.

3.6 Methodological Limitations and Strengths

As mentioned by Griffin (2004), “both qualitative and quantitative approaches have their strengths and weaknesses” (p. 3) that need to be considered with regards to the study’s research purpose and questions. To begin, the limitations affiliated with qualitative research include: the processes of collecting and analysing the data can be time-consuming, labour intensive (Choy, 2014) and expensive. As well, qualitative studies rely on relatively small sample sizes (Griffin, 2004). This is apparent in the current study as the sample could only include three teachers. Another limitation to qualitative research is that the researchers’ interpretations are limited and conclusions are based on personal experience and knowledge. Due to researchers analyzing the data and interpreting themes from text, important issues may be overlooked or go unnoticed. In semi-structured interviews, the questions are open-ended leaving room for participants to have
control over the data collected (Choy, 2014). Qualitative interviews are also very difficult to replicate as they are dependent on the participants and research context (Edwards & Holland, 2013). The data collected in qualitative research is not objectively verifiable (Choy, 2014) and continues until no further themes emerge from the research (Fossey et al., 2002). With regards to this study, the data collected can only inform the topic of teachers’ reported methods for fostering students’ self-regulated learning skills in a classroom, rather than generalizing the experience of teachers in a broader context. The only method used to assess the study’s research problem involves interviews. Driscoll (2011) discusses the importance of observation, surveys and interviews when conducting a qualitative study. Both interviews and surveys are important when gathering information about people’s beliefs and behaviours (Driscoll, 2011). Another limitation to the study is that interviews with teachers was the only form of data collection. Including surveys or in-class observations of the teachers’ methods of teaching and fostering self-regulated learning skills would add value to the research study.

In contrast to the limitations of qualitative research, there are strengths. Qualitative research allows flexibility in the research design, the ability to focus on key issues for participants, and insights into these issues with regards to the meaning and connection to participants’ experiences, social processes, practices (Edwards & Holland, 2013), perspectives, lives (Griffin, 2004), values, beliefs and assumptions (Choy, 2014). This research enables researchers to tackle sensitive issues (Griffin, 2004). Furthermore, qualitative research can yield information that is different from surveys or quantitative research. Due to the open-endedness of semi-structured interview questions, participants can talk freely and discuss issues that matter to them (Choy, 2014). For this research study, interviewing teachers allowed for a more in-depth analysis when compared to surveys and allowed these teachers to discuss theory, practice and
meaningful insights. Although the study only involved interviews, Driscoll (2011) mentions that “interviews are best used when you want to learn detailed information from a few specific people” (p. 163). With the sample size being small and the goal being to learn how and why teachers are fostering these SRL skills in their classrooms, interviews were the best suited source of data collection for this study.

3.7 Conclusion

In this chapter, I explained the research methodology. First, I discussed the general research approaches and procedures where I thoroughly examined the meaning and significance of qualitative research and the ways that it differs from quantitative research. Next, I described the instruments of data collection available to qualitative researchers, focusing on qualitative interviewing and, more specifically, semi-structured interviews. I then described the sampling criteria for the study, focusing on junior science secondary school teachers, and the recruitment procedures. This study’s procedures focused mainly on purposive and convenience sampling. I then reviewed different techniques for qualitative analysis, described how I analyzed the data by examining each participant’s interview transcripts and identified the text that was then sorted into categories to create common themes across the data. I proceeded to discuss the ethical issues with regards to qualitative research and interviewing, and the ways to mitigate these. The major ethical issues reviewed comprised of potential harm, informed consent, data storage, and participant privacy and exploitation. Finally, I identified some methodological limitations to my study such as sample size and interpretation, accompanied by the study’s strengths, like flexibility and making connections to participants lived experiences. In the following chapter I am going to report the findings.
Chapter 4: Research Findings

4.0 Introduction to the Chapter

This chapter identifies and discusses the findings that emerged through the data analysis of three research interviews. During the analysis, the primary question guiding this qualitative research study was: how are Ontario junior secondary school science teachers seeking to foster students’ self-regulated learning (SRL) skills? This research question was constantly referred to when examining teachers’ beliefs, reported practices, and experiences when working with students who lacked either engagement, motivation and/or metacognitive awareness. The sub-questions to further guide this inquiry involved the teachers’ perspectives and general beliefs about SRL, how they define SRL, and how they reportedly implement SRL in their classrooms. The bodies of literature I focused on in Chapter 2 revolved around SRL skills and how fostering these affects and/or improves students’ academic performances. On top of that, reviewing self-regulated learning in both science and general classrooms; I looked at teachers’ methods to foster students’ self-regulatory skills, the important findings of SRL in both junior and senior secondary classrooms, and finally some key features of environments and common teaching practices that are known to promote SRL. As noted in Chapter 3, the methodology of this study was a qualitative research study using in-person semi-structured interviews with three junior secondary school science teachers. The instruments used to collect the data were voice recordings on both a password protected computer and phone. The teachers interviewed were experienced teachers who have taught in the GTA for at least five years, taught either Grade 9 or 10 Applied and Academic general sciences for a minimum of two years, and have supported a student who lacked either motivation, engagement and/or metacognitive awareness.
In this chapter, connections are highlighted between the participants’ experiences and perceptions as well as made to the Chapter Two literature review. Research findings are organized into four main themes:

1. Teacher definitions of students’ self-regulated learning,
2. Reported factors that influence students’ SRL skills,
3. Teachers’ perspectives on and general beliefs about student learning, and
4. Reported methods used by teachers seeking to foster students’ SRL skills.

Along with these four main themes, there are sub-themes that further illustrate how Ontario junior secondary school science teachers seek to foster their students’ SRL skills in the classroom. In each theme section, I will describe the theme, report on the data from the research interviews, and conclude by highlighting significant connections between each theme discussed and existing research literature. Conclusively, my research findings will be summarized and I will transition to Chapter Five where I will discuss both the limitations and recommendations for future qualitative research studies.

4.1 Teacher Definitions of Students’ Self-Regulated Learning

There are several important aspects when discussing self-regulated learning. To get a better understanding of how the participants define SRL, I asked a series of questions which required participants to offer their definitions of the terms motivation, engagement, and metacognitive awareness (these referred to in the next sentences as ‘X’). While examining the participants’ responses, there were two major points discovered: a student who is displaying X and a student who is lacking X. In the final subsection of this theme, I compare and contrast the participants’ definitions of each term and comment on their success.
4.1.1 Teacher definitions of student motivation

While looking at the participants’ definitions of motivation, each considered what the presence and absence of motivation looks like. The code that I used for this was “the motivated student” and “the unmotivated student,” both of which will now be discussed. All three participants discussed the importance of student participation and engagement when defining a ‘motivated student’ in their junior secondary science classes. Sky particularly mentioned that motivated students are:

- students that engage. Students that ask questions. Students that seem interested in discussion. Students that want to create an interaction with the teacher and not isolate themselves from the class or class discussion or any activities. Motivation is based on student awareness of what’s going on in the class and what the teacher’s teaching.

In Sky’s response here, it is evident that there are many aspects that encompass a motivated student, which is one of the important aspects when discussing self-regulated learning. The motivated student to Sky was solely based on what the student does and what the student wants to do. Jules added to this definition by stating that motivation occurs when the students want to participate and learn without the need of an external force – like “brib[ing] them with mark[s]” or “threaten[ing] them with detentions”. This depends if the student intrinsically and internally wants to do it. On the other hand, Sky positioned the absence of motivation – i.e., the ‘unmotivated student,’ as someone who seems isolated from any sort of interaction with any type of activity. This is predominantly seen through the students’ “lackadaisical attitude” and “poor grades” (Sky). Jules also described it as “pulling teeth” where everything that the students need to do is “laborious”. This is something Jules mentioned as being identifiable particularly through the students’ body language and facial expressions. Hayden expanded on the unmotivated
student definition with characteristics such as being disengaged, not interested in what the teacher is saying, and that thought of being “somewhere else, and maybe they are somewhere else. They’re physically present but somewhere else”. The unmotivated student to Hayden is someone who is absent from the classroom, although they still may be physically present.

The majority of the writing on self-regulated learning emphasizes the importance of motivation in the classroom. Motivation is known as the drive to do something (Dinsmore et al., 2008); therefore, the motivated student is someone with this drive and the unmotivated student is someone who lacks it. As also mentioned by the participants, motivation is the natural drive and involvement of the student in class. Jules made note of this when they discussed the unmotivated student as one who needs external forces to drive them to do things in the classroom, thus they are not using their natural drive to be motivated in the classroom. Students who are known as being high achievers have more motivation to learn and better time management skills (Asikainen at al., 2013). Psychosocial features of the classroom environment and how the students interact can also influence their motivation (Velayutham & Aldridge, 2013) and “a willingness to view motivation as more than an individual-difference variable” (Urdan & Schoenfelder, 2006, p. 346). Similar to what Sky mentioned when they described the motivated student as someone who wants to interact with their teacher and classmates in discussions, rather than isolating themselves from interacting in the classroom. Urdan and Schoenfelder (2006) confirm Sky’s idea – along with the other participants’ emphasis on group work, when they discussed the transition of the unmotivated student to the motivated student happens when “the tasks are tailored to their interests, or if students are given the opportunity to fulfill social needs by working with friends on the task” (p. 345).
4.1.2 Teacher definitions of student engagement

Following the same format that I had the participants use to define motivation, I had them define engagement. The codes used were “the engaged student” and “the disengaged student”. All three participants mentioned group work and activities as being key for engagement in their classrooms. To begin, Sky and Hayden both talked about putting students in groups for activities and looking for what the students are actually doing in their groups: if everyone is participating or only one student is taking over. However, it’s important to note that students engage differently, and because of this Sky said they tend to “do a lot of activities with the students because [they] feel that’s how [they] get all aspects of student understanding”. Building on the importance of group work/activities, Jules and Hayden believe that the level of participation is certainly reflective of a student’s engagement in the class. Jules mentioned the importance of physical engagement and limiting the “seminar” and “chalk talk” teaching in order to help increase students’ eye contact and attentiveness in class. Hayden noted that engaged students like to volunteer answers, participate in class and “just want to chat”.

Sky and Hayden saw the absence of engagement as students who are not interacting or participating within the class. Sky particularly indicated that a disengaged student is one who is not focused on the lesson, nor interacting during activities or with the technology involved in the lesson (e.g., the Smartboard). Hayden focused on the lack of discussion from the students and a “lot of just sitting, working on their own”. Jules expands on both of these definitions, by stating that these are students who are “glazing over”, bobbing their heads, using their smart phones, breaking things, and often times involved “in various forms of mischief and misbehaviour. … So a disengaged class, very quickly becomes very unmanageable”.

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Self-regulated learning skills are known to influence the level of academic achievement and engagement students have in their learning (Boekaerts & Cascallar, 2006). According to Paris and Paris (2001) the definition of cognitive engagement is when “they go beyond the requirements of the assignment, they exhibit preferences for challenge and risk-taking, and they make psychological investments to master the knowledge and skills” (p. 93). Engagement also depends on students’ needs to satisfy competence, autonomy and relatedness. When students are deeply engaged, they have been found to: extend beyond the requirements of the assignment, they prefer to be challenged and take risks, and they make psychological investments to master both the skills and the knowledge of the task (Connell & Wellborn, 1991; Paris & Paris, 2001). For their definitions of engagement, all three participants mentioned the need for actively participating in the activity or discussion and being interested in the content. As well, Sky made note of students’ need for autonomy when they discussed the need for teachers to incorporate multiple activities to provide students with learning options and chances to take control of their learning to overall further engage their students’ SRL skills. It was noteworthy to see that none of the participants mentioned allotting time for self-reflection nor goal planning and monitoring in class which has been known to enhance students’ engagement in SRL (Perry et al., 2002).

### 4.1.3 Teacher definitions of student metacognitive awareness

The last definition I asked the participants to define was metacognitive awareness. Interestingly, two of the participants were not entirely sure of what metacognitive awareness was when initially asked. The participants required further prompting and explanation of the term prior to giving their responses. Meanwhile, the other participant – Jules, could define this term effortlessly. Following the same trend as above, the “metacognitively aware student” and the “non-metacognitive aware student” were identified. Sky defined metacognitive awareness as:
understanding concepts but also trying to relate to them and not just trying to memorize them and understanding the idea of a concept. … But if they basically have their brain work, process, let them figure it out themselves, I believe that students will become more aware of what they are trying to learn. And that’s a process. But sometimes you know, it takes time.

Sky clearly stated here that metacognitive awareness is being able to know and relate a concept, but is a process that takes time to learn and to do. Both Hayden and Sky suggested that students start to become metacognitively aware in early grades. Hayden believes that the metacognitively-aware student better understands how they learn, using terms like kinesthetic, visual or auditory, to describe their own way of learning. As the focus of this study is on applied junior secondary science classrooms, Jules stated that metacognitive awareness – i.e., “to think and then think about what they just thought”, is not a reasonable target for applied students; instead, Jules believes that applied students should strive to be more self-aware and self-reflective.

The “non-metacognitively aware student”, for these teachers, is one who does not self-reflect on what they have learned. Sky termed this “robotic understanding” – where the students focus more on memorizing the material rather than understanding and applying the information. Jules’s definition complemented Sky’s definition by describing the non-metacognitively aware student as one who goes through the motions but does not “really question … why am I doing this”. Jules believes that not operating at a true metacognitive level is appropriate for an applied level course as these students have other useful and practical assets, such as hands-on skills, that the world can benefit from.

It’s important to note that being metacognitively aware means to monitor and think about one’s own cognition (Dinsmore et al., 2008) – it encompasses metamemory which involves
being aware of what you do know and what you do not know (Sindhwani & Sharma, 2013). Hayden brought up this point when they defined the non-metacognitively aware students as those who are:

- not aware of how they think, they might not be successful just because they don’t really know how to approach their learning properly, right. They don’t know how to study properly; they don’t know how to organize their courses or their notes for the most success. … I always say, they don’t know what they don’t know. ... So they don’t recognize the need to come for help because they thought they understood it but they really, they try to memorize it versus understanding.

Hayden also mentioned that these students do not know what is the best way to address their type of learning – i.e., kinesthetic, visual, or auditory, and that they are often comfortable where they are at – i.e., know that “I’m a strong student” or “I’m a weak student”. Here, Hayden emphasized on the students being comfortable with who they are and simply not knowing how to self-regulate their own learning process; it is simply the students do not know ‘how to’ in various aspects of learning, not just in metacognitive awareness.

Metacognitive awareness is broadly defined as thinking about thinking (Dinsmore et al., 2008) and being aware of what you do and do not know (Sindhwani & Sharma, 2013). Metacognition also involves having control (Thomas & Anderson, 2014) and monitoring (Schraw et al., 2006) one’s own cognition. Hayden brought up this point when they described the “unmotivated student” as not being aware of how they think or not knowing that they do not know. Hayden talked about knowing how to study – which is an aspect of a self-regulated student. Strategically planning (DiBenedetto & Zimmerman, 2013) is also a part of a self-regulated student, however neither of the participants explicitly mentioned this in their
interviews. Hayden also addressed students being aware of who they are and how they learn – i.e., their own self-concept. As Hayden mentioned, they are often comfortable with knowing who they are and this then affects their learning. Correspondingly, Wang et al. (2010) findings stated to improve students’ SRL performance, students must establish a positive self-concept; it appears Hayden’s students may be lacking this for various reasons. This is further mentioned in the following section, 4.2: Reported factors that influence students’ SRL skills. Each participant did indicate the need to know about what you are thinking and learning. Jules discussed the need to self-reflect and be self-aware, which is what Brown and Pressley (1994) highlighted as methods to improve students’ learning processes and outcomes; ultimately improving their metacognition and self-regulation. Finally, there are two components of metacognition – the knowledge of cognition and the regulation of cognition (Baker & Brown, 1984; Dinsmore et al., 2008; Kaberman & Dori, 2009). Each of the participants focused on the knowledge of cognition – what one knows about their own cognition; however, only one participant – Jules, addressed the regulation of cognition – the way one controls and monitors their learning i.e., planning, revising, testing, and evaluating (Baker & Brown, 1984; Dinsmore et al., 2008; Kaberman & Dori, 2009), when discussing the need for self-reflection and self-awareness.

4.1.4 Comparing participants’ definitions of SRL

Here, I am going to synthesize a clear definition from the data obtained from each participant, as mentioned in the subsections above, then compare and contrast each of their definitions for motivation, engagement and metacognitive awareness.

To begin, when each participant defined motivation they described what a motivated and unmotivated student would look like in the classroom. For Sky, motivation was the need to be engaged with what is going on in the classroom and what the teacher is saying, along with what
the student is and wants to do. For Jules, motivation was internally and intrinsically wanting to do something without the need of an external force. For Hayden, motivation was defined as being engaged and fully involved in the classroom – i.e., students are both physically and mentally present. Interestingly, Jules discussed external forces for motivating students, Hayden focused on the student being fully present in the classroom, and Sky concentrated mainly on students’ actions in the classroom. Overall, all three participants believe that motivation is present when a student participates and engages in the classroom.

For the next definition – engagement, each participant described what an engaged and disengaged student would look like in their classroom. For Sky, engagement was defined as understanding, focusing and fully involving oneself in the lesson or activity that is going on in the classroom. This being the way students are collaborating and what they are doing while working in groups. Expanding on this, Hayden defined engagement as volunteering, participating and working together in class groups or discussion. Jules’s definition of engagement focused on someone who’s attentive, focused on the task at hand, actively participating throughout activities and lessons, and behaving appropriately in class. Jules made a distinct mention of student behaviour when it comes to engagement that the other two teachers did not explicitly mention.

As a whole, the participants gave their own definitions of engagement which overlapped in many ways, particularly focusing on participation and students’ actions in the classroom.

Finally, for metacognitive awareness, each participant described what a metacognitively aware and a non-metacognitively aware student would look like in their classroom. Two of the participants – Sky and Hayden, required further explanation and prompting at the beginning when asked questions on metacognitive awareness. All three participants defined metacognitive awareness as the need to know about what one is thinking and learning, and a process involving
self-reflection. Jules was successful when defining metacognitive awareness as “to think and then think about what they just thought” however they found it unreasonable to expect applied students to do so. Instead Jules thought being self-aware and self-reflective was more for the “applieds”. Sky defined metacognitive awareness as a process of knowing and relating to a concept without “robotically” memorizing it. Hayden defined it as understanding how a student learns and studies. Conversely, Hayden successful described a non-metacognitively aware student as one who is not aware of how they think. Overall, the participants were on the right track for their definitions of metacognitive awareness. Although each of the three participants gave distinct definitions, they were all able to define the broad aspect of metacognitive awareness which is being aware and understanding one’s own thought processes – i.e., it is one’s thinking about thinking (Dinsmore et al., 2008) and awareness of what one does and does not know (Sindhwani & Sharma, 2013).

Thus, it is believed that all three the participants did understand and were able to effectively define the terms motivation, engagement and metacognitive awareness; however, Sky’s and Hayden’s definition of metacognitive awareness wasn’t as strong. Some implications of this could have been due to not fully understanding or being able to discuss the term ‘metacognitive awareness’ in detail or the overarching theme of ‘self-regulated learning’. Further implications will be discussed in the following chapter, chapter 5: conclusion. It is important to note that the participants were not informed of the study’s primary focus on self-regulated learning prior to the interview. The main reason for not informing my participants about this focus was because I wanted to get an understanding if they knew what it was, without being asked or told what was specifically being looked at. In addition to, if the participants read about the study’s focus on the consent forms, they may have researched the topic which would take
away the natural flow of the research and impact their interview answers. Next, I will analyze the reported factors these teachers mentioned that have an influence on students’ SRL skills.

4.2 Reported Factors that Influence Students’ SRL Skills

In terms of motivation, engagement and metacognitive awareness, I found that the most significant reported factors that the participants perceived to influence their students’ self-regulated learning skills were: internal factors, external factors and environmental influences, and student streams. I will first discuss the internal and external influences, and then briefly touch on the comparisons made throughout the interviews with regards to student learning in both the academic or applied streams.

4.2.1 Students’ internal factors influence on their SRL skills

These teachers believe that one of the main reasons students lack self-regulated learning skills relates to internal factors. Each participant implicitly noted these during their interviews.

When Sky was asked to list some internal factors that affect motivation, engagement and/or metacognitive awareness, Sky responded that motivation may be hindered due to things going on socially or “at home [that] are kind of on their mind”. Having these factors play on the student’s mind can create and open much greater internal factors such as anxiety, stress, depression and so on. Other internal factors that Sky mentioned were students being uninterested, not wanting to put in the effort or not wanting to learn, being distracted by their phones and “anything that they’re not focused on can kind of throw them off and therefore the interest is no longer going to continue because they lost the path”.

Hayden reviewed similar internal factors as Sky. Hayden also included the need for students to understand what’s going on in class and to have a natural and genuine interest in the
material. Jules did not explicitly mention any further internal factors that influence students’ level of motivation, engagement and metacognitive awareness.

4.2.2 Students’ external factors and environmental influences on SRL skills

It was clear that the participants also thought external factors and environmental influences play a role in students’ SRL skills. All three participants mentioned the role of the teacher and home life as being a factor that influences the students’ motivation, engagement and/or metacognitive awareness.

Sky focused on student interaction, home life and parental influences, and extracurricular activities as external factors affecting students’ motivation and engagement. Sky specifically mentioned peer pressure, gossiping, isolation and competitiveness with other students. Sky gave an example of students on sports teams and how balancing school and sports can influence the students’ expectations, driving forces, effort required in school and even discipline. To get a better understanding of these students, Sky reports asking them, “‘are you a student athlete or an athlete student?’ [laughs] and I say, ‘what are you putting in first?’” Sky believes that teachers play a role as they choose what the students are going to learn. Nonetheless, Sky overall said that the “factors are the students themselves [as they] need to understand process”. Here, Sky believes that external factors are less important or impactful than internal ones; it’s the student and who they are that matter the most, not what happens outside of their own internal process.

Jules also mentioned the teacher as being an external factor. Jules specifically talked about the attitude and motivation of the teacher, as the teacher themselves are the number one thing that they can control. Jules went on to add that the teachers’ attitudes impact both the students’ attitude and their feeling of being engaged in their learning. Jules also identified that “there a lot of factors outside of your hands, like the students’ home life, what socio-economic
background they come from, what’s on their IEP. You can’t, you can’t control that”. Here, Jules made explicit connections to external factors that the students are unable to control yet play a significant role on their motivation, engagement and/or metacognitive awareness.

Similar to Sky and Jules, Hayden brought up the need for a connection with the teacher as “a lot of times you’re their second parent”. In addition to the influence of the teacher, Hayden discussed issues such as: the influence of having a job during school, helping their family with bill payments, parents who are not interested in or supportive of their child’s academics, and malnutrition. Finally, Hayden argued the environment the students are learning in may not be “an environment they learn best at” and the need for greater school-wide involvement when teaching students how to think about their own learning, test writing and school resources.

4.2.3 Students’ streams influence on their SRL skills

In each participants’ interview, they voluntarily compared and contrasted the academic and applied streams. Doing so, led to a greater understanding of what stream of students are primarily demonstrating these SRL skills in junior general science classrooms. For the most part, the participants generalized that students who are in the academic streams have developed and are utilizing their SRL skills in the classroom. This contrast of streams helps to provide evidence for how teachers can aid students in becoming “self-regulated learners” as well as adjusting to the students’ learning needs. They discussed the importance of building a relationship with the students and showing them that you – the teacher, care and want the students to be there.

Sky noticed that the applied level classes require better structure whereas the academic level classes allow room for deviation. Sky believes there is no set level for activities and they can be used in either stream. In Sky’s view, the academic class would require more in terms of expectations than the applied class. Also, the academic students tend to appreciate anything that
is introduced to them. Sky over the years has noticed that the applied level students are more “robotic” when it comes to doing an activity; effort is often dependent on if it is for marks. Often Sky mentioned they counteract this by telling the students “I’m collecting it. What I’m marking and how I’m marking I’m not going to tell you”. Not telling the students if what they are doing in class is going to be collected or marked leaves an area of uncertainty for the students that is believed to motivate them to complete their work. Having the students also do the assignment to the best of their capabilities – as it may or may not be marked, will allow them to develop a better work ethic and practice SRL skills in the classroom, such as metacognitive awareness.

During the interview, there were a few times that Jules discussed the applied-level students. Jules commented on the need for less lecturing and more group and hands-on activities, emphasizing the point that even full grown adults don’t want to listen to a two-hour lecture. Jules perceived a difference between ‘true applieds’ and other applied students, mentioning that:

you’re true typical applieds are those who... are not going to become engineers, or theoretical physicists. But they’re good hard working kids … [and] sometimes you will in fact have kids that, if they were under better circumstances or applied themselves they could in fact do the academic stream but for a variety of behavioural issues they’ve been streamed into applied.

Here, Jules referenced their view that applied level students are known to be “problem kids”. Jules later revealed a negative part of streaming that impedes students’ motivation and success, being the idea of “you get into academic or nothing else” and that applied classes are “dumping grounds for behavioural issues” rather than being a stream towards building more hands-on job related skills. Jules mentioned that at the academic level you are learning at a faster pace and the students can afford to fail at a task and just redo it; however, in the applied classes it takes more
time to do it in the first place. Jules made note of applied students rarely being able to be truly reflective or operate at a metacognitive level, it is more common for the academic level students. It is understood that Jules believes that the academic stream includes students who would have developed and are readily demonstrating these self-regulated learning skills.

In Hayden’s interview, they stated that the applied students are less motivated because they usually do not know what they are doing after high school, thus they don’t see a need to invest in some of the courses. Academics, on the other hand, “have everything mapped out and have a goal to aim for”. On the contrary, the applied students have a “strong social game” and are “a lot better, at volunteering answers and trying whether they’re right or wrong, cause no one is judging them … whereas the academics don’t want to answer because they’re afraid that someone’s going to think they’re stupid”. The applied students work well in group settings and are more collaborative than the academic students because the academics are overly concerned about their grade and are willing to have one student take over to get the work done. Hayden compared academic and applied students’ memory, but was not sure if the difference is due to poorer memories in the applied students or that they do not practice their homework as much, if at all. Hayden brought up the need for schools to put their more qualified teachers in junior applied classes to keep the students engaged. Throughout these references to applied and academics, Hayden revealed that the applied students require more work from the teacher, which implies the applied students lack SRL skills when compared to the academic students.

Throughout this theme, teachers made note of several factors that they either voluntarily shared or answered during their interviews. It is noted that these teachers believe one of the main reasons students lack SRL skills relates to both internal and external factors that affect student learning. Each of the participants made note of internal factors – such as the way the student is
feeling, and external factors – such as their home life status, that play a significant role on their day-to-day activities. On top of external factors, is the students’ environment in which they learn in. These teachers voluntarily compared and contrasted the applied and academic steam of general science. These teachers also believe that in different streams there are different requirements of the teacher and the student. Also, that students, for the most part, who are in the academic streams have developed and are utilizing these SRL skills in the classroom. Being aware of these differences can assist teachers in helping their students in their academic learning along with further developing important learning and self-regulated learning skills.

In a study with Wang et al. (2010), they found that factors such as self-concept, adjustment to learning environments and learning attribution significantly impact students’ SRL. Wang et al. (2010) findings also suggested that in order to improve students’ SRL performance, students must “establish their positive self-concept, change their irrational learning attribution and provide them with positive learning environments” (p. 262). Although Sky mentioned specific internal factors, none of the participants mentioned students’ self-concept nor their learning attribution as factors affecting SRL. Sitzmann and Ely (2011) found that these four self-regulatory processes: goal level, persistence, effort and self-efficacy strongly effects students’ SRL. Personal attributes that have been found to affect SRL in a classroom setting are: planning, monitoring, help seeking, emotional control, metacognition, time management, environment structuring, attention focusing and trying various learning strategies (Berkhout et al., 2015).

Similar to these studies, the teachers reported factors such as: effort, interest, emotional control, attention and environment to have an effect of students’ SRL skills. Similar to Mega, Ronconi, and De Beni (2014) study which showed that students’ emotions influence their SRL and motivation, the teachers mentioned internal factors – such as stress, anxiety, and depression, that
influence students’ SRL skills. Hailikari and Parpala (2014) study also found that the importance of developing students’ SR skills is by creating a learning environment that supports students’ autonomy. Jang et al. (2010) discuss the importance of creating self-regulated learning environments that facilitate students to make decisions about their learning and their learning environment, promote respect for individual views, and encourage students to create and achieve mastery goals. In this study, Hayden made explicit mention that the students may be learning in an environment that may not be the best one for them and in turn can influence the students’ motivation and engagement in the classroom. Next, I will explore these teachers’ perspectives on and general beliefs about student learning.

4.3 Teachers’ Perspectives on and General Beliefs about Student Learning

All three participants indicated their perspectives on and general beliefs about student learning. Understanding these helps to predict the teachers’ behaviours and willingness to promote SRL in the classroom. First, I will discuss each participant’s current perspectives and beliefs, making note whether these have reportedly changed over the years, and then discuss each participant’s views of whether and how students have control over their own learning.

4.3.1 Teachers’ views on teaching and learning

As I gathered information about each participant’s beliefs about teaching, I noticed that all three were keen to indicate some sort of change in their beliefs from when they began teaching to where they are now. They either mentioned lowering their expectations or further accommodating the students’ and school’s needs. Although the participants were asked if their views changed and how, it was surprising to see that all of them noted a change. I believe that these teachers beliefs of teaching and learning has changed overtime due to life circumstance – such as having one’s own family and children as mentioned by Hayden, the advancements in
technology – as mentioned by Sky, possible instances that they may have experienced in the classroom, and/or the idea that overtime the world changes which includes the educational system, the students coming into the schools, and the expectations for the teachers. Through any of these listed experiences, and many more that were not mentioned, one’s original views of teaching and learning could change.

Sky focused their view of teaching and learning on the students themselves. Over Sky’s teaching career, they have reportedly built more understanding, specifically of students and technology. Sky believes that students’ “learning has changed over time” and is very cognisant of that change. Hayden like Sky, said they are now “more understanding of where these kids are coming from”. Hayden’s perspective of teaching and learning reportedly changed after becoming a parent. Hayden also has realized that “school isn’t for everyone, or especially the way school is sort of formatted”. Here, Hayden expressed the need of having both a ‘parental hat’ and a ‘teacher hat’ on when it comes to understanding students. Hayden believes that the way the school system is formatted may not be in the best interest for all students; or for some students, school in general is just not meant for them.

Jules instead focused their view of teaching and learning on the teachers rather than the students. Jules believed that they have always tried to maintain an optimistic view on teaching and learning, and that “you can always make a person better than where they are”. Jules described their overall teaching and learning philosophy as maintaining “the bright eyes bushy tail fresh out of teacher’s college kind of perspective for the most part”. Jules believes that some colleagues become cynical over the years and focus on the students getting worse. Jules has reportedly always tried to stay away from that sort of attitude and not fall “into that trap”. Jules believes that the teachers need to be engaged and open to learning with their students. Although
Jules expressed this optimistic approach, they still believe they have maintained and even improved their optimistic approach to teaching over the years.

Teachers’ beliefs are known predictors of their behaviours (Dignath-van Ewijk & van der Werf, 2012). For teachers to incorporate methods to promote students’ SRL, they need to form beliefs around SRL and examine their own self-regulation (Winne & Perry, 2000). Like Jules’ perspective on teachers and students learning, Oolbekkink-Marchand et al. (2006) believes that the regulated learning process is done by both the teacher and the learners in secondary and higher educational settings. There is also a need for teachers to incorporate content and student focus lessons into their classrooms.

4.3.2 Teachers’ views on students’ control of their own learning

When the participants were asked about their views of students having control over their own learning, Hayden and Jules discussed the need for student improvement and the degree of control given to the students, respectively. Instead, Sky believes that students absolutely have control over their learning and that they can decide how much effort to invest. Sky thought that “effort does relate to their learning. If they want to put the effort to wanting to listen and understand then I think it will make them be more open to understanding overall”. Sky made it clear that students need to put in the effort into their own learning as they are the main source of control of their own learning. Whereas Hayden and Jules believe students do play some role in the control of their learning, nonetheless as a whole they do not have complete control.

Although Sky and Hayden did not mention the school system and other teachers with regards to student control, Jules, interestingly, did. Jules brought up the issue of teachers’ involvement in the stream students go into. Jules said that “the choice is supposed to be there but I sometimes fear in practice it doesn’t quiet work out … we don’t offer quiet as much choice as
we could possibly have”. Teachers are required to put the students in a stream that they feel suits the student’s needs, which Jules believes directly impacts student’s choice and control over their own learning. In Jules’s eyes, students do not have true control over their learning.

Zimmerman and Kitsantas (2014) found, in a study involving 507 high school students and their teachers, that self-regulation predicts both measures of students’ achievement – these being students’ grade point average and performance on state-wide achievement tests. Self-regulated learners need to understand and take control of their own learning environment and behaviours – such as their cognitions and emotions. Self-regulation involves self-control, self-management, self-discipline and self-directed behaviours (Zimmerman & Kitsantas, 2014).

Similarly, as noted by Sky, many students do have the ability to take full control over their own learning; however, it can be difficult as Jules and Hayden explained. Dignath-van Ewijk et al. (2013) found that teachers’ beliefs of SRL predicted their recognition of self-regulated practices, and that teachers’ beliefs of SRL favour the constructivist learning environments aspect of SRL rather than the strategy instruction aspect. Therefore, teachers who are aware of SRL and share the beliefs of SRL – such as students having control over their learning, are more likely to recognize self-regulated practices; thus, these teachers would be able to recognize these students and provide the tools to foster their students’ SRL skills – i.e., motivating the ‘unmotivated student’. However, as Dignath-van Ewijk et al. (2013) highlighted, “although teachers consider SRL as important, most of them do not integrate strategy instruction into their teaching” (p. 8).

Nonetheless, teachers who give their students the chances to take full control of their learning helps to support their students in engaging with their SRL skills (Perry et al., 2002) and therefore provides greater opportunities to better their students’ learning.
4.4 Reported Methods Used by Teachers Seeking to Foster Students’ SRL Skills

Throughout the interviews, I found that all three teachers discussed a variety of teaching practices they use in class – particularly for students in the applied junior secondary science classrooms, and for those who lack motivation. When reviewing their reported methods, there were a few important aspects addressed – these are highlighted in the sub-headings below.

4.4.1 Common teaching practices used to promote students’ SRL skills

All three participants emphasized the need to teach students in various formats (such as group settings, activities and discussions) and provide opportunities for students to take control of their own learning, specifically through inquiry practice techniques. These teaching practices – problem solving techniques and cooperative learning, are known to significantly promote students’ SRL skills (Hattie, 2009; Pino-Pasternak et al., 2014).

Sky mentioned that over the years they learned the importance of giving students the chance to take control of their learning. An activity that Sky used for this involved inquiry learning, or learning through discovery. In this activity students are required to come up with the definition of density by performing their own experiment and answering questions regarding the two provided cubes. In the past, Sky would just teach the topic density; however, this inquiry activity allows students to be fully engaged with their learning and define density on their own. Sky loves doing different activities in class to engage and interest the students in what they are learning. Sky defined a typical lesson as: an ice breaker to start, using inquiry or application to give the “meat” of the lesson, and a summary at the end to introduce the new concepts. Sky declared that it is important to stay consistent in delivering lessons, so that the students are consistent in the way that they learn. Sky also identified that “setting goals are very important, and if you have a goal about being successful, then you could use that moving forward”.
Jules did not comment on how they deliver a specific daily lesson plan but rather creating a lesson plan for an entire unit. Jules would start with the big ideas of the course, then makes unit plans, then lesson plans, and then breaks it down to daily lesson plans. Jules talked about “transferring [the] responsibility to the students” with inquiry based learning. Jules reported that they get their students to create their own labs, lab questions and answers. Jules noted during inquiry labs, students come up with new ideas or questions that the students may not have thought about prior to this activity, and this enables learning for both the teacher and the students. Jules mentioned the need for the teacher to not intervene during this activity to allow the students to take full control. Jules also argued that self-reflection is important even for a teacher, “because you care, you’re constantly reflecting back on what you’ve done and how [to] make it better for them. And then if each day you come back with it slightly better than before, even if the kids don’t consciously acknowledge it, at least subconsciously” they will. Allowing time to self-reflect aids in both the students’ and teacher’s learning experiences.

Finally, Hayden reported that they break up the unit into logical sections and covers one topic at a time. Hayden’s daily lessons are said to consist of: a recap where Hayden reviews what was covered in the previous class, a new topic accompanied by a demo or hands on activity to demonstrate the concept, and a review or practice period at the end to apply what was just learnt. Hayden finds that demos benefit the students as they tend to recall the information from the demo during tests and assignments and ultimately builds and strengthens their understanding of the topic. Like Sky, Hayden believes there needs to be consistency in how teachers deliver their lessons and that they need to involve inquiry activities in class. Hayden tends to explain to the students what is required and lets them figure out the rest. Although there is some guidance, Hayden mentioned that they push for the students to “reason with other students … and figure
things out [together] along the way”. Inquiry activities allow students to collaborate with their peers, and learn and gain support from their peers. Hayden and Sky both include technology in their daily lessons. Hayden tends to incorporate engaging group activities in their lessons, such as JIGSAW, KAHOOT, labs and class discussions. Throughout Hayden’s interview, they mentioned the need to have a personal relationship with their students – especially the applied students, and to remember to give recognition. Although Hayden did not mention setting goals, Hayden talked about making sure the students are successful particularly from the beginning of the course and continually assisting them throughout. Breaking sections up in smaller chunks, giving quizzes and splitting up unit tests all allow students to do better overall in the course.

Pedaste and Mäeots (2012) studied 42 students in a science learning web-based inquiry-learning environment. Their study’s result revealed that this environment improved students’ inquiry skills and the quality of their regulative processes. Having students reflect throughout their learning processes was found to foster students’ regulative activities and even enhance their inquiry capabilities in activities. Pedaste and Mäeots (2012) also found that the strongest influence on students’ outcomes was evaluation. The higher levels of regulative skills statistically significantly correlated with higher levels of inquiry skills (Pedaste & Mäeots, 2012). Sky, Jules and Hayden all discussed inquiry-based learning as an effective teaching strategy that they include in their classroom lessons. As the participants mentioned, inquiry-based learning allows students to take control of their learning, this type of learning has been found to engage students’ SRL skills (Perry et al., 2002) and enhance their level of regulative skills (Pedaste & Mäeots, 2012). Sky surprisingly was the only participant who identified a key component of self-regulated learning in their description of their practice, this being setting goals. Paris and Paris (2001) noted to develop self-regulative processes, teachers need to provide students with
information and opportunities to help them become strategic, motivated and independent learners. This involves teaching students how to set attainable goals, along with planning and monitoring their time and resources which has been found to allow students to assess their learning (Paris & Paris, 2001; Paris & Winograd, 1999). Expanding on the point Jules made about the necessity for teacher reflection, it is also essential to discuss personal growth and include time for student reflections to further promote SRL development (Paris & Paris, 2001; Paris & Winograd, 1999). Additional important techniques teachers can use to promote SRL that were not discussed by the participants include: teaching cognitive/metacognitive strategies, encouraging self-questioning and verbalization, problem solving techniques, peer tutoring, and understanding students’ perceptions and interpretations of classroom activities (Hattie, 2009; Pino-Pasternak et al., 2014). It is important to comment on the fact that the participants focused on what they do in the classroom more than what they say. However, teachers’ use of language needs to promote in-depth processes that target students’ metacognitive knowledge (Thomas & Anderson, 2014) to enhance their students’ metacognitive and SRL skills.

4.4.2 Methods teachers use to motivate and engage students in the classroom

During the data analysis, teachers reported practices for motivating and engaging their students in class was by including interactive and interesting lessons – such as activities, group work and technology, and the teacher’s attitude and actions in the classroom. Sky stated several different ways in which they seek to motivate and engage their students, these being: doing the “little things”, activities with a “game aspect”, incorporating technology and things that the students are interested in – such as phones, iPads/iPods, Smartboard, and music, and to not focus strictly on knowledge building in class. Sky believes that the students need to be to engaged first and then the learning will follow; they asserted that it is a process that the students need to learn.
Jules added to the need of engaging and motivating students by reflecting on their own teaching. Jules articulated that, “as a teacher the number one thing you can control is how motivated you are to teach, which then directly impacts how motivated students will be able to be motivated to learn”. If students see that Jules likes teaching the lesson, Jules believes that the students would then be more inclined to enjoy learning. Jules also mentioned that students need to know what is being taught is building towards something, as this helps students stay engaged.

Hayden elaborated on Sky’s and Jules’s methods of motivating and engaging by stating that teachers need to: provide students with opportunities to try new ideas and learn different things, connect with the teacher, reward student learning, chunk material into manageable sections, make and build connections, have flexibility, and give students breaks during class.

Teachers need to enhance their students’ motivation by altering the features in the students’ learning environments, both social and academic features, and view motivation as more than individual differences (Urdan & Schoenfelder, 2006). Similar to the participants’ interview responses on their teaching methods, Urdan and Schoenfelder (2006) noted the importance of altering teaching styles, curriculum, and school and classroom polices to promote motivation in students. They also mentioned the need to create an environment that is motivating to allow students to take more responsibility if they lack motivation – rather than teachers assuming full responsibility and being required to alter the controllable factors (Urdan & Schoenfelder, 2006) as mentioned above. Teaching students in ways that are both motivating and self-regulating have been found to improve students’ academic performance (Ning & Downing, 2012). Sky discussed the need to do things beside just building knowledge in the classroom; Moos and Ringdal (2012) confirms Sky’s point when they comment on the need for classroom instruction to extend beyond factual knowledge which will aid in implementing their students’ SRL. As Jules and Hayden
mentioned, it is important to try new things with their students. Teachers who do this and reflect on their experiences has been found to help develop their own SRL (Moos & Ringdal, 2012) which in turn affects their students’ SRL. Jules also talked about the need for teacher reflection. As Hayden mentioned, a strategy they use to motivate their students is rewards. McWhaw and Abrami (2001) found that students who are rewarded can outperform students that are goal-oriented, this being a positive effect of rewards. Although the participants do not explicitly mention implementing pedagogical strategies, Velayutham and Aldridge (2013) found that planning and implementing both pedagogical and motivational strategies in the lower secondary science classes can increase students’ SRL and motivation towards science learning.

4.4.3 Teachers use of student assessment in the classroom

Although students and teachers often think of assessment as giving a student a mark on a specific task, such as a test or an assignment, the participants also noted the need for assessment as learning and providing various formats of assessment – such as labs, discussion and/or observing the students – to guide students’ learning throughout their course. During the interview, I asked all three of the participants if they use assessment as learning – i.e., assessing while the student is learning the concept. Similarly, I asked the participants to explain what forms of assessment they use while their students are completing a lab or an activity in class.

Sky accentuated the importance of assessment as learning and the belief that it is always associated with a mark – which Sky remarked is what students think now-a-days. Sky removes this “robotic idea” of doing something because it is going to get marked. In Sky’s classes, students are required to hand certain things in regardless if it will be marked entirely or used to gauge their understanding. Sky believes that assessment as learning is part of the entire process. While assessing students’ learning, Sky is said to focus on the four categories (knowledge,
inquiry, application, and communication). During activities or labs, Sky would assess a specific learning skill related to a concept, and later give a formative assessment (either a handout or another lab/activity) that focuses on that same skill to see if the students have improved.

Jules feels that assessment AS learning is a challenge when there are multiple sections with many students in each. Jules emphasized that marking needs to be very “judicial”. They attempt to include assessment AS learning, however; time, formative assessments for midterm grades, class size and even the students in these class can deter Jules from using assessment AS learning. Jules said “it all boils down to marks”. The students basically won’t do something unless it is worth marks, or they will hand in something that is not their best work. Jules did mention the need for rich feedback when assessing students’ work to further motivate the students to do well. Some forms of assessment that Jules mentioned they typically use during activities are observation and collection of lab papers and assignments.

Sky and Jules both discussed assessment AS learning with references to marks; Hayden did not make any specific mention of this. Hayden noted they sometimes use assessment AS learning, typically throughout a lesson. For example, Hayden gives a lesson and will asks the students to answer a question that is directly related to what was taught. Hayden thus relates this form of assessment to student participation, and the accuracy and quality of their answers. During labs or activities, Hayden reported that they normally assess the students by observing, marking lab reports, and evaluating lab skills. During the semester, Hayden also noted that they use quizzes, tests and other little assignments to assess learning.

Assessing students is an essential part of teaching, and directly impacts student learning. Students’ motivation and self-regulation can be affected by inappropriate assessment (Asikainen et al., 2013). Relatedly, Sky discussed that course grades are not the only form of assessment that
teachers should use. It is also important for teachers to provide students with feedback and evaluation (Perry et al., 2002). Sky made note that students often ask if something is going to be marked and thus will put the effort they think is required into ‘marked’ or ‘not marked’ assignments. Pedaste and Mäeots (2012) showed a similar finding which found that the strongest influence on the students’ outcomes were caused by evaluation. Jules made note of the need for reflective feedback. It is correspondingly vital that teachers receive feedback from their students to help guide their understanding on effective and self-regulated teaching (Dignath-van Ewijk et al., 2013). None of the participants talked about asking their students for feedback on their teaching. Although, self-efficacy was not explored in its entirety, Perry et al. (2002) mentioned the need to use evaluations and feedback to challenge students’ learning and to ensure it does not threaten their beliefs and self-efficacy.

4.4.4 The role of the classroom environment and student connections

The classroom environment can drastically affect how a student behaves, learns and interacts with their teachers. Having an environment that is focused on the student, and student-teacher interactions, can aid in developing students’ self-regulated learning skills. Although participants were not asked any specific questions relating to the classroom environment nor student-teacher interaction, all three of the participants surprisingly spoke about at least one of these during their interviews.

When Sky discussed the classroom environment, they noted that the right environment needs to be created in a way that gets students to be both motivated and engaged. When the perfect environment is created, the students’ personal beliefs will change as well. Altering the classroom environment, like who they are sitting next to, can help students engage in the lesson rather than be distracted by friends. In Sky’s view, this can remove the struggling “spectator”
and create an engage student who is involved in the learning process. The environment the students learn in is important, Sky expressed, “I really believe, I’m really focused on that student and try to, put them in the right environment for them” in hopes that they go will in the right direction. In terms of creating a connection, Sky briefly said that teachers need to engage in having a relationship with their students, and want to learn with their students as well.

Hayden reflected on how the traditional classroom setting might not be the right environment for all students to learn in. Hayden reported that they try to make use of the school’s fit room by going there during class time to allow students to burn off energy on the bikes or yoga mats while watching course related videos as a class on the TV. For many students, school is their second home and making sure it is a safe environment is important. When connecting with the students, it is important to be personable and open – this will help students feel like they can come talk to you. Hayden said that especially applied students want to feel a sense of care and interest from the teacher, “you need to show them that you want to teach them, you want their class, and that you’re happy that they’re there”. Jules did not comment on the classroom environment specifically; nonetheless, Jules did mention the need for teachers’ attitudes to be both positive and caring, as students will feed off them, and to try new things.

Self-regulated learning environments help students to make decisions about their learning and their learning environment, promote respect for individual views, and encourage students to create and achieve mastery goals (Jang et al., 2010). These environments also help students to react purposefully as they are encouraged to create a greater awareness of self, social context and environmental cues (Eilam & Reiter, 2014). Sky made note of students’ personal beliefs and how they can change due to their environmental surroundings. Boekaerts and Cascallar (2006) further explains that teachers’ behaviours, instructions and expectations are some environmental cues
that trigger self-regulating strategies in students. This is like Jules’ perception of the need to watch teachers’ attitudes and their level of motivation in the classroom. As each of participants noted, student-teacher relationships are important. This social interaction between the learner and the teacher (and/or peers) affects the development of the students’ SRL skills (Boekaerts & Cascallar, 2006). While the participants did not mention this explicitly, it is important to note that learning environments need to relate new knowledge to existing knowledge, along with building new knowledge from real-life applications and cooperative learning experiences in the classroom (Dignath-van Ewijk et al., 2013).

4.5 Conclusion

Through the analysis process, four main themes emerged. The first theme identified was the participants’ overall definition of students’ self-regulated learning throughout their interviews. The participants were asked a series of questions to help define the terms motivation, engagement and metacognitive awareness; these terms are actively present when defining SRL. The participants were successful at giving distinct definitions for the first two; however, there was a bit of a struggle with the definition of metacognitive awareness. Nonetheless, they all were still able to define the broad aspect of metacognitive awareness. In the participants’ definition of metacognitive awareness, they focused more on the first component of metacognition, which is the knowledge of cognition; rather than also describing the second component of metacognition, this being the regulation of cognition. Based on the literature review, I had originally thought the participants would have emphasized on the need for students to plan, monitor and achieve their learning goals. Sky touched on the point of students setting goals; nevertheless, it was not discussed anywhere else or by any of the other participants. This could be due to the interview questions or other factors; however, I feel it is important that the participants were able to list
what these students look like when they are engaged, motivated and metacognitively aware; as well as what they looked like when they lacked these in the classroom.

Secondly, I found and categorized the teachers reported factors that influence students’ self-regulated learning skills. This is supported by students’ internal factors, external factors and environmental influences, and academic stream. The participants believe that there are many social impacts on students both internally and externally. In terms of the classroom environment, the participants noted that the students’ learning environment affects their learning and it may not be the best environment for them. All three participants believed that there are different requirements in different streams, for both the teacher and the students, and that being aware of these differences can help teachers aid in further developing their students’ learning and SRL skills. It was through this comparison of streams, that revealed an interesting finding that suggested students in the applied level are less likely to demonstrate SRL skills – such as being metacognitively aware, than those in the academic level. These findings were based on the teachers’ perspective and interpretations of factors that influence students. More research needs to focus on the specific factors that influence students’ SRL skill and how these affect the role of the teacher and students in a classroom.

Next, I discovered the factors that influence teachers’ perspectives and general beliefs related to student learning. Here is where I looked at the participants’ views on teaching and learning, and their views on students having control over their own learning. I learnt that teachers believe that learning changes in both the school system and the way the participants address their students. Also, these teachers noted an importance in their belief of student learning and understanding that student learning is different for all. For their general teaching and learning beliefs, these teachers further mentioned the need to not expect that students are able to
understand or do something right the first time, and that there is always room for teachers to aid in making a student better than where they currently are. The literature on teachers’ perspectives and views aligned with the need to be cognisant of your own beliefs and what you bring into the classroom. Furthermore, two of the participants believe that students did not have as much control over their learning, while Sky believes they absolutely did. As the literature shows, part of self-regulation, more specifically ‘the regulation of cognition’, is students understanding and awareness of having control over their own learning environments and behaviours.

Finally, I found various reported methods used by teachers seeking to foster students’ SRL skills. I looked specifically at the common teaching practices, ways to motivate and engage students in the classroom, student assessment, and the classroom environment and student connection with their teacher. Overall, all three teachers reported the need to include inquiry-based learning in their classroom, this aligned with research literature on SRL. The participants also brought up the need to allow students to take control over their own learning during these inquiry practice techniques – which was surprising to me, as all three participants did not agree with students in general having control over their own learning. There are also many methods to motivate and engage students in the classroom, some of the noted ones were: including interactive and interesting lessons – such as activities, group work and technology, and the teacher’s attitude and actions in the classroom. For student assessment, it is important to use assessment AS learning, the participants said that they try to do this often. The participants also mentioned, for students to benefit from their learning processes, it is vital to: guide student learning throughout their course, give reflective feedback, and include both formative and summative evaluations. Lastly, it is important for teachers to create an environment that fosters students SRL skills – like metacognition and motivation, as these play a key role in student
learning. Similarly, it is important to create an environment that fosters students’ SRL skills and students’ interaction with their peers and teacher; doing this is imperative for students as it further contributes to their level of engagement and motivation in the classroom. A method that was specified for the applied level, although not limited to, is the need for teachers to positively display to their students that they care, are interested and want them in their classroom.

I had originally approached this paper with the assumption that teachers do not self-consciously foster self-regulated learning in the classroom. What I found, however, was that the participants do in fact seem to promote self-regulated learning in their classroom mainly through motivation and engagement. These Ontario junior secondary school science teachers have been fostering some SRL skills in the classrooms. On the contrary, they have not explicitly mentioned teaching nor catering to SRL, especially the aspect of metacognition. My findings point to the need for junior secondary science teachers to foster and further incorporate SRL skills – especially ones like goal setting, time management and metacognition – into their classrooms, as these can impact both students’ learning and academic success. With a further understanding of the topic, I believe it would be more beneficial for students’ learning and understanding if teachers were made more aware of the importance of SRL and consciously fostered these skills in their classrooms. Going forward, more research needs to be done to see how teachers promote self-regulated learning in junior secondary school classrooms; even more specifically in the sciences.

In the next and final chapter, I offer implications and recommendations for teachers, students, parents, administrators and the research community for their own ways to foster and integrate a focus on SRL primarily in the schools and classrooms.
Chapter 5: Conclusion

5.0 Chapter Introduction

This final chapter identifies and discusses this study’s key finding and their significance, implications of the research – both broad and narrow implications, and their respective recommendations. These implications will be focused on the educational community and my professional identity and practice. I will finish Chapter Five by stating areas of further research and concluding comments on how this research study has impacted me as an educator – both presently and in the near future.

5.1 Overview of Key Findings and their Significance

There were several key findings that emerged from the interviews with three junior science teachers. One of the key findings was that the teachers broadly defined metacognitive awareness – though it was not understood or stressed as well as motivation and engagement. Thus, these teachers did not associate metacognitive awareness with motivation and engagement. Interestingly, these teachers could mention key aspects of the first part of metacognition – the knowledge of cognition, in their definitions. Yet, they did not mention the planning and evaluation process of learning, in the later part of metacognition – the regulation of cognition. Another key finding was that the participants believe that learning environments and student-teacher and peer relationships all can influence students’ learning, motivation and/or engagement. The participants voluntarily compared and contrasted the academic and applied level junior science students. It was found, through analyzing the teachers’ beliefs, that the applied level students are less likely to demonstrate SRL skills than those in the academic level, due to various influences. The literature on teachers’ perspectives and views aligned with the need to be cognisant of one’s own beliefs and what they bring into the classroom. Surprisingly,
only one of the participants believe that students have full control over their learning – this also is an aspect in the second part of metacognition that the teachers were not as successful at mentioning. Although, some of the participants did comment on the need to allow students to take control over their own learning during inquiry practice techniques. Though, two of the three participants for the most part felt as though students do not have full control over their learning. All three science teachers reported the need to include inquiry-based learning in their classrooms, which aligns with the research literature on SRL in the classroom. A final finding was that the participants mentioned using various assessments while teaching – such as assessment AS learning, and the need to create the right environment and connections – mainly between teachers and students, in order to see students self-regulate their learning in class. The teachers overall mentioned the need to guide students’ learning throughout the course, give reflective feedback and include various evaluations to aid in the students’ learning processes.

The nature of these findings and the significance that they have to existing literature on self-regulated learning is very insightful. For many of the results of this study, it follows what is already mentioned in the literature. These findings help to understand how teachers define SRL, the reported factors that impact students’ SRL, the influence of teachers’ perspectives and beliefs of SRL related to students’ learning, and teachers’ reported methods to foster students’ SRL skills in the classroom. Although this was a qualitative study – which is different than the many quantitative studies and literature reviews on SRL, there were many aspects that either overlapped or added further profound data on SRL. While the data aimed to answer the overall research question “how are Ontario junior secondary school science teachers seeking to foster students’ SRL skills?” there is still further investigation required to understand quantitatively how these teachers are fostering SRL skills – like motivation, engagement and metacognitive
awareness. Combining this study with an quantitative study on the same topic, will help gauge
the degree of teachers fostering these SRL skills in their junior science classrooms and give a
better understanding of their effectiveness on students’ learning and academic achievements.

5.2 Implications

For the implication section of this chapter, I will discuss both the broad and narrow
implications of this study. The broad implications will focus on the educational community –
including teachers, students, parents, administrators and the research community, for their own
ways to foster and integrate a focus on SRL in the schools and classrooms. The narrow
implications will highlight my professional identity and developing practice as a future educator.

5.2.1. Broad: The educational community

In the educational community, there may be factors that are affecting how, if and why
students are becoming true “self-regulated learners”. As it has been mentioned in the previous
chapters, there are many aspects to self-regulated learning (cognition, metacognition and
motivation) which all can be affected by various stakeholders – such as teachers, students,
parents, administrators and the research community.

To begin, the participants stressed the need to always engage and motivate the students
with “things” that interest them. As well, they mentioned that school may not be a concern,
priority or even the right environment for certain students – suggesting those who have lower
SRL skills. Some teachers may not be educated or trained enough on how to assess, monitor or
even foster students’ SRL skills in the classroom. These teachers could also not know the
importance of students’ acquiring SRL skills in the classroom or what the outcome is if they are
fostering these SRL skills. As mentioned by Jules, it is believed that students at the applied level
are unable to be fully metacognitively aware. With this, an implication could be that teachers
may feel they cannot fully foster the students SRL skills in the classroom as there may be other more important skills to be teaching these students. Teachers may also lack the time in class (as mentioned by the participants in their reported methods) to find ways to foster and incorporate effective SRL strategies for students to learn and use.

On the same note of school not being a priority for certain students – especially those in the applied level courses as highlighted by the participants, students may be lacking SRL skills and the knowledge of self-regulation due to a personal lack of effort, interest or motivation to take control of their own learning. Students may also not find any importance in having these SRL skills as they may be unaware of the impacts that these skills could have on their overall academic performance and success. As mentioned by Jules, there could be challenges in motivating certain students due to “circumstances in their previous classes and schools”. Students may not be taught these SRL skills in elementary schools or in their junior secondary classes, thus they will not know how to effectively plan, monitor or assess their learning goals.

Another implication that arose from the participants’ comments on challenges and barriers was parental involvement, home life and the background of the student. Parents might not be invested enough in their child’s education to aid in creating and fostering these SRL skills. Parents also may not understand nor recognize the importance of SRL skills. Additionally, it is possible that parents or guardians could have other priorities for their children rather than their academic achievements and school life.

For the next stakeholder, school administrators, there is one implication that was derived from Jules’s comment on the need for direct support from the educational community. Jules said that “there’s only so much you can do as a consultant from a distance or providing with PD training”. With this in mind, school administrators might not recognize the need or a challenge
for teachers, especially in applied classrooms, for fostering students’ SRL skills. There also may be a lack of educational assistants in schools for students who are lacking these SRL skills.

Finally, students, teachers and parents all may not be modelling appropriate, effective or even important SRL skills for the students to learn or adapt themselves. It is difficult to gauge motivation, engagement, metacognitive and even success through qualitative interviews with teachers as it is subjective to the students themselves. Therefore, it would be beneficial for teachers and researchers in SRL, and related research, to have a clear definition and focus of these terms as well as teachers’ reported methods of implementing them into the classroom.

5.2.2 Narrow: My own professional identity and practice

For the last few years, I have witnessed a decline in effort and grades for students in post-secondary science courses. After completing an undergraduate thesis that quantitatively looked at the effects of specific learning tools on students’ self-regulated learning and metacognitive practices in a Year 2 Organic Chemistry course, I developed a greater interest in learning effective ways to motivate and foster students’ SRL skills. It was through this research that I was able to understand ways that Ontario junior secondary school science teachers are currently fostering these skills and areas for improvements.

From the results of this study, there are several strategies that I have come up with that can aid in promoting SRL in schools today. I can be open with my colleagues and school professionals with methods to promote students’ SRL skills in the classroom. As well as, adapt and provide quick questionnaires (that are available online) to assess students’ SRL skills throughout the course, or primarily distributing them at the beginning, middle and end. With that, I can also be open to working with my colleagues and other school professionals on ways to identify, teach and foster students’ SRL skills in the classroom. I will also, if required, have the
opportunity to work with parents, and students who are lacking SRL skills, to identify areas of student improvement along with providing useful materials and strategies to help foster students’ SRL skills. Ultimately, teaching the students in my future classrooms how to self-regulate their learning and become students who are able to “think about what they are thinking” will then be transferred and used in other school classrooms – outside of my future science classroom.

With my awareness of fostering self-regulated learners, which has grown even more after completing this research, it is in my best interest to model the appropriate behaviours for my students to learn from; as well as support, encourage and motivate all my students into engaging their SRL skills both inside and outside of my future classroom.

5.3 Recommendations

In the previous subsection, both broad and narrow implications of this study were highlighted. In this section, the corresponding recommendations, both immediate and long term, will be discussed in reference to the broad implications.

First, there are a few immediate recommendations that can be implemented in the educational community today. Teachers and parents should further learn and emphasize the importance of school and the methods to promote students’ learning experiences and academic performance – specifically with reference to SRL. Teachers should alter their classroom environment to suit the needs of all students, and foster self-regulated learning. Students should be educated on the importance of students’ possessing SRL skills, along with the direct and indirect impacts of SRL on school performance and academic achievement. Doing this, accompanied by modelling self-regulated learning skills (such as setting goals, monitoring goals, evaluating goals) in the classroom can aid students in learning, adapting and ultimately exercising these crucial learning skills.
Next, there are some further recommendations for the educational community that may take longer to implement; nonetheless, they are still essential for creating educational environments that promote SRL. Teachers should be informed of specific SRL skills to address in their daily teachings and effective pedagogical methods that they can use that have been found to promote self-regulated learning. They should have opportunities, both in and outside of school, to learn about SRL and the methods of addressing, teaching and fostering these skills in the classroom. Policy makers, the school administrators and/or the union could provide these teachers with professional learning courses and/or time during professional development days for teachers to learn about SRL and SRL pedagogical strategies to use in their department classrooms (i.e., for science teachers, English teachers, etc.). As well, the schools could develop a program for students who are either lacking SRL skills or do not know how to self-regulate; this would be even more beneficial if there are professional educators and teachers there who can help these students go through the self-regulation process and develop these skills. Although time in class is an issue for many teachers – mainly due to the ministry expectations, teachers should allot time to assess their students’ SRL skills. When assessing students’ learning and SRL skills, students could be given a test online at the start, mid-point and end of the semester to assess if and how the students are using and learning these SRL skills in their classroom. In the future, this data could be included on the students report cards, which will give parents, students and teachers an indication of where the student is at and optimistically lead to ways to improve the students' SRL skills. Finally, policymakers within the ministry of education should consider implementing expectations of teachers assessing students’ SRL to maximize the students learning and skill development in schools. Some of the future recommendations would require more time and resources to implement, however it is believed that doing these would further
support and train the teachers to foster these SRL skills in their classrooms. Doing this ultimately would better prepare their students for senior level courses and post-secondary education.

5.4 Areas of Further Research

The current study was able to answer most of the research topic and questions. After conducting this research, there have been a few areas of further research identified that could have led to more significant research findings. For future research – which was also a limitation of the study – there should be a larger and more diverse sample size that includes participants from different schools and boards. Due to the limited amount of sampling time and criteria, the participants in this study taught at the same school. In the future, it would be beneficial to sample a great population of Ontario junior secondary school science teachers, rather than focusing on the GTA, to better understand how they foster SRL skills in the classroom.

While there has been an increasing trend of quantitative studies on SRL, it was more difficult to find qualitative studies that focus on SRL in a classroom – especially in a science classroom and at the junior secondary level. In order to fully understand best methods to promote SRL in the classroom, further areas of research could focus on the qualitative level and/or encompass both the quantitative data from their students on the SRL skills being used and the qualitative data from what the teachers are reportedly doing. It was also difficult to find studies that looked at the internal and external, environmental and even the stream level influence on students’ motivation, engagement and metacognitive awareness – essentially SRL.

Finally, as it was in this study, teachers struggled more with the metacognitive awareness aspect of self-regulated learning. An important area for future research would be to look at teachers’ understandings and reported methods used to promote metacognitive awareness in the classroom, specifically science classrooms. Focusing on the second part of metacognition – the
regulation of cognition, would also be beneficial for understanding how the teachers and students are addressing this in their classroom and its benefits. In addition to this, it would be interesting to research how the students are impacted in different subject from SRL teachings.

5.5 Concluding Comments

The goal of this study was to interview Ontario junior secondary school science teachers about their methods to fostering students’ SRL skills in their classrooms. Although there were implications, limitations and further recommendations mentioned in this chapter, the main goal of answering the research topic and questions was believed to be successful. Due to the nature of this study and time, further participants would have added more significance and value to the results. The major result of this study was that teachers are somewhat aware of self-regulated learning and they are doing lessons in their classrooms that are believed to be fostering areas of SRL; however, there is more research needed into the extent of how they are doing this and students’ benefits. It is important to note that none of the participants explicitly mentioned SRL in the study, as they were not informed about the overarching theme until after the interview. It is believed by these teachers that students in the applied level are less likely to foster SRL skills, especially metacognitive awareness, than those in the academic level.

As I have always been involved with teaching, and have had a passion for the sciences, I have noticed a decrease in both effort and marks over the years as an Instructional Assistant. One of my wishes would be to change this decline to an increase in both students’ effort and grades in the sciences; hoping this change will begin to emerge through teaching my future students’ SRL skills with the methods that I have learned from this research study and literature review. I truly hope that in the future, with more research and awareness, a greater number of teachers will explicitly teach their students SRL skills in their classrooms and that these students will
ultimately benefit from this – both in effort and their final grades. Ultimately, it would be amazing to see this change in all of the science, and even non-science, classes in Ontario.
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Appendix A: Letter of Consent

Date: MONTH DAY, 2016

Dear _______________________________,

My name is Brittany Doerr and I am a student in the Master of Teaching (MT) program at the Ontario Institute for Studies in Education at the University of Toronto (OISE/UT). A component of this degree program involves conducting a small-scale qualitative research study. My research will focus on techniques teachers when dealing with students who lack motivation, engagement and/or metacognitive awareness in junior (grade 9 and 10) secondary applied and/or academic general science class. I am interested in interviewing teachers who have experience working with these students and their methods of promoting students’ learning skills in their science classrooms. I think that your knowledge and experience will provide insights into this topic.

Your participation in this research will involve one roughly 60 – 75 minute interview, which will be transcribed and audio-recorded. I would be grateful if you would allow me to interview you at a place and time convenient for you, outside of school time. The contents of this interview will be used for my research project, which will include a final paper and informal presentations to my classmates. I may also present my research findings via conference presentations and/or through publication. You will be assigned a pseudonym to maintain your anonymity and I will not use your name or any other content that might identify you in my written work, oral presentations, or publications. This information will remain confidential. Any information that identifies your school or students will also be excluded.

The interview data will be stored on my password-protected computer and the only person who will have access to the research data will be my course instructor. You are free to change your mind about your participation at any time, and to withdraw even after you have consented to participate. You may also choose to decline to answer any specific question during the interview. I will destroy the audio recording after the paper has been presented and/or published, which may take up to a maximum of five years after the data has been collected. There are no known risks to participation.

Please sign this consent form, if you agree to be interviewed. The second copy is for your records. I am very grateful for your participation.

Sincerely,

Brittany Doerr
Consent Form

I acknowledge that the topic of this interview has been explained to me and that any questions that I have asked have been answered to my satisfaction. I understand that I can withdraw from this research study at any time without penalty.

I have read the letter provided to me by Brittany Doerr and agree to participate in an interview for the purposes described. I agree to have the interview audio-recorded.

Signature: ________________________________________

Name: (printed) _______________________________________________

Date: __________________________
Appendix B: Interview Protocol/Questions

1. Opening Script

   Good (morning/afternoon/evening) __________________ (participants name). My name is Brittany Doerr and I am a second year Master of Teaching candidate at OISE (UofT) conducting this research study for my MTRP.

   I want to sincerely thank you for devoting your time to participate in my research study. The purpose of this research study is to interview junior (grade 9 and 10) secondary applied general science teachers who have experience working with students who struggle with motivation, engagements and/or metacognitive awareness and their methods of promoting students’ learning skills in their science classrooms. I would like to learn this as I am on the road to becoming a science teacher and believe knowing the answer to this question will help me in my future teachings. This interview should take approximately 60-75 minutes, which will be transcribed and audio-recorded. The interview is comprised of approximately 25 questions. The interview protocol is divided in five sections including demographics, consent and the interview itself. The interview questions look at teachers’ perspectives/beliefs, teaching practices, supports and challenges, and next steps. There are no foreseen risks. I want to remind you that all information will be kept confidential and stored safely, you have the right to choose not to answer any questions or withdraw from the study at any point, and in the end you will have the chance to member check the transcript prior to data analysis. Do you have any questions before we begin? Is there a specific pseudo name you would like to known by?

2. Consent

   Signed consent form

3. Demographics (Background Information)

   1. How long have you been working as a teacher in Ontario?
      a. What year did you begin?
   2. Can you describe your education and qualifications for your position?
   3. Have you always taught in the Greater Toronto Area (GTA)?
      a. If no, where else have you taught?
   4. What grades, subjects and streams (e.g., Applied/Academic, etc.) do you currently teach?
   5. For how many years have you taught Grade 9 general science?
      a. If yes, for how many years?
   6. How about Grade 10 general science?
      a. If yes, for how many years?
4. Interview

Section A – Teacher Perspectives/Beliefs

1. Have your beliefs about teaching changed over the years?
   a. If so, can you indicate what has changed?
   b. What about your beliefs about learning?
      i. Do you believe students have control over their own learning?

2. I’d like to get a sense from you of how you define the terms ‘motivation’, ‘engagement’, and ‘metacognitive awareness.’ I am going to go over a few questions for each.
   a. What does X look like in the classroom?
   b. What does its absence look like?
   c. What are some internal factors that affect/produce/reduce X?
   d. How about external factors?
   e. Do you feel as though you explicitly try to foster X through your teaching?
   f. Do you have a strategy that you have tried which is effective?
   g. By Grade [9 or 10], what level of X does a typical student exhibit, in your experience?

3. Which do you feel has a greater impact on a student: their motivation, engagement or metacognitive awareness (using your own definitions)?

4. What does it mean to develop a students’ self-efficacy skills in the classroom?
   i. Do you feel this is important in the classroom? Why?
   b. What about a student’s personal beliefs?
      i. Do you feel this is important in the classroom? Why?

Section B – Teacher Practices

1. I’d like to understand how you plan and deliver your lessons/assignments on a daily basis. How would you say you go about doing these?
   a. Do you ever deviate from this?
   b. Do you find this type of planning/delivery benefits the students?
      i. In what ways?
      (i.e., motivation, engagements, metacognitive awareness, transforming mental abilities to academic skills, self-regulation, etc.)

2. During classroom activities (such as labs, assignments or homework), what are some ways in which you go about assessing students’ learning?
   a. Do you often use the same assessment?
      i. If no, what types of assessments do you use?
         1. Why different?
      ii. If yes, what types of assessment do you use?
         1. Why the same?
   b. Do you find you use assessment AS learning during classroom activities?
      i. How does this look in your classroom?
      ii. Do you feel it is an effective strategy for motivating students?
3. Could you walk me through a particular lesson/activity where you encouraged students to take control of their learning experiences?
   a. What was the lesson/activity?
   b. How do you think it went?
      i. How did the students respond?
         1. Plan/monitor/evaluate their learning experience? Learning goals?
   c. What did you do in the lesson/activity that differed from your daily lessons?
      i. What was similar to your daily lessons?
      ii. What type of learning techniques did you use?
         1. Did they help?
   d. Was there something you felt you did right?
      i. Wrong?

4. Tell me about an experience when you worked with a student who lacked motivation, engagement, and/or metacognitive awareness?
   a. How would you describe this student?
      i. Strengths? Weaknesses? Distinct characteristics?
   b. What was it that they lacked most?
      i. How did you know this? (Grades, Attitude, Focus, etc.)
   c. What was the assignment or activity?
   d. What strategies did you use?
   e. What effects do you think you were able to have on the students’ ________?
   f. Would you say your work with the students was successful?
      i. Why/not?

Section C – Supports and Challenges
1. What general challenges and/or barriers do you experience in trying to motivate junior science students?
   a. What do you think needs to be done beyond your own classroom to manage these challenges and barriers?
2. What kinds of support systems and resources are available to you in trying to motivate junior science students?
   a. What do you think about the supports and resources currently available to you?

Section D – Next Steps
1. What advice do you have for a beginning science teacher, such as myself, for motivating students in the classroom?
2. Do you have any final thoughts?

5. Closing Script

Okay, so we have come to the end of the questions that I had for you today. Thank you for your time and considered responses. I am now going to turn off the audio-recorders. Before I do is there anything you would like to add that may potentially be included in the final transcript? [TURN OFF AUDIO-RECORDE]. I particularly appreciate ____________ (how open you were about your practice / sharing your experiences / knowledge on motivating and engaging students in a science classroom / etc.). Do you have any questions for me?