The experiences of Natural Sciences teachers in the application of self-regulated learning.

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ABSTRACT

In the context of improving the learning process, a framework of self-regulated learning (SRL) is presented, which is regarded as a necessary pre-requisite for life-long learning. SRL has been used as a conceptual framework for a qualitative investigation conducted through participatory action research. Within the basis of the social-cognitive theoretical framework the phases of self-regulated learning are presented and analyzed as teachers implemented these phases during the teaching of Natural Sciences in grade eight and nine. The framework is envisaged to assist teachers to explore their own teaching and also to inculcate a sense of autonomy and responsibility in their learners' learning.

The Natural Sciences teachers, who participated in the study, attended a two hours' workshop for three days to be informed about action research and self-regulated learning as these were new concepts to them. The teachers taught self-regulated learning strategies through investigative lessons based on inquiry-based learning. Three middle schools were examined using on-site observations, open-ended interviews with individual teachers and teacher journals as data gathering methods.

The results explained the experiences the teachers encountered during the application of SRL strategies in the classroom. Despite the limitations of the study, the teachers support the integration of SRL strategies in the teaching and learning of Natural Sciences and they also see SRL as a motivation to engage in innovative programmes to continually improve teaching approaches in order to better the performance of learners. The outcome of this research study was partly positive because the participating teachers could not effectively implement the SRL strategies in the classroom for it was their first encounter with the concepts self-regulated learning and action research. Hence, there is still a lot that has to be done for effective implementation.

Keywords: Self-Regulated Learning, Action Research, Learning Strategies, Intervention, Integration, Constructivism, Inquiry-Based Learning, Cognitive Development, Learning Cycle, Motivation.

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ABBREVIATIONS

AR   Action Research

CD   Cognitive Development

IBL   Inquiry-Based Learning

LC   Learning Cycle

NS   Natural Sciences

OBE   Outcomes-Based Education

PAR   Participatory Action Research

SRL   Self-Regulated Learning

CHAPTER 1

ORIENTATION, PROBLEM STATEMENT AND FACTORS THAT LED TO THE STUDY

1.1 Introduction

South Africa has experienced a series of transformations in its government sectors since 1994 when the new democratic government took over. The education sector was transformed with the aim of creating a system that would give out education and training of good quality (Department of Education, 2002). This meant there would be equality in the educational and employment sector unlike in the past. The transformation was based on developing people and providing learning opportunities for all. This was supported by South Africa's constitution which guaranteed non-discriminatory opportunities for all (Department of Education, 2002, 2005). In that light, this study holds a strong believe that all learners have potential. The transformation of the teaching and learning of Natural Sciences through the introduction of an intervention was found to be essential to equip learners to be able to access learning opportunities.

Since educational research emphasizes the importance of effective learning, the improvement of teacher performance to increase the desired learning outcomes, teachers in this study were made to realize they were agents of change and could support learners to become responsible for their own learning and inculcate in them the skill to become lifelong learners. Hence the study involved teachers in an investigation on the application of self-regulated learning (SRL) strategies when teaching grade eight and nine learners. As a consequence, the aim of this study was to bring to the attention of teachers the important role they could play in developing the teaching and learning of Natural Sciences through the application of self-regulated learning strategies.

As a step towards the improvement of the education system with regard to the attainment of desired learning outcomes the South African Education sector introduced an outcomes-based curriculum (OBE) which was called Curriculum 2005 (C2005). The curriculum specified learning outcomes which would show the competency of the learner (Department of Education, 2002, 2005). This curriculum replaced the former which focused mostly

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oncontent. Outcomes-based education was introduced, shifting the focus to what the learners could do with the knowledge they gained, and in particular whether they could use this knowledge to meet the specified outcomes (Smit, 2001).

1.2 **Background of the study**

Most of the reports on South African education indicated that most of the teachers did not have quality training to successfully meet the needs of the growing democracy (Smit, 2001). In essence, the OBE system in South Africa could have been very successful if the following conditions had been met: "if teachers had been well qualified and understood the principles of OBE, if all schools had been equipped with libraries, laboratories, computers and other audio visual aids, and if there was an environment conducive to self-study and problem-solving methods" (Smit, 2001, p.29). Presently, the implementation of the National Curriculum Statement for Grades R-12 has commenced in all grades.

The OBE education and training depended on the outcomes of the learning process rather than the input of the teacher. In this type of learning, some standards are set against which the progress of learners would be compared (Department of Education, 2005). This implies that formal assessment would be done in a more transparent manner. The objectives of the OBE curriculum as indicated in Department of Education(2003, 2006) which include among others, the promotion of a learning situation which supports constructivist orientation to knowledge acquiring; the stimulation of self-awareness of the learning process and the encouragement of meta-cognitive awareness could not be achieved in most schools as the policy directives were not clearly understood as to how these objectives could be achieved in practice. This led to C2005 becoming difficult to implement and resulting in a review in the year 2000 (Smit, 2001). The curriculum was then revised for the first time: "Revised National Curriculum Statement (RNCS) Grade R-9 and the National Curriculum Statement (NCS) Grades 10-12 (2002)".

On the basis of the on-going implementation challenges that the OBE system experienced, Hattingh, Aldous, Howie and Venter (2005) explain that from the results of research on curriculum reform, the shift from learning which was content based to that which focused on outcomes has been slower than expected. This was indicated by the few skills that the learners displayed in comparison with what they were supposed to display following their

achievement of learning outcomes. Research on the implementation of the NCS and RNCS indicated that many teachers experienced uncertainties in implementing the curriculum (Ramsuran, 2005).It became evident that it was not easy for teachers to interpret the curriculum documents. In addition, Smit (2001, p.28) stated that "teachers did not have the understanding on how to interpret and implement the policies and it became clear that teachers only expressed and presented learner-centered practices without proper knowledge of the philosophies involved". This was exposed by the limited knowledge that the learners expressed.

The system experienced on-going challenges, which culminated into another review in 2009 where the Revised National Curriculum Statement (2002) and the National Curriculum Statement Grades 10-12 were amended to produce a new document. From 2012, the two National Curriculum Statements for Grades R-9 and Grades 10-12 were combined into a single document known as the National Curriculum Statement Grade R-12. This new document extended the curriculum in place. The difference brought about by the new document is that it provides clear outlines as to what the teacher should teach and what the learner should learn within a specified period of time (Department of Basic Education, 2011, p.2).

The new National Curriculum Statement Grade R-12 stands as a policy to be used in schools and includes: "Curriculum and Assessment Policy Statements (CAPS) for all approved subjects, National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grade R-12, and the National Protocol for Assessment Grades R-12" (Department of Basic Education, 2011, p.2). While the new policy clearly outlines what the teacher and the learner should do, this study hopes to bring forth self-regulated learning strategies that could assist both the teacher and the learner to effectively implement the policy. The SRL strategies link with the OBE system because they both are based on a constructivist learner-activity-based approach.

Johnson, Scholtz, Hodges and Botha (2003, p.88) made it apparent and expressed that"although teachers can enter any professional development intervention available to them with a variety of different levels of competence and experience, change is a long process". However, these authors believed that professional development modifies teachers' beliefs, knowledge and skills to a greater or lesser extent so that when teachers return to their

classrooms, they may be motivated to try out the practices to which they have been exposed. In support, Spicer, Stark and Hatch (2006) also mention that professional development brings about changes to the planning of teaching and learning in the classroom. However, there are researchers who contend that changes are difficult to achieve since professional development offered does not necessarily meet the needs and expectations of the real classroom situation (Collinson and Ono, 2001; Feiman-Nemser, 2001 ; Yang, 2006 ; Villegas-Reimers, 2003).

It is also these researchers' belief that professional development is necessary and finds truth in the statement that change is a long process. Thus it becomes important for the Department of Education to make sure that teachers understand the changes they have to implement in their classrooms, and to provide teachers with clear directives and continuous support. However, this study argues the teachers' practical and theoretical knowledge are important factors which would determine how they would adapt the teaching and learning process. Having learned and implemented the application of self-regulated learningstrategies; teachers could give learners the opportunity to become autonomous by allowing them to make decisions in their learning.

1.3 Teaching Natural Sciences in South Africa

The scientific aspect of the previous curriculum in middle schools (senior phase) had three major learning outcomes:"1) scientific investigations, 2) developing scientific knowledge, and 3) science and society, each with a number of assessment standards per grade" (Department of Education, 2002, p. 6). The learning outcomes have been modified in the new curriculum and assessment policy statement (CAPS) document with the following as Specific Aims: "Specific Aim 1: Doing Science, Specific Aim 2: Knowing the subject content and making connections, and Specific Aim 3: Understanding the uses of Science, all operating with the core knowledge areas of Matter and Materials, Energy and Change, the Earth and Beyond, and Life and Living" (Department of Basic Education, 2011,10).

In recent times there has been growing public anxiety about the teaching and learning of science in South Africa. Studies showed that science have been studied at very low scales and observations indicated the use of rote learning which made the process of learning science difficult (Howie, 1997, 2001). Moreover, Hattingh et al. (2005) also indicate that the imbalance between policy and practice resulted in the poor performance in science. They

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argue that the learners' performance would remain poor when what was done in the classroom is not aligned with policy.

South African learners performed very poor in science subjects as compared to their counterparts in other countries. This came from:"Trends in International Mathematics and Science Study (TIMSS) in which South African learners performed poorly" (Howie, 1997, 2001). Science education in South Africa has to date experienced challenges as brought forth by several researchers like Laugksch (2000, p.76) who pointed out that students are seen to be less interested in science related careers hence the decrease in number of students enrolling in the science and engineering fields.

The low number of learners who register for physical sciences at senior secondary level is also a point of discussion (DoE, 2002, 2003). Moreover, Kahn (2001) mentions that the pass rate in Grade 12 school leaving examinations in physical sciences has generally been low, particularly for African learners who form a bigger part of South Africa's school population and who mostly reside in rural areas (DoE, 2003). Learner performance has dominated current discussions on education matters thus, according to Smit (2001, p.69),researchers in education hold a belief that the performance of learners has not become satisfactory because the curriculum has not yet been well understood and implemented in schools.

The teaching of science per se has been a challenge in most countries. Hodson (2003) also mentions that the practice of teaching science has been reported as not having showed much improvement across the world despite significant advances in science education in the last two decades. Australians, for example, are currently experiencing disappointing science teaching and learning in their schools (Goodrum, Hackling and Rennie, 2000). These authors highlighted that the traditional 'chalk and talk' teaching and notes taking, which offer little challenge or excitement to the learners, were still the order of the day in many classrooms. The United States curriculum was also found to be focused mainly on content than on learners' reflections which was a prerequisite for building understanding (Goodrum et al, 2000).

Within Sub-Saharan Africa, including South Africa, researchers such as Ottevanger (2002, p.313) have also noted that the chalk and talk teaching styles were still the order of the day, a high prevalence of recalling factual knowledge and being unmotivated to ask questions. The

discovery also included a dearth of practical work. A further indication was that the curriculum seemed not to be beneficial to the community since more time was spend on finishing the content rather than helping learners to understand science context of life beyond school (Laugksh, 2000, p.78).This is where the study saw a gap; the focus was on finishing content rather than on empowering learners to understand content. In order to address this situation we must empower learners with skills to take responsibility of their own learning.

The study introduces regulating strategies which could help the learner to have authority over own learning process, monitor and evaluate own progress in learning. In addition, the regulation strategies could help teachers to replace their feelings of insecurity in teaching Natural Sciences with confidence as they will continuously reflect and improve on their teaching approaches.

It is possible that finger-pointing among stakeholders could be limited by a constant search for ways and means to improve the current status quo. The OBE system could have partly focused the shift on developing the learner to become independent and responsible for regulatingtheir own learning process, while the teacher assists the learners to reach each outcome. Smit (2001) add and argue that the new system increased the workload requiring teachers to spend more time documenting, planning and assessing rather than motivating and supporting learners to have authority in their learning.

It would appear that teachers had an idea of what was expected of them in terms of planning, but the necessity thereof which forms the basis of outcomes-based and learner-centered teaching approach was perceived differently. It also appeared that the extra workload for teachers resulted in teachers being reluctant to make an effort to adopt new interventions that could lead to the improvement of the classroom environment making it more conducive to learning,motivating learners to engage in tasks, enabling them to reflect and become open-minded to engage in higher-order thinking.

1.4 **The approach to teaching and learning in science**

The shift from a teacher-centred to a learner-centred approach in teaching science reflects the need for teachers to search and try new ways of teaching which will positively cater for the needs and interests of learners. Applying the new ways will encourage learners to take

control of their daily learning (Rogan, 2004, p.165). According to Goodrum et al. (2000), effective teaching looks at the way in which learners learn.Rogan (2004, p.166) also report that innovative approaches could be used to familiarize learners to many aspects of science.

Goodrum et al. (2000) further maintain that teachers should value the different experiences that learners bring to class. The implication here is that different needs and interests of learners have to be accommodated by the new teaching and learning activities. Therefore, learners need to be motivated to own their learning. This may be achieved by teachers working together with learners in developing the learning goals. Taking part in these activities will increase the learners' confidence to actively engage in the learning process (Goodrum et al., 2000).

The National Curriculum Statement requires teachers to act as facilitators in order to teach in a learner-centered environment (Department of Education, 2002). Learner-centered environments thus call for the teacher to use an inquiry-based method of teaching (see Chapter Two, Section 2.7 for a detailed discussion onthis teaching method). The emphasis is on active learner participation and using learners' experiences in delivering the curriculum. Protheroe (2007, p. 40) describes a learner-centred environment to be where the learner receives assistance towards building new knowledge on the existing knowledge. Additionally, learner-centered settings incorporate learners' interests and strengths into the activity, engaging with activities and learning experiences. Furthermore, Goodrum et al. (2000, p. 111) emphasize that the engagement of learners would result in them becoming aware of the strategies they could use to think and to learn and they could also monitor their use of these strategies.

This research therefore investigated the experiences of Natural Sciences teachers in the application of self-regulated learning strategies when teaching Grade 8 and 9 learners. This study postulates that if learners could be developed to self-regulate their learning, teachers would be able to manage their workload and would always be on the lookout for ways and means of helping learners to improve their learning. The reason behind the choice of self-regulated learning was that all the concerns about science teaching and learning have been expressed without particular attention to how self-regulated learning strategies might contribute to improved motivation to learn Natural Sciences and the improvement of its teaching in the classroom. This would benefit teachers' instructional and assessment planning

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and implementation, which would focus on assessing learners' deeper understanding of Natural Sciences instead of speeding up the presentation of content to cover all the curriculum content as is the case presently.

This project was based on action research in which Grade 8 and 9 Natural Sciences teachers taught self-regulated learning strategies to their learners. The aim of the project was to improve the learning of Natural Sciences in three public middle schools located in Nokaneng. The study focused on the participating teachers' understanding of self-regulated learning strategies and how these strategies could be incorporated in the teaching and learning of Natural Sciences, whether they found self-regulated learning strategies useful for improving teaching and learning and the motivation of learners, as well as whether there were changes in their facilitation of learning after the implementation process.

1.5 **Problem statement**

Improving Mathematics and Science education has been South Africa's main aim of education (Bernstein, 2005). However, research has indicated that the country has failed in this endeavor and that has probably become the most important hindrance to the African success and advancement in South Africa (Bernstein, 2005). Bernstein's (2005) research brought forth a reality that undermined all the objectives of the country to increase economic growth.Moreover, many researchers have investigated local classroom practice in the initial stages of curriculum reform in South Africa and have discovered that the shift from content oriented to outcomes-based learning has been slower than expected (Hattingh et al., 2005). This displayed that very few skills that the learner was supposed to acquire through the attainment of learning outcomes were actually acquired. The failure of the new learner-centred teaching approach was emphasised by Hattingh et al. (2005, p. 13) as they posit that time, money and effort were wasted and good ideas were not translated into classroom reality due to the continued focus on unprecedented curriculum change.

The Department of Education (2003, 2005) indicates that when the teacher designs learning experiences emphasising learner-centeredness, the objectives should be to ensure that learners take action and make changes before they need to be made. This helps in creating self-directed learning, and making resource-based learning more flexible. Additionally, learner motivation is enhanced, providing opportunities for learning founded in collaboration,

group or social approaches, and providing individual enrichment via resource and learning extension (Department of Education, 2005).However, most studies in learner-centred environments show that teachers are still challenged to implement such an approach and are still trapped in the traditional approach (Rogan, 2004, Ramsuran, 2005). Rogan (2004 p.166) emphasises "the implementation of learner-centred practices appears to be far from straight forward, and indicates that teachers find it hard to intervene, particularly in situations involving group discussions even though the true widespread perception is that curriculum reform encourages intervention". Furthermore, it has been observed that teachers find it hard to intervene to get learners to challenge their conceptions (Rogan, 2004). This shows that the ideals of the curriculum have not yet been realised.

It has been shown that "learner centeredness requires change in the way that teachers think and the choices they make with regard to content and teaching methods" (Randler & Hulde, 2007 p. 329). Such changes result in transformed classrooms as authority and power in the classroom move away from the teacher and learners are allowed to engage more deeply in the content. This creates "a climate quite different from that of a traditional, teacher-centred classroom and the class becomes more flexible and encourages greater learner participation" (Esteve, 2000 p.198). On that basis, the assumption of this study is that to some extent, the awareness of learners regarding self-regulated learning strategies may help teachers torealise a learner-centred environment.

This study resonates Smit (2001) that it would be difficult to improve academic performance without providing sufficient individual learner support. It is the assumption of this study that a shift towards equipping learners to be independent and to be able to take responsibility for their own learning should be the focus. However, one possible point of departure that can be argued is that the constant 'take responsibility for your own learning' is not well operationalized.One way to take responsibility is through self-regulation. Self-regulation, according to Zimmerman (1989 p.5), "is regarded as the degree to which individuals are motivationally active agents in their own learning". By reading through the literature on self-regulation, it was learned that there were strategies that could be learned to become a self-regulated learner. By practicing these strategies, learners take a proactive rather than reactive role in their learning process (Zimmerman, 2002). This starting point however, brought forth the need to investigate the understanding of teachers' of self-regulation.

The urgent need to promote learning and improve performance in natural sciences in middle schools in Nokaneng, in the Morelete District was basically based on the poor performance of learners in natural sciences. As a natural sciences teacher, I have seen the persistently poor performance in the subject as undermining the future of learners in pursuing science related careers. This area of self-regulation has not yet received much focus in South Africa, especially in secondary schools.

1.6 **Rationale**

The aim in undertaking this study was prompted by my limited observation as a natural sciences teacher, and a cluster leader for natural sciences in the Nokaneng circuit from the discussions with natural sciences teachers on the low performance of science learners in the circuit as well as in the province and in the country. I realised that although teachers were trying to practice the learner-centred approach following OBE, learners are not motivated, are still dependent on their teachers and do not take charge of their own learning process.

The poor performance of the learners made me wonder how I could help these learners to improve their learning. The learners had to be independent and not totally rely on the teacher for everything, meaning that they have to take charge of their learning process. I realised that this could be done by bringing an intervention through self-regulated learning (SRL). I asked around during cluster meetings when we discussed ways of improving learner performance regarding the strategies that we could use. The responses I received only involved action from the teachers' side (e.g. giving learners more classwork and homework activities). No mention was made of any action on the part of learners, except for writing informal homework/classwork and formal assessment activities.I then informed the teachers that I thought we should maximize the responsibility of the learning process to the learners. The next question was, how can that be done? Teaching learners self-regulated learning strategies was thought to be an answer to the problem. I asked the teachers how we could go about doing this and no one had any idea. I then realisedthat there was a need for a study about self-regulated learning and how we could integrate it into our classroom programmes. I then accessed articles on self-regulated learning and the different models.

From the literature, I found the following reasons that were encouraging and confirmed that self-regulated learning strategies was a valid topic worth further study:

- "Innovation in education is important to prepare young people for an exciting but uncertain future. In a teaching and learning environment, this means creating opportunities for learners to learn new ways to meet their individual needs" (Randler & Hulde, 2007, p.330).

- "Self-regulated learning follows a learner-centred approach (Wehmeyer, Agran & Hughes, 2000, p.59) therefore it could be the answer for those teachers who find it difficult to implement this approach".

- "Self-regulated learning strategies help to prepare learners for lifelong learning and the important capacity to transfer skills, knowledge and ability from one setting to another" (Paris & Paris, 2001, p.90).

- "Self-regulated learning can be applied by learners of all ages when given the opportunity to do so. Perry, VandeKamp, Mercer and Nordy (2002) conducted research which confirmed that young children can and do engage in SRL in classrooms where they have opportunities to engage in complete open-ended activities, make choices that have an impact on their learning, control challenges and evaluate themselves and others" (p.14).

I further realised that due to the fact that many teachers have no idea on how to teach self-regulated learning strategies, this called for teacher development on self-regulated learning and its strategies. It was thought that these teachers could improve their practice as well as generate knowledge and understanding of self-regulated learning through action research. This study could also make a contribution towards the improvement of practice by providing a variety of teacher voices sharing ideas from their own experiences of integrating self-regulated learning in their classroom environments. It is highly possible that including "self-regulated learning strategies" when teaching naturalsciences could be an important part of the curriculum in all schools (Paris and Paris 2001, p.90)

It is the belief of this researcher that all learners have potential. Today's learners need an education that meets their individual needs and connects them to what is happening around the globe. The challenge that is then presented to teachers is to be innovative in the way they create opportunities for learning. However, Rogan (2004, p.169) posits "it is the responsibility

of the school to encourage teachers to always check whether their methods are still effective and be ready to try new ones that may help all learners to develop self-regulation and life-long learning skills".

This study puts specific focus on self-regulated learning, "a topic that has garnered a great deal of interest among academic researchers and practicing educators because it is a worthy objective for learners of all ages and all disciplines" (Paris & Paris, 2001, p.90). Self-regulated learning is important, according to Zimmerman (1989, p.74) and Smith (2001, p.68),"as it is the basic foundation for a lifelong learning process which offers control of mind, attitude and behavior of learners". This is supported by Fallon (2006) and Perry, Phillip and Hutchinson (2006, p.256), who emphasise that "a good approach to learning that could bring success beyond school is self-regulated learning". By using the strategies of SRL, learners are expected to be more independent, responsible and motivated to learn. Besides that, teachers would also be encouraged to be more creative in developing instruction and assessment (Zimmerman, 2000). However, some authors like Schunk (2008) contend that total reliance on SRL for improving learner achievement may not be the answer and theyemphasise the fact that "there are still many unanswered questions about how learners could become self-regulated learners that improve their achievements" p.464.

This study assumed that the application of self-regulated learning strategies in natural sciences through classroom observations, interviews and developmental workshops, would:

- Serve as a starting point for schools to see the need to support learners to become responsible and take charge of their own learning process;
- Clarify the importance and task of the learner in the learning process;
- Teachers will be motivated to collaborate with each other within their schools and those from other schools;
- Teachers will be supported and developed to create teaching and learning of good quality; and
- Improve assessment.

Up to now there has been limited research done to evaluate an intervention project that develops teachers in the application of self-regulated learning strategies in Natural Sciences forGrade 8 and 9 in the South African context. This indicated the need for this study.

Additionally, there are also fewer studies on SRL in South Africa as compared to the current focus on SRL internationally. Perry et al (2002, p.9) advocates that "local and international studies tend to focus mainly on higher education as compared to secondary and primary education". Such an investigation may add to the limited body of knowledge on SRL in the South African context.

1.7 **Research Questions**

This study addressed the following research questions:

1.7.1 **Primary Question**

How do Natural Sciences teachers experience the application of self-regulated learning strategies when teaching Grade 8 and 9 learners?

1.7.2 **Secondary Questions**

1. How do grade 8 and 9 Natural Sciences teachers understand the concept of self-regulated learning?
2. How do teachers describe the change experienced in the teaching of Natural Sciences,if any, in their teaching practices as related to the use of self-regulated learning?
3. What are these teachers' views on the usefulness of learners having an awareness of self-regulated learning strategies when learningNatural Sciences?

1.8 **The Site and participants**

This study took place in three schools located in Nokaneng, a rural village in the Nkangala District, Mpumalanga. School A, school B and school C catered for 230, 210 and 189 Grade 8 to Grade 9 learners respectively. All three schools had predominantly Sepedi and Setswana learners. The principals gave permission for their schools to become research sites. Natural Sciences teachers in grade 8 and 9 were invited to take part in this research. Seven teachers responded favorably: from (school A) three teachers showed interest, from school B, two teachers and from school C also two teachers. Initially I had planned to use only two schools, but I found that most teachers taught more than one grade (e.g. one teacher teaching Grade 8 and 9). I therefore decided to add a third school. Seven teachers, four females and three

males who work with middle school-age learners (years 12 to 15) were recruited who were all experienced teachers ranging (from five to thirty years). In all three schools there was a formal briefing session wherein the teachers received therequired clarification about all the aspects of the study. All the participating teachers were enthusiastic and interested in the study.

1.9 **Definition of terms**

1.9.1   **Self-regulated learning**

Pintrich (2000, p.545) defines self-regulated learning as "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation and behavior while being guided and constrained by their goals, the contextual factors and the environment". According to Duckworth, Akerman, MacGregor, Salter and Vorhaus (2009, p.1),"self-regulated learning is a dynamic concept which suggests the activities and thinking processes that learners can engage in and which are amenable to change, rather than fixed traits that individuals either possess or lack". Zimmerman (2008, p.166) also describes self-regulated learning as "a proactive process that students use to acquire academic skills such as goal setting, selecting and deploying strategies, and self-monitoring one's effectiveness". Schunk (2000, p.631) puts it as"a systematic management process regarding one's own thoughts, emotions, and behavior regarding one's personal goals and achievements".

 From the above definitions,it has been gathered that self-regulated learning is a strategy that equips the learner with the skill to work independently to set goals, monitor and reflect to evaluate their progress towards the attainment of a goal. This skill is necessary for preparing the learner for the world outside of school.

1.9.2   **Action Research**

There are many terms used to describe action research. These terms show many key issues but most researchers see action research as a process where the communities do investigations by themselves and the investigations are not done on them (Herr and Anderson, 2005). Action research is also described as a systematic procedure whereby

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teachers collect data on how they could better the running of their schools and to improve how their learners learn(Mills, 2011). McNiff, Lomax and Whitehead (2003, p.178) define action research as "a systematic and orderly way for teachers to observe their practice or to explore a problem and a possible course of action".

Cohen, Manion and Morrison (2007, p.298) define action research as "a small-scale intervention in the functioning of the real world and a close examination of the effects of such an intervention". The meaning and essence of action research is encapsulated within its name. McKay and Marshall (2001, p.46) relate action research to "represent a complex position which involves action and research or practice and theory". Therefore, it could be said that action research is focused on producing knowledge by means of seeking solutions or improvements to practical real life problem situations.

From the literature on action research, it has been gathered that this research isthe kind in which the teacher is active and works alone or in collaboration with others to investigate a context with the aim of bringing about change or improvement to the teaching and learning, and also gaining a better understanding of one's educational situation.

1.10   Chapter Summary

This chapter provided an introduction and orientation of this study. The study intended to investigate the experiences of natural sciences teachers when teaching self-regulated learning strategies to Grade 8 and 9 learners. The assumption was that if learners could be taught self-regulated learning strategies, they could be motivated to learn natural sciences, become independent learners and be able to take responsibility for their own learning process.

1.11   Summary of the Chapters

In Chapter One, this research study was contextualized within the South African educational perspective. The purpose and the significance of the studywere then presented.
Chapter Two examines the literature on how different researchers think about self-regulated learning, the theoretical background, and the theory which forms the basis for this study. This study further explored the theory of learning explained by Zimmerman's Self-regulated Cycle of Learning. In conclusion the study explains the strategies chosen by this study.

Chapter Three explores the advantages and limitations of a qualitative approach. Action research is explained as a research design and how it is applied in practice. The chapter also describes the research techniques as well as the ethical issues that should be taken into account.

Chapter Four presents the results, report on analysis of data collected, the two workshop phases, lessons presented and the reflections as well as the perceptions of teachers on their experiences of teaching self-regulated learning strategies.

Chapter Five discusses the general overview of the results as presented in Chapter Four. The chapter presents the results in association to research questionsof the study. This includes the limitations and the positives of the study. The conclusions, recommendations, areas for further research and my reflections on the study are also discussed.

CHAPTER 2

THE THEORETICAL ORIENTATION, MODELS OF SELF-REGULATED LEARNING AND STATEGIES USED IN THE STUDY

2.1 **Introduction**

The integration of innovative ways to improve teaching and learning requires the teacher to have a good understanding of how school children learn. Different learning theories provide valuable information and insight into how children learn and how they can be supported by their teachers to achieve their optimal potential in learning. This chapter starts with the theoretical orientation based on an exploration of theories from the behavioral to cognitive theories. The theories of Piaget, Vygotsky and Brunner are also discussed and compared. These theories were chosen because they advocate the cognitive functioning of learners, which serves as the basis for understanding how learners can be taught to use self-regulated learning strategies in their learning process.

It is therefore important to first have an understanding of how the theories are applied in the classroom and the expectations for teachers. Above all, the study chose to follow Vygotsky and Brunners' social constructivist theory (see Section 2.3.4) as its principles form the basis upon which the self-regulated theory is grounded. From the literature, the chapter presents the definition of SRL, its different models and strategies, as well as the model and strategies chosen for the study. It was important to get a deeper understanding of SRL so that the essentials of SRL could be drawn into this action research practice.

2.2 **Theoretical Framework**

2.2.1 **Behaviorist model of learning**

From the perspective of J B Watson, Harzem (2004, p.6) explains "behaviorism is grounded in the belief that behaviors can be measured, trained and changed". This theory of learning is based on the idea that all behaviors are acquired through conditioning. It is also the belief of behaviorists that "a human response to environmental stimuli shapes their behavior, since

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conditioning occurs through interaction with the environment" (Harzem, 2004, p.7).Buell (2005) clarifies the instruction that this model focuses on conditioning the learners' behavior, which is influenced by the environmental condition. This meant that the stimuli and the consequences being arranged within the environment, the learner would passively adapt to the environment. Svinicki (2003) elaborates that "behavior theory also suggests the concept of hierarchical sequencing of behaviors and the value of teaching components in a particular order. This strategy involvesanalysing the components of the final behavior and having the learner to master each one in order as a way of achieving the target behavior".

Furthermore,behavior theory, however,"has not been as helpful in advising teachers about how to structure the actual teaching material". Aside from "the concept of task analysis and small steps carefully sequenced, behavior theory did not speak directly to the design of instruction as it was said to ignore the most crucial thing with learning, that is thinking" (Svinicki, 2003). Many critics argue that "it is a one-dimensional approach in understanding human behavior" (Harzem, 2004, p.6).The lack of focus on "the restructuring of thinking and understanding, free will, internal influences like (moods, thoughts and feelings) gave way to the emergence of the cognitive theories" Harzem, 2004, p.6). These are discussed below.

2.2.2 Cognitive theories

Early cognitive theories focused on learning as a reorganization of memory, where new information is organized in such a way that it could be easily stored in memory (Svinicki, 2003, p. 264). The second phase of cognitive theorywas the result of the belief by for example Svinicki (2003, p. 264) that learners are controlling and directing learning. This process was named "metacognition, or thinking about thinking". In the original version of cognition, the teacher was the ultimate controller of the process of learning. Metacognition however, shifts the responsibility to the learner with support from the teacher. Cognitive theories have come out showing a new perspective indicating the ability of the learner to process information. However, knowledge is still seen as given and absolute as in the behaviorist theory (Svinicki, 2003, p.265).

Metacognition was an attempt to show that the learner has the ability to control learning. Then, attention was given to the learner being in total control of the learning process and being motivated (Svinicki, 2003, p. 265); this is explained in the discussion of

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constructivism. Constructivism emerged to emphasize the extent to which learners could be able to create their own world view, as shown in the brief discussion below.

2.3 **Constructivism**

The literature on constructivism advocates "a challenge regarding the issue of whether constructivism is a theory or a philosophy" (Yilmaz, 2008, p.161). To bring about a clear understanding of this construct, the following discussion will highlight important features that describe constructivism as a philosophy and again as a theory.

2.3.1   **Constructivism as a philosophy**

Yilmaz (2008, p.162) highlights that the traditional Western theories of knowledge were not satisfied about the traditional idea of the truth as representing an external world, hence the emergence of constructivism. Constructivism postulates that "knowledge cannot exist outside our minds, the truth is not absolute and knowledge is not discovered but constructed by individuals based on experiences" (Schunk, 2000, p.162). Schunk, (2000) further extends to say that individuals do not passively perceive knowledge from the world but develop it by interpreting their experiences of the world. Thus, it provides a set of values in many learning applications.

2.3.2   **Constructivism as a theory**

Constructivism is not a single theory but is categorised by different perspectives. Also different theoretical backgrounds indicate different sides of constructivism as cognitive development, social aspects and the role of context (Yilmaz, 2008). According to Matthew (2000, cited in Yilmaz, 2008), it is evident from the literature that there are eight different kinds of constructivism which have been identified in relation to methodology, yet many theorists and scholars identify the kinds of constructionism in three categories: sociological, psychological and radical constructs. A common aspect of these categories is that they all share the epistemological assumption that knowledge or meaning is not discovered but constructed by the human mind (Richardson, 2003, p.1623).Since its inception as an epistemology and philosophy, constructivism theory has prompted educators to build constructivist pedagogy. (Richardson, 2003, p.1623).

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Richardson (2003, p.1623) calls constructivist pedagogy:

> "The creation of classroom environments, activities and methods that are grounded in a constructivist theory of learning, with goals that focus on individual students developing deep understandings in the subject matter of interest and habits of mind that aid in future learning".

Learning is viewed as process in which the learner makes meaning out of knowledge received. This means that individuals develop ways of learning, meaning and systems of teaching while in the process of learning (Svinicki, 2003, p.265). A constructivist perspective according to Beamer, Van Sickle, Harrison and Temple (2008, p.49) teachers are able to associate theory with practice which results in growth and development. Therefore, constructivism is defined as, "a view of learning that sees learners as active participants who construct their own understanding of the world around them using past experiences and knowledge, learners make sense of the new information that they are receiving" (Brown & Adams, 2001, p. 7, cited in Beamer et al., 2008).

Garbett (2001, p.37) emphasises the teacher has in important role to play in assisting learners to engage in constructivist learning when new meaning has to be linked to teaching experiences. In support of this idea, Svinicki (2003, p.265) highlights that constructivism and social constructivism form some foundations for learning collaboratively. These theories assert that learning is a process of developing a construction of reality in the mind of the learner. Thus the learner uses past interactions and newly acquired information to build a worldview of the existing environment. Epstein (2002) clarifies this by explaining that learners should be guided when engaging with problems. It is through this guidance by more experienced adults that children eventually internalise what they learn.

2.3.3 Approaches to the cognitive development of learners

Research influenced approaches to teaching which explained the children's learning styles and abilities. This study discusses the approaches of Jean Piaget, Lev Vygotsky and Jerome Brunner who have emphasised cognitive development within a social context.

Piaget's theory of cognitive development is a compact theory about the nature and development of human intelligence. It is primarily known as "a developmental stage theory, but in fact it deals with the nature of knowledge itself and how humans come gradually to acquire, construct and use knowledge. To Piaget, cognitive development was a progressive reorganisation of mental processes as a result of biological maturation and environmental experience. Accordingly, children construct an understanding of the world" (Garner, 2008, p.32).According to Piaget, learning should be student-centred and accomplished through active discovery learning and therefore the role of the teacher should be to facilitate learning rather than to direct tuition (Garner, 2008, p.34). Therefore, the teacher should encourage the following:

- "A focus on the process of learning rather than the end product of it;
- Using active methods that reconstruct the truth;
- Using collaborative, as well as individual activities;
- Devising situations that present useful problems, and create disequilibrium in the child; and
- Evaluate the level of the child's development so that suitable asks can be set".

Vygotsky proposed a theory to develop how children function in their home settings. He explained the concept of "zone of proximal development" (ZPD) which is said to refer to how knowledge is gained depending on existing knowledge learned under instruction. (http:www.infed.oralthinkers/bruner.htm).

It is Vygotsky's belief that the social environment plays a major role in the child's development, which is when the child interacts with family members, school teachers and friends. Accordingly, the child adopts the cultural practices from the people he interacts with. Children are viewed as active participants in the construction of knowledge, skills and attitudes and not just copying what happens around them. Essentially,society's culture and background influence the child's growth, more than that it determines the cognitive development as well as the manner in which the child will learn (Woolfolk, 2004, p.174).

Scaffolding is another Vygotskian principle in terms of the socio-cultural perspective. Scaffolding involves giving the learner guidelines to solve problems which would develop the learner to approach similar problems better in future. While Piaget believes the child is

not yet developed to solve the problem, Vygotsky would encourage that the child should be supported and guided to try to solve the problem (Woolfolk, 2004).Vygotsky's socio cultural theory has language development as one of its major principles and puts much emphasis on the importance of cultural tools. He indicates these could be any tools that could assist in communicating (e.g. media, tv, computers and books). After receiving guidance children would internalize the use of cultural tools which would enable them to use the tools by themselves in future. Vygotsky's teaching principle involves the zone of proximal development, which is the area in which a child is able to solve difficult problems with the guidance of an adult (Woolfolk, 2004).

Bruner's theory of constructivism emphasises that the learner has to be active in the process of learning in order to build and make sense of information. The theory believes in the use of past knowledge wherein the learner uses reasoning to construct learning. This approach is called spiral curriculum which involves learners building on existing knowledge. The spiral process starts from the basics of each subject and moves towards the complex forms over time. (http://www.spych.nyu.edu/bruner).

Bruner further studied about learning and researched on scaffolding theory in education. The theory emphasizes that learners should receive enough support in the early stages of learning. Children should not be left to find understanding by themselves but should be assisted and guided until they are ready to do it independently. The major theme of Bruner's theory is that the mind of a learner is matured to adopt different ideas at any age, provided proper guidance is provided (http://www.simplyspychology.org/piaget.html).

Vygotsky's sociocultural theory of development stated that social environment and culture are important spheres into which a child grows. Like Piaget, Vygotsky believed that there are always problems in the child's understanding. However, in contrast, Vygotsky believes a child can perform a bigger problem considered to be above his mental capability only if proper guidance is provided. The two philosophers (Piaget and Vygotsky) believe in discovery learning. Piaget believes there should be less intervention by the teacher while Vygotsky believes the teacher should always provide guidance in the classroom (Woolfolk, 2004).

Bruner's theory had its basis in both Piaget and Vygotsky's theories. Bruner unlike Piaget argue for the importance of language in the social environment which increases cognitive growth while forming the basis of a scaffolding process. He emphasised that it should also be taken into consideration that each age group has its own way of thinking. (http://www.oralthinkers/bruner.htm).In contrast, Piaget emphasised that there are different developmental stages that children go through.

2.3.4 Social Constructivist theory as the chosen theory for this study

The social constructivist theory of Lev Vygotsky is a type of cognitive constructivism that emphasises collaboration in the learning process. This theory includes the principles that describe how self-regulated learners could be developed. As indicated in the previous discussion on cognitive theories, Vygotsky argued that "learning could not exist without the influence of the social context. Learners become introduced to the knowledge community and therefore making learning the result of social interactions. He claimed that knowledge is co-constructed" (Anderson, 2002, p.10).

According to this theory, learners are supposed to work in groups towards a common goal. This means thatlearners provide critical thinking by sharing ideas while learning together. When learners engage in discussions and dialogues they reshape their existing knowledge.Within the natural sciences context, for example, when learners engage in an inquiry based lesson, the teacher has to work with a group and facilitate the learning process. Learners have to work together to acquire new understandings. Thorough discussions with teacher and peers could benefit the learner to reach his potential development which Vygotsky termed the zone of proximal development (ZPD). Vygotsky described it as an area in which the learner can perform a challenging task given appropriate help (Anderson, 2002).

I therefore link the process explained above to Zimmerman's definition of "self-regulated learning, which incorporates social cognitive constructs that describe learners as active participants in the learning process". This means that the teacher has an important role in keeping learners motivated during teaching and learning. This applies specifically to the focus on the aims and goals that learners have to achieve (Zimmerman, 2002, p.67).

I used Zimmerman's theory of self-regulated learning as opposed to the other theories in the field due to the fact that it has its basis and include an in-depth perspective of the learner which highlights the phases of learning which provide a framework by which this study argues could improve classroom intervention. I will show how I used this theory in the next chapter.

2.4 Defining Self-Regulated Learning

In recent years, there has been an exciting development in increased knowledge of and emphasis on self-regulated learning, a process that positively affects learning outcomes (Zimmerman, 2000). Zimmerman (2008, p. 167) describes self-regulated learning as a "proactive process that learners use to acquire academic skills, such as goal setting, selecting and deploying strategies and self-monitoring one's effectiveness".

Research has suggested that learners of all ages can successfully apply self-regulated learning strategies when afforded the opportunity to do so. To be a best learner is to assess own behavior and use the findings to bring about a positive change (Perry, Vandekamp, Mercer &Nordby, 2002 p.7). The self-regulated learning strategies not only impact on a learner's academic achievement, but they may also increase the learner's capacity to develop life-long learning skills (Zimmerman, 2000). Self-regulated learning follows a learner-centered approach that teaches a learner that he/she can affect the learning process (Wehmeyer, Palmer, Argan, Mituang & Martin, 2002, p.439). For Wehmeyer, Argan and Hughes (2000, p. .439), teachers can create successful learning environments by motivating learners to be in control of the learning process. Schunck and Zimmerman (1998, p.225) concurred, suggesting that teachers as facilitators should guide and observe learner-directed strategies.

The present study aligns with Paris and Paris (2001) regarding the fact that given the information and opportunity, leaners of all ages can become strategic, motivated and independent learners. In support of that, Zimmerman and Schunk (2001, p.128) relate that research provides evidence that learners who are self-regulated achieve outstandingly and are confident and never stop to look for resources. Moreover, the more the learners become self-regulated, the more they take control of their learning and they tend to depend less on the teachers' support (Zimmerman &Schunk, 2001).

The above discussion necessitates action and thus this study supports Pintrich and Zusho (2002, p.252) regarding the fact that "teachers can make learners aware of different types of learning and help them to use learning strategies appropriately in relevant learning situations".

2.5 The Conceptual Framework of the study

Self-regulated learning has been seen in the literature to be integrated in the development of education (Paris &Paris, 2001). This is due to a variety of topics that are relevant to self-regulated learning, for example, "the influence of motivation on education, the social influences on school adjustments, self-regulated learning theories, personal cognitive development and many other topics" (Pintrich andDe Groot, 1990, p.34).

These topics have been grouped to form categories of studies. In general, the literature has brought forward three types of studies regarding self-regulated learning (Zimmerman, 2000). Self-regulated learning studies have been categorised as those studies that investigate a relationship between the factors of self-regulated learning and the level of SRL. These studies examined the relationships between learners' motivational beliefs and the level of SRL, as well as the relationship between the learners' level of self-efficacy and the level of SRL. The other category of studies sought a relationship between learners' level of SRL and their learning outcomes. From these studies, a positive correlation was found between the learners' SRL and their learning outcomes (Schunk & Ertmer, 2000, p.631).

The last category of studies attempted to apply self-regulatory strategies to the learners to see if they showed any difference in terms of their level of SRL or learning outcomes (Gravill & Compeau, 2008). This study falls within this third category of studies, although the focus is on investigating the perceptions of Grade 8 and 9 teachers of SRL. From the literature, I thought it would be proper to introduce an intervention of SRL strategies to a specific group of learners. However, I had to determine how the teachers perceived these strategies, how much they know about and understand SRL, and whether the teachers felt that the integration of SRL strategies could bring about a change in the teaching and learning process. This change would mean that learners would use the strategies and improve their self-efficacy and achievements in Natural Sciences inGrade 8 and 9. The procedures carried out will be discussed in full in Chapter 3.

Different theoreticalapproaches have been seen as important in analyzing self-regulated learning because self-regulated learning affected many aspects of learning and control (Paris &Paris, 2001). These include theories based on Piaget's constructivist theory, Vygotsky's social-cultural theory, and information processing theories (Zimmerman &Schunk, 2001). These theories were used to develop conceptual frameworks to better understand constructs of SRL and portray the relationships among these constructs. Several researchers have developed conceptual frameworks to explain self-regulated learning (Pintrich, 2004; Wolters, 2010). Although not every researcher clearly states the following in their studies, most self-regulated learning frameworks share four general assumptions. "Firstly, learners are active participants in their learning process. Secondly, learners have the potential to monitor and control their learning. Thirdly, there is a goal, criterion or standard to which learners can compare their learning. Lastly, self-regulatory activities are mediators between personal and contextual characteristics and performance" (Paris and Paris, 2001, p.89). The next section discusses a few contemporary frameworks and shows which of these this study identified with.

2.5.1 Zimmerman's Self-regulated learning theory

In this model, self-regulated learning is composed of three phases: forethought, performance control and self- reflection. In the first phase (forethought), the learner sets the stage for an upcoming learning task. Self-regulated learning develops realistic expectations, creates goals with specific outcomes and identifies plans to maximize success in the particular learning task. In phase two (performance control), there are processes that are involved with learning. This phase includes specific strategies, e.g. self-talk and self-monitoring that are used to maximise success in a learning task. Lastly, SRL students reflect at the conclusion of the learning activity. Self-evaluation compares the performance outcomes to the goals (Zimmerman, 2002, p.64).

2.5.2 Pintrich's areas of regulation

Pintrich (2004) offers a slightly different perspective constituting four phases and four areas of regulation. "The phases are planning, monitoring, control and reflection. These phases are intended to reflect the common assumptions shared by many SRL models. Phase one: the

learner plans, sets goals and activates knowledge about the context, text and self. Phase two: learners exhibit metacognitive awareness and monitoring of cognition. Phase three: learners select cognitive strategies and regulate different aspects of the context, task and self. Phase four: learners make cognitive judgments and reflections on the context, task and self.

Within the four phases, Pintrich also proposes four different areas for regulation. These are cognition, motivation/ effect, behavior and context. The last area (context) reflects contextual features such as task characteristics, which can impede or facilitate a learner's attempt to self-regulate their learning". Pintrich assumes that the phases can occur concurrently and dynamically (Pintrich, 2004, p. 386).

2.5.3 Winne's Four Turning Point model

Winne (2005) offers another perspective based on the Information Processing Theory (IPT). This model includes phases of self-regulated learning specifying the learning behaviors which occur at each of the three cyclical phases. The four turning points model suggests critical processes or turning points, which must occur during self-regulated learning.

"Turning point one: learners must understand the learning environment. The learners are required to understand the factors affecting academic success such as time requirements, expectations and environmental influences. Turning point two: goal setting can only proceed once turning point one is satisfied. This turning point requires the learner to identify the academic goal and begin developing strategies for achieving that goal. Turning point three: the ability to apply learning strategies requires a learner to have or be able to obtain the necessary skills in order to implement learning strategies and can only occur once turning point one and two are satisfied. Turning point four: when all the turning points are satisfied, the learner must also be motivated to spend the time and effort necessary to apply the learning strategies" (Winne, 2005, p.232). Table 2.1 below illustrates key concepts of the SRL frameworks discussed above.

The three SRL frameworks explain the role of context in the learners' self-regulated learning. Zimmerman's social cognitive approach to SRL assumes that the environmental factors have interact with the behavioral and personal aspects of learners' personal and behavioral characteristics. According to the framework, when the learner interacts with the context, this

would result in the development of a cycle and the learners' SRL will be adopted (Moos & Ringdal, 2012). Winne's IPT also indicates how the context could affect SRL (Winne, 2005, p.559). Based on this approach "learners develop different ideas of the learning tasks partly based on what they have learned from the context". The assumption made by this theory is a cyclical nature of SRL, this means that one phase becomes the foundation for the processing of information (Moos & Ringdal, 2012).Pintrich (2004, p. 386), however, postulate these phases can occur at the same time and not necessarily one after another. In this theory,"the first areas of regulation are cognition, motivation/effect and behavior". "The last area reflects contextual features such as task characteristics, which can impede or facilitate a learner's attempt to self-regulate their learning".

Table 2.1: Self-Regulated Learning Frameworks

"Zimmerman(2002)	Pintrich (2004)	Winne (2005)"
Forethought phase	**Phases**	**Phases**
-Task analysis	-Forethought, planning, and	Forethought
-Self-motivation beliefs	activation	Performance
	-motivation	Self-reflection
	-control	
	-reaction and reflection	
Performance phase	**Areas of regulation**	**Turning Points(TP)**
-self-control	-cognition	TP1:Understanding the
-self-observation	-motivation	learning environment
	-behavior	TP2: Goal setting
	-context	TP3: Ability to apply learning
		strategies
		TP4: Apply learning strategies
Self-Reflection		
-self-judgment		
-self-reaction		

The general conceptual framework, upon which this study is based, is that of Zimmerman (2002). According to Zimmerman (2002, p.66), self-regulated learning"is concerned with regulating their aspects of learning: Firstly, relating to the learner controlling different resources that are available to the learners, e.g. their time, study environment and their use of others (peers, parents, teachers) to help them. Secondly, theregulation of motivation and effect, which relate to the control and change of beliefs in motivation, like for example, self-efficacy and goal orientation, so that learners could be able to adapt to the demands of the task. Learners can learn how to control their emotions and effect (e.g. anxiety) in ways that improve their learning (Zimmerman, 1989, p.329). Thirdly, the regulation of cognition, which relate to the control of different cognitive strategies for learning, e.g. use of deeper processing strategies that will enable learners to learn and perform better".

2.6 **Social Cognitive Theory and Self-Regulated Learning**

For many researchers, self-regulated learning originates from the perspective of Bandura's (1986) social cognitive theory. According to Bandura (2001), social cognitive theory adheres to a model of emergent interactive agency. Bandura (2001) explains being an agent as "to intentionally make things happen by one's actions" (Bandura, 2001, p.2). Bandura further defines the belief of social cognitive theory:

> "In the social cognitive view, people are neither driven by inner forces nor automatically shaped and controlled by external stimuli. Rather, human functioning is explained in terms of a model of triadic reciprocity in which behavior, cognitive and other personal factors and environmental events all operate as interacting determinants of each other"(Bandura, 2001, p. 18).

This explanation formed the basis of Zimmerman's "Triadic Definition of SRL" involving the interaction of "1) personal self-regulation involving the adjustment of cognitive and affective state, 2) behavioral self-regulation involving self-observing and strategically adjusting performance, and 3) environmental conditions". Zimmerman (2000, p.65) describes these interactions as "occurring within a self-regulatory goal setting, monitoring and evaluation loop, including forethought of task, performance and self-reaction" (Zimmerman, 2000; 2002).

While there are differences on this social cognitive conception of SRL, most researchers postulate the interaction of goal setting, monitoring and the regulation of cognitive, behavioral and environmental conditions to maximize learning.(Boekaerts andCascallar, 2006). Self-regulated learning applies mostly the principles of social cognitive theory (Zimmerman, 2008; Zimmerman and Schunck, 2004; Printrich, 2004). From the social cognitive perspective, self-regulation requires learners' choice (Zimmerman, 1998, 2000). This emphasises the fact that learners are given the liberty to choose the social and physical setting they use to work on the task. By so doing they will structure their environment to make it conducive to learn as well as seek help when they need it.

Based on research evidence showing that self-regulatory competencies can be increased by using educational interventions (Schunk andErtner, 2000; Schunk andZimmerman, 1998; 2008), this study introduced an intervention to investigate the experiences of teachers when applying self-regulated learning strategies in their teaching and assessment of learners in Grade 8 and 9 Natural Sciences classes. It was hoped that the intervention in this study would enhance self-regulatory competencies in teachers who would then transfer these competencies to the learners.Social cognitive theorists see the importance of a learner's actions and cognitions in the learning process, hence the creation of several conceptual frameworks to better understand SRL (e.g. Schunk, 1990, 2001; Zimmerman, 2000; 2002; Boekaerts, 1996; Pintrich, 2000; 2004). This study is based on Zimmerman's framework (2000; 2002). Zimmerman (2002) proposed a three cyclical phase model of self-regulation which involves the concept of self in terms of "1) forethought; 2) performance; and 3) reflection".The cycles are reflected in figure 2.1.
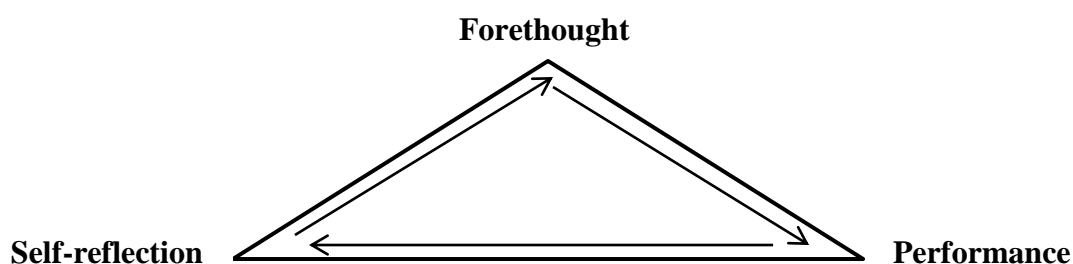
Figure 2.1: Self-regulated learning cyclical phases (Zimmerman, 2000)

Zimmerman (2000) used this framework to explain the phases and sub-processes of SRL. "The forethought phase covers processes and beliefs that comes before learning commences; the performance phase encompasses processes that occur during behavioral implementation; and the self-reflection phase indicates what happens after each activity"(Zimmerman, 2002,p.

69). This framework is unique in that it attempted to explain the SRL process in phases. In addition to this, under each sub-process, specific methods and strategies are also introduced.

2.6.1 Forethought Phase

In this phase, the learner critically analyses the task and set goals and plan the strategies to follow, and research evidence indicates that learners with proximal, specific goals demonstrate increased academic achievement (Zimmerman, 2002). The learner develops expectations about the task, creates goals looking at specific outcome that identifies plans that could enhance success in that task. Self-motivation beliefs are often derived from self-efficacy and outcome expectation. Self-efficacy refers to "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affects their lives" (Bandura, 1994, p. 71), and outcomes expectations means how learners perceive the consequences of learning.

Zimmerman (2000) explains that this phase prepares the learner to perform and stimulate self-motivation. The learner starts by identifying the requirements of the task, sets goal(s) and think of the strategies which can assist their learning. In natural sciences using inquiry-based learning, they may design an investigation and identify the questions that "they wish to answer and then use specific search strategies to locate information to address these questions. Learners will therefore become self-motivated through intrinsic interest in a topic, or through a belief such as the expectation that answering a series of questions will lead to a satisfying conclusion" Zimmerman, (2002, p.66). The leaner may ask the following questions to help him through this phase:"what are my needs and interests? What are my questions? What are my goals? Which strategies should I use? Where should I work? Should I work with a friend or by myself?"

2.6.2 Performance Phase

In this phase, self-control illustrates the application of identified strategies from the previous phase. The learner can monitor his learning process in order to enhance the achievement on the set goals in the particular learning task. Self-observation refers to "self-recording personal events or self-experimentation to find out the cause of these events" (Zimmerman, 2002,

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p.68). Zimmerman emphasises that "the learner will in this phase act on the strategies outlined in the forethought phase while thinking about the process of learning. The learner may utilize different ideas". This means the learner might be able to use one technique in many parts of a project.

The learner may ask the following questions to help him through the phase:"Am I making progress towards my goals? If not, what adjustments should be made to my approach? Are environmental elements or classmates distracting? If so, what adjustments should be made in my work environment? Am I productive or bored? If so, what adjustments should be made to self-motivate? Am I bogged down? If so, what adjustments should be made to my strategies? Am I stuck? If so, where should I seek help?" While answering these questions, learners being aware that the teacher is the immediate source of help will indicate to the teacher where help is needed and the teacher, as indicated in the discussion on applying constructivist teaching, will also be waiting to assist the learner.

2.6.3   Self-reflection Phase

In this phase the learner reflects after the actual process of learning, evaluates and compares the outcomes to the set goals. Self-evaluation and causal attribution are forms of self-judgment, and self-satisfaction and adaptive reactions are forms of self-reactions (Zimmerman, 2000; 2002). Learners check if they have met their goal, conditions that helped them to be successful, conditions that were a distraction, and strategies that were effective. This means that the learner will in this phase compare his performance to the set criteria or standards. They also identify where they have gone wrong and analyze why they went wrong.This is in fact a gauge of success and failure. These analyses and evaluations then set the basis for the learners' future goals and planning to the next cycle of learning. The learner may ask the following questions to help him through this phase:"Did I accomplish my goals? If not, what can I do differently next time? How did I react when I became bored, stuck or frustrated? How can I apply this knowledge to future projects? What strategies were most and least successful? What techniques should I use again? What areas need to be refined?"

Table 2.2**:** The processes in Zimmerman's Self- Regulated Learning Cycle (2002).

Zimmerman's Self-Regulated Learning Cycle (Zimmerman, 2002)
Forethought Phase Processes
Task Analysis Goal setting: deciding on specific outcomes of learning Strategic planning: selecting learning strategies or methods for attaining the set goals.   **Self-motivation beliefs**: Influenced by: self-efficacy, outcome expectation, intrinsic interest value, learning goal orientation.
Performance Phase processes **Self-control** Imagery: forming mental pictures to enhance learning and recall Attention focusing: focusing on the task, protecting the learners' intention to learn from distractions and from competing intentions Self-instruction: telling oneself how to proceed during a learning task. Task strategy: choosing an appropriate strategy   **Self-observation**: Self-recording: recording personal events about learning Self-experimentation: simple inquiry about ones' own learning Self- monitoring: cognitive tracking of personal functioning".   **Self-Reflection phase processes** **Self-judgment:** Self-evaluation: comparing self-monitored information with the set goal Causal attribution: attributing success or failure to results, identifying source of errors, identifying successful strategies.   **Self-reaction:** Self-satisfaction/effect: applying positive or negative self-reactions to strategy use Adaptive/defensive: evaluating the whole process, adapting different strategies, refining the process.

2.6.4 Strategies used by teachers in this study

Since self-regulated learning was a new concept to the teacher participants in this study, I thought it was fair not to include too many learning strategies and tools so as to minimise confusion that could be experienced during the implementation. As such, I selected the teaching of goal setting, planning, self-motivation, help seeking and self-evaluation as a first step in making learners aware of their role in the learning process. "Quick Writes" were used at the end of the lessons to determine to what extent the learners understood what they have learned and whether they had achieved their goal at the end of the cycle. A brief description of the strategies and the tools is given below.

2.6.4.1 Goal Setting

Goals can be thought of as "standards that regulate individual actions (Schunk, 2001, p.126). In the classroom, goals may be as simple as earning a good grade in an exam, or as detailed as understanding a topic". It is advantageous for learners to use short-term goals because they can be attained and are used to reach long-term aspirations (Zumbrunn et al., 2011). Research has indicated the importance of motivating learners to set short-term goals for their learning. It is believed this could be an effective way to help learners to monitor their progress(Zimmerman, 2002, p. 66).

2.6.4.2 Planning

According to Zumbrunn et al., (2011, p.23), research indicates that planning and goal setting are complementary processes as planning can help learners establish well thought out goals and strategies to be successful. It is also emphasised that guiding learners to plan their tasks could be a good approach for promoting self-regulated learning.

2.6.4.3 Self – motivation

Self-motivation occurs, according to Zumbrunn et al. (2011, p.24),"when a learner independently uses one or more strategies to keep themselves on track towards the learning goal". Additionally, self-motivation does not require of external rewards or incentives and can therefore be a strong indicator that a learner is becoming more autonomous. It is also

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important to the process of self-regulation because it requires learners to assume control over their learning.

2.6.4.4 Seeking help

Zumbrunn et al (2011, p.25) explain that teaching can encourage learners to seek help when they receive feedback on their work, which also allow learners to resubmit their assignments after making appropriate changes. Furthermore, it is also important to note that self-regulated learners often require help with their tasks when they need it.

2.6.4.5 Self – evaluation

Self-evaluation enables learners to "make judgments on the strategies they applied to the task in order to know if they could use them in the future". Zumbrunn et al. (2011, p.27) state thatteachers can learners to realize they can change their set goals and strategies as the learning progresses.

When I introduced action research to the participants, I presented an explanation orally and in handouts, which included the concept and procedures of performing action research. The participants had to go into action to present SRL strategies following Zimmerman's learning cycle in a practical way in the classroom. The participants drew a plan of action, which they put into action to collect information of their experiences in the classroom. When they, for example, taught 'goal setting', they taught learners the different types of goals (short and long term); they modeled how to set realistic and achievable goals based on their learning content; and how to plan and select relevant strategies to use towards the attainment of the set goals.Learners were also taught to monitor themselves and seek help where necessary when applying their strategies. Lastly, they were taught to evaluate the feedback received from the teacher in order to ascertain whether they were able to achieve their goals or not.

The participants designed a template which learners would use in the second observation when the strategies would be directly applied to a task. The process of teaching SRL to the learners was observed (first observation is explained in Chapter 3) and the participants recorded their experiences regardingtheir lessons in journals. This was another way of

collecting data for the study, the records were later analysed (see Chapter 3 for details). The participants' records served as baseline data for this research.

For the purpose of this study, the teachers focused on helping Grade 8 and 9 learners to make progress in their learning. The lessons that the teachers prepared for the second observation were investigative lessons, meaning that learners had to be involved in inquiry- based learning, which is discussed in detail below.

2.7 Inquiry-based learning

Inquiry-based learning is described as "a strategy used to allow learners' questions and curiosities to drive the curriculum" (Anderson, 2002, p.2). Research evidence shows that inquiry- based learning draws on constructivist learning theories where understanding is built through the active development of conceptual mental framework by the learner. The evidence also indicates "learners who are taught science through the use of inquiry-based methods showed an improvement in skills and attitudes towards science" (Colburn, 2000, p.43). It is upon this evidence that the present study has chosen inquiry-based learning as it is rooted in the principles of the constructivist theory, which forms the base of the study and it builds in learners a positive attitude towards science (lesson presentations are shown in Chapter 4).

According to Anderson (2002), the power of an inquiry-based approach to teaching and learning is its potential to increase intellectual engagement of practical and critical teaching and learning. Colburn (2000, p.43) sees inquiry-based learning as "an approach which engages children to question, conduct research for genuine reasons, and make discoveries on their own". This approach also takes into consideration previous experience and knowledge.

2.7.1 The importance of inquiry-based learning

There is evidence that learners being taught in effective inquiry-based learning environments improve skills and exhibit more positive attitudes towards science (Colburn, 2000). However, an inquiry approach to teaching science, according to van Zee, Lay and Roberts (2003), has not yet become frequently used in schools since many teachers still do not understand the use of this approach, the practicality thereof and how to use it in the classroom.

Van Zee et al. (2003, p.588) advocate that this learning strategy of inquiry enhances the involvement of learners. It is the researchers' belief that by using learner derived investigations, knowledge is more relevant and meaningful. The implication therefore is that by investing in the curriculum and learning process, learners will be able to construct knowledge by themselves and not depend on acquiring facts transmitted by the teacher.

2.7.2   How to teach inquiry-based learning in a science classroom

Mazzulla (2011) argues there should be a change in the way things are done in the school classroom based on the fact that learners appear to be less and less motivated to engage in classroom activities. Inquiry-based learning is advocated as an approach that could bring about the envisaged change. Since the ultimate goal of the approach is seen as being to enable a learner to move from mere knowledge to a deep understanding, the teaching of inquiry-based learning requires the teacher to keep the abilities and understanding of inquiry in the foreground and the scientific content in the background (Anderson, 2002). Although, Anderson (2002) argues that this is not always easy, he further emphasises that this does not mean that the content should be ignored.However, the subject matter must be simple enough that it does not obscure or detract from the learners' ability to learn how to conduct investigations.

Van Zee et al. (2003, p.588) postulate that learners come to the classroom with pre-conceptions about the world. This means that teaching practices should focus on what the learners already understand. The implication of this process is that the learners will not wait for the teacher for answers, but instead they will actively involve by for example, searching for solutions, making new enquiries and take part in designing investigations. As a result, learners quickly see the cycle of learning and discover on their own that learning has cycles (Colburn, 2000; Mazzulla, 2011).

Anderson (2002) finds that when learners werepractically implementing the inquiry-based skills, they automatically develop problem solving skills and they can apply the skills in their fure situations at school and beyond (Anderson, 2002, p.3). The development of these skills and the learners' ability to learn through inquiry will provide good evidence that the learners will be able to self-regulate the learning process, which was the aim of the present study.

The self-regulated learning strategies and the selected tool fitted into the lesson that required leaners to test for starch and fats in different foods, this is presented in Table 2.3 below.

Table2.3: Phases of Zimmerman's SRL Cycle (Zimmerman, (2000)

Phases of Zimmerman's' Self-Regulated Learning Cycle (2002)
Forethought Phase
The lesson: Investigation: Test for fats in food
Goal setting, planning learning strategies, self-motivation,
Performance Phase
Attention focusing, implementing the plan, self-recording, attention control, help seeking
Goal monitoring,   Tool: 'Quick Write'
Self-Reflection Phase
Self-evaluation: attributing success or failure, evaluating the process, refining process, applying positive or negative self-reactions
Self-assessment, reflecting on goals, setting new goals

SRL PHASES   **SRL STRATEGIES**   **SELF-REGULATED LEARNER**
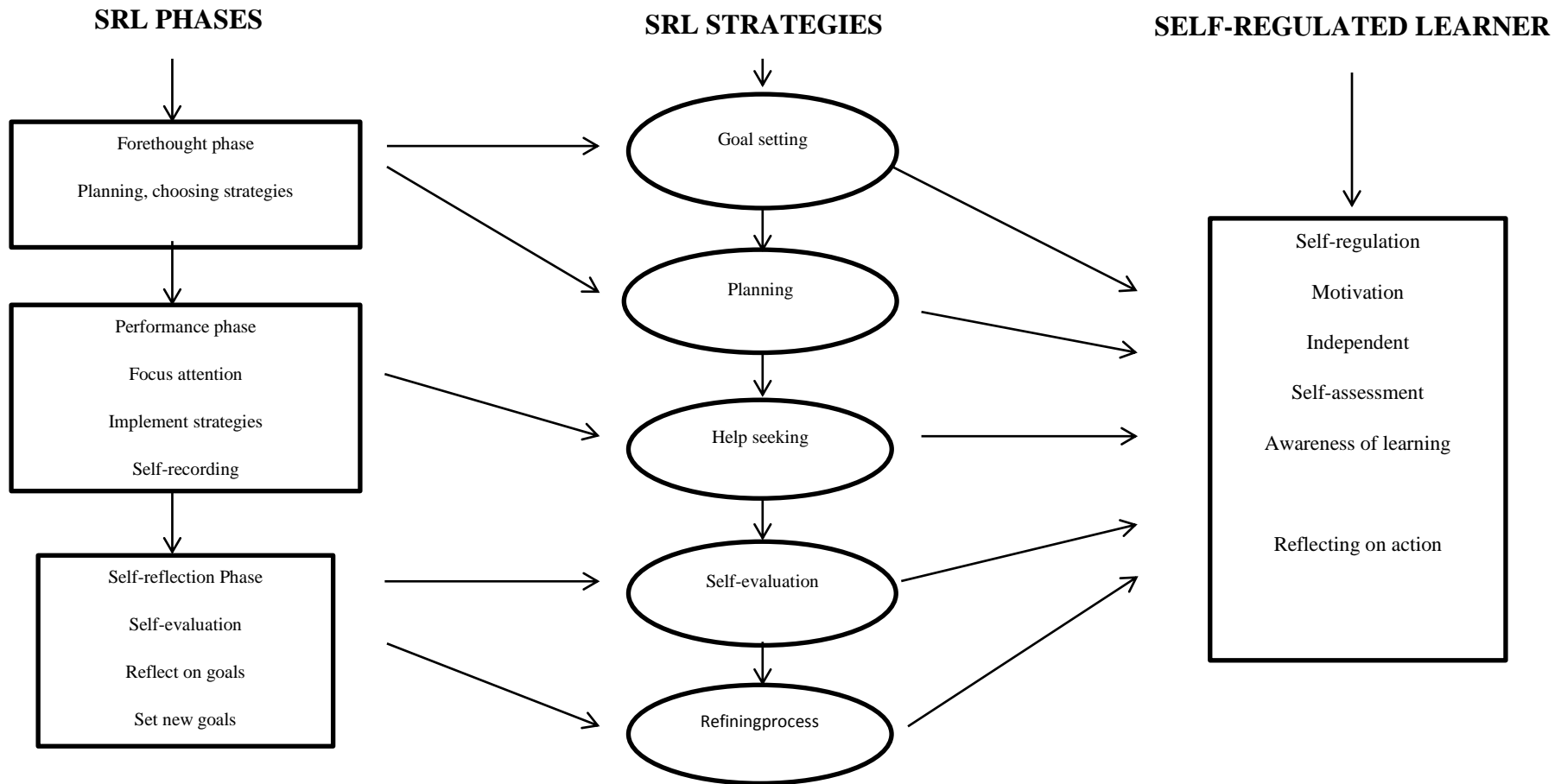
Figure 2.2: Conceptual Framework of Self-Regulated Learning Phases indicating strategies this study used in a science inquiry-based learning process (Zimmerman, 2000).

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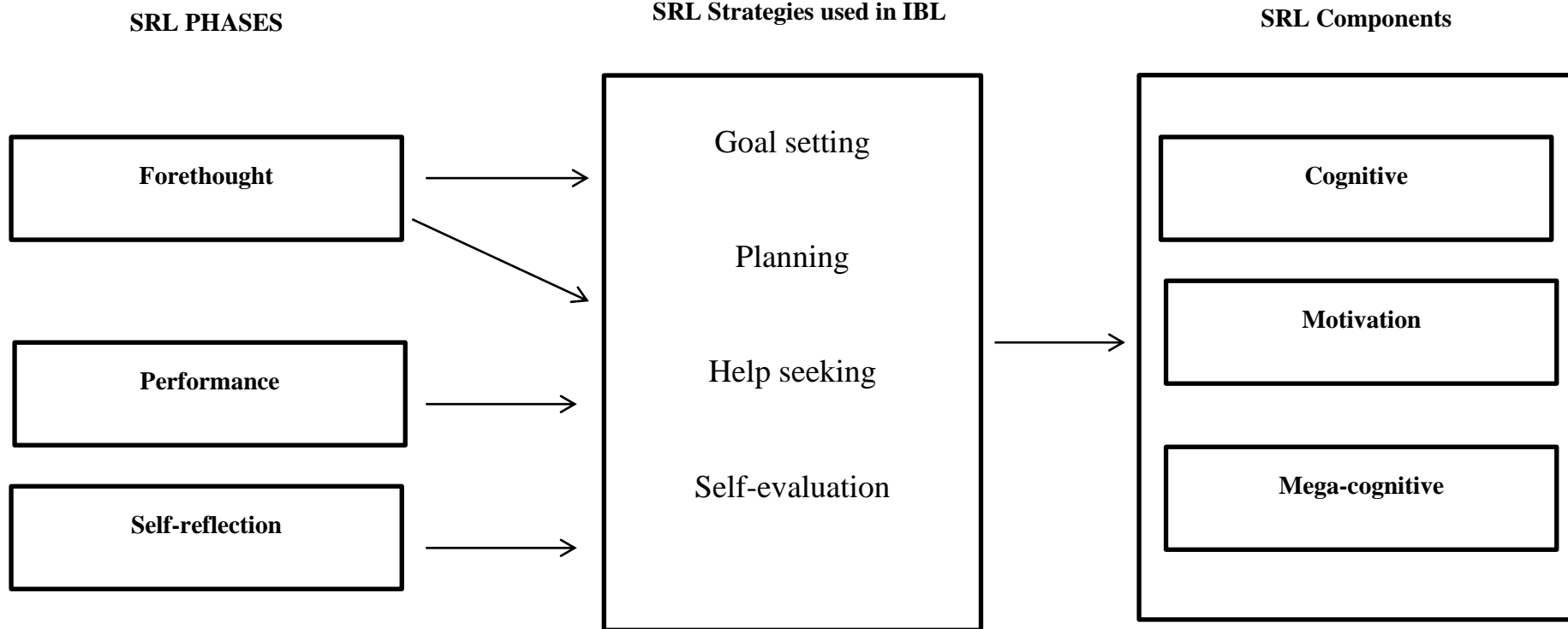
Figure 2.3: Conceptual framework of SRL Phases, SRL strategies used in IBL and the skills developed in the learner (Zimmerman, 2000).

The above conceptual framework shows that Natural Sciences teachers, when using the cycle of learning as related by Zimmerman (2002), may include in their inquiry-based lesson the three phases of forethought, performance and self-reflection, and can also include the use of the strategies goal setting, planning, help seeking and self-evaluation. The outcome of this learning process would be a learner who would have discovered the steps involved in the learning process. The learner would gain the ability to make observations, collect and analyse information, as well as to draw conclusions. With the above mentioned qualities, the learner would have also acquired problem-solving skills which would further increase their motivation to continually self-assess and regulate their own progress in the whole learning process.

2.8 Self-assessment of learners as part of self-regulated learning

Zimmerman (2000) postulates the notion of self-assessment to involve the internalisation of standards so that learners are able to manage their learning more effectively. This is when learners are able to understand their performance, their perceptions of ability and efficacy. In addition the learning process requires knowledge of identifying what is known, what requires more effort, and what skills could be used and what skills were not effective.

The importance of self-assessment to learning is also brought to light by Black and Wiliam (1998, p.139), who assert that it is important for learners to set goals that they understand and are able to determine relevant strategies to use to achieve the goals..For example, learners can usecolored cards to label their work. The colors would indicate their level of understanding of that particular part of work. Black and William (1998, p.140)further recommends the following could be used in the classroom assessment:

- "The criteria for evaluating any learning achievements must be made transparent to learners to enable them have a clear overview both of the aims of their work and of what it means to complete it successfully. Such criteria may well be abstract, but concrete examples should be used in modeling exercises to develop understanding.
- Learners should be encouraged to keep in mind the aims of their work and to assess their own progress towards meeting these aims as they proceed. Then they will be able to guide their own work and so become independent learners".

Gibbs and Simpson (2004 p.21) emphasise the importance of training learners to be self-evaluative during whole class sharing. According to Gibbs and Simpson (2004), the training of learners should include: explaining to the class the purpose of self-evaluation sessions, repeating the learning intentions during the lesson, and displaying a range of self-evaluative questions at the end of the lessons. The teacher can also use a variety of approaches for different days (e.g. whole class responses, paired responses, group responses).

It is posited by this study, as based onParis and Winograd (2001, p.6)that peer assessment makes a distinct contribution effectively to the learning process and secures the objectives that has no other way of being achieved. In support of this, Gibbs and Simpson (2004, p.11) also show that evaluation develops an increase in self-esteem, the learner becomes confident to seek help, the learner controls learning, the learner becomes able to set goals, the learner enjoys to be on the same level of thinking with others.

2.8.1 **'Quick Writes'**

'Quick Writes' is "a brief, timed writing activity". Giving learners two or three minutes to reflect on and summarise their learning in writing allows them to make sense of what they have been studying" (Dodge, 2009, p. 13).'Quick writes' are carried out as follows:

- "Either midway through a lesson or at the end provides learners with a half sheet of paper.
- Advise the learners that they will have two or three minutes to reflect on what they have just learned and write about it.
- State the prompt you want the learners to respond to. You may pose a question, ask for a summary of content, require a list of steps, ask for an analysis of a word, or request the use of a specific content area vocabulary in a wrap-up of the topic under study. The more specific the prompt, the better the response".

Together with quick writes, learners could use a graph to record their assessment outcomes with the idea of monitoring their progress looking at the main goal (Dodge, 2009, p.13).

2.9 Self-regulated learning and motivation of learners

Self-regulated learning can be controlled by a connection of factors that causes its development and that also sustains it (Pintrich 2000, Zimmerman, 2008). Motivation has been found to be a major part of this framework. Zumbrunn et al. (2011) explain that learners would not spend time setting goals if they do not see the importance of the tasks. This is why Zimmerman (1989, p.329) argues that self-regulation deals with the level of motivation the learners have to actively control their learning. Motivation is defined as the drive to do something (Tileston, 2004), while Linnenbrink and Pintrich (2002 p.313) define it as "a strong personal interest in a particular subject or activity". Based on this, Aleven, Stahl, Schworm, Fisher and Wallace (2003, p.277) are also of the opinion that motivation influences the ways that learners act within the learning setting. Therefore, this gives a clear indication of the importance of motivation to a student's academic progress.

Additionally, learners' self-efficacy beliefs, which mean their confidence in their ability to successfully complete tasks, play an important part. Intrinsic motivation and volition guide the level of effort and persistence used in completing a task and use of self-regulation strategies Zimmerman (2000, p.67). Zumbrunn et al (2011, p.25) also indicate that the learners' casual attributions, are the factors learners attribute to their success or failure for a specific task, play a key role in their reflection on performance phase as learners make decisions regarding whether or not they will engage in the activity and utilise self-regulation strategies for similar activities in the future. In addition, self-regulation and motivation work hand in hand to explain learner's learning and success in the classroom (Zimmerman, 2000, p.67).

This is supported by Zumbrunn et al. (2011, p.25), who add that "when learners are motivated to learn, they are more likely to invest the necessary time and energy needed to learn and apply appropriate self-regulated learning skills, and when learners are able to successfully employ self-regulation strategies, they are often more motivated to complete learning tasks". Paris and Winograd (2001) also argue in support of a relationship between self-regulated learning and motivation and point out that self-regulated learning involves motivational decisions about the goal of an activity, the perceived difficulty, and value of the task. Paris and Winograd (2001, p.11)hypothesise that "learned helplessness, apathy, and defiance may be counterproductive motivational responses to learning that can be overcome

with better understanding of self-regulated learning".Moreover, Murphy and Beggs (2003) emphasised the importance of motivation in learning when they established in their research in science education that due to lack of motivation, learners' interest and attitudes towards specific subject areas deteriorates as they grow older. Keller (2004) posits teachers could diagnose reasons for learners to be motivated or unmotivated and the outcome could help them to encourage the learners' motivational development. Keller (2004) furtherindicates that research evidence have shown that for learning to be more effective, learners should be highly motivated. Based on the above information on motivation, this study intended to improve the quality of teaching and learning in the natural sciences senior phase.

Zimmerman (2002) suggests that self-regulated learning can be developed in learners when parents, teachers and peers could promote SRL.Promoting self-regulated learning requires an understanding of the roles and relationships between each phase of SRL, the learning environment and individual learner characteristics. Learners' awareness of academic requirements is the consequence of prior knowledge, experience and interaction with teachers and peers (Steffens, 2008, p.222). As the learner works towards the learning objective, self-monitoring facilitates personal understanding of current progress and the on-going capacity to evaluate or adjust learning behavior (Chiou and Wan, 2007; Kramarski and Mizrachi, 2006).

It isdue to the information gained through reading about these strategies that it was decided in the implementation of this study to check their implementation in class. The strategies had to be taught to learners by teachers as these are expected to prepare learners for the future challenges (Paris and Winograd, 2001).

2.10   The role of teachers in self-regulated Natural Sciences classroom

Self-regulated learning is has been a topic of interest among academic researchers (Paris and Paris, 2001, p.91). It is also from this statement that an opportunity was seenin this study to introduce SRL to Grade 8 and 9 learners. Paris and Paris (2001, p.91) posit thatschools have the responsibility tomotivate to create their own learning strategies. This is important for all schools because SRL can be learned by learners of all ages in all disciplines. Furthermore, teachers should provide more and higher academic ambitions with regard to student learning.Self-regulated learning, drawing from the different definitions, requires that learners should be independent and be able to set learning goals, monitor and reflect in order to

evaluate whether the goal has been achieved or not.In early childhood research, McClelland, Morrison and Holmes (2000) indicate that self-regulation is taught and does not emerge naturally. This then shows that teachers have an important role to play in this regard.

Paris and Winograd, (2001, p.14) posit that teachers are challenged to equip themselves with self-regulated learning strategies as they face difficult and complicated problems in schools. They advocate that knowing more about their own thinking, developing effective strategies, and sustaining their own motivation will be crucial for those teachers who are interested in making schooling more relevant to the outside world. In addition to this, by combining the notions of contextual teaching and self-regulated learning, teachers gain a deeper understanding of the learning experiences that the learners face, teachers also gain a better sense of what is entailed in those experiences, what obstacles need to be overcome, and what teaching or learning strategies will be called into play.

In a Natural Sciences classroom, as the teaching will be from a constructivist perspective, the teacher should at alltimes be on the lookout for those learners who need assistance as they creatively developinvestigations. The teacher should help the learners to most of the time practice working individually to learn independence while showing them the right direction, however, teachers do not have to lose control of the classroom while letting learners lead the investigative process, but the teacher should model things like, how to use time effectively, how to collaborate with peers as well as how to use equipment properly (Anderson, 2002).

It is imperative in the Natural Sciences classroom to help learners to collaborate to solve problems, as indicated by Anderson (2002) that working and sharing knowledge with others are important parts of the scientific processhowever, the teacher should set a clear criteria for learners to achieve the outcomes and should also give feedback timeously and encourage learner interactions.

Paris and Winograd (2001, p.14) support teachers as key role players and add that teachers should be innovative to introduce in different contexts and also apply more different instructional strategies. In a Natural Sciences classroom, for example, the teacher may supply the learners with all the material needed to effectively conduct the investigative process, but should guard against ruining the process byrevealing the outcomes before the learners could find out by themselves (Anderson, 2002). When learners are participating actively in asking

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questions, developing procedures, carrying out investigations and analysing data, they take responsibility for their own learning.It is therefore important for teachers to instill a sense of independence in learners to increase their self-efficacy and apply the strategies in(Paris & Winograd, 2001, p.15).

Linnenbrink and Pintrich (2002) agree that teachers and other professionals should try and foster positive and accurate self-efficacy beliefs. Additionally, Butler (2002, p.82) believes the most important aspect of instruction is to guide learners to improve their perceptions of themselves and their belief in their ability to perform. Teachers are said to be able to do more than just talk about efficacy that is why Zimmerman (1989) reminds teachers of the importance of demonstrating, not just discussing techniques that increase self-efficacy. He stresses that the modeling of effective self-regulated learning strategies can improve the self-efficacy of all learners, even struggling learners.

2.11   Chapter summary

In this chapter, I have considered some relevant research and attempted to provide a description of cognitive learning theories, self-regulated learning, a comparison of self-regulated learning models and the model used in this study. I have also shown the theory within which the study is situated, that is the social cognitive theory. I indicated the self-regulated learning cycle, as well as how the strategies and the tool used in the study were placed in the phases of the cycle. Also discussed is inquiry-based learning, its importance and how it can be used in a natural sciences classroom. The learning cycle could be integrated into the day to day teaching and learning of natural sciences inquiry-based lessons. The next chapter explains how the study was carried out.

CHAPTER 3

RESEARCH APPROACH, RESEARCH METHOD AND DATA COLLECTION STRATEGIES APPLIED TO THE STUDY

3.1 Introduction

This chapter describes the methodology and related rationale in the investigation of the experiences of natural sciences teachers when applying self-regulated learning strategies to the teaching of Grade 8 and 9 learners. Important aspects of the methodology focus on the basis of a qualitative study, the research approach, and the elements of this approach, the research design and the overall implementation of the study. Discourse in this chapter concerning methodological, epistemological and ontological issues is associated with the approach undertaken;it also offers a framework for conceptualising the research methodology of the study.

3.2 The Qualitative Approach applicable to the study

Cohen, Manion and Morrison, (2007, p.167) provides an exposition of two competing paradigms within the social sciences; that is the quantitative and qualitative paradigms. It is useful here to briefly outline the characteristics of and the differences between the two paradigms to demonstrate why this study proposed the use of qualitative methodology. Creswell (2012, p.16) explains qualitative research as "a research process that attempts to learn more about a phenomenon from the perspective of the participants through exploration".The two paradigms have got different characteristics which are based on the paradigms' assumptions of reality and knowledge. This means that they have different ways of 'seeing' the world and attributing meaning to reality. In the literature, the positivist, (regarded as the old) paradigm and the interpretive (regarded as the alternative) paradigms are often cast in opposition (Creswell, 1994).

The positivist (old) paradigm is characterized as being traditional, experimental, prescriptive, and reductionist. This means that thephenomenon is reduced toits simplest elements. The paradigm also uses large numbers of subjects and standardized methods to control selected

variables. While the interpretive (alternative) paradigm alternatively is characterised as being naturalistic, descriptive and holistic which means that it looks at the situation in totality and usesfew participantsin an open-ended communicative approach, and multiple methods (Ercikan & Roth, 2006). In-depth meaning of these characteristics will be discussed in the section that follows.

3.2.1 The epistemology and ontology of a qualitative approach

Qualitative research studies people or systems by interacting with and observing the participants in their natural environment and focusing on their meanings and interpretations. The emphasis here is on the quality and depth of information and not on the scope or breadth of the information provided, as in quantitative research (Maree, 2007, p.47). The distinction between quantitative and qualitative research is also highlighted by the 'objective' (positivist) versus 'subjective' (constructivist) approaches; where the objective approach is concerned with the discovery of general laws, while the constructive approach is concerned with the uniqueness of each particular situation (Maree, 2007).

The main focus of the quantitative approach is placed on "developing statistically valid samples, or measuring the size or scope of the phenomena, while the qualitative focus is on describing and understanding phenomena within their real contexts with the intention of developing and understanding the experiences expressed by the participants" (Maree, 2007, p.47). The qualitative approach has the basis of an ontological assumption that reality is socially constructed; hence social life and reality are constructed entities and are regarded as human products. To the contrary, quantitative research is based on the assumption that phenomena is studied objectively from the outside since there is one objective reality that is observable by the inquirer who has little, if any impact on it (Maree, 2007).Reality in the qualitative research accepts that the researcher cannot be separated from the research and this is in opposition with the quantitative assumption that the truth is an objective phenomenon that exists independently of the researcher (Cohen et al, 2007, p.13). This studyfavoured methodological approaches whereby the behavior and the interaction of the research participants are directly observed and the participants are encouraged to tell their own stories and reflect on their day-to-day experiences.

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This study is a qualitative study of the introduction of self-regulated learning strategies as an intervention strategy to improve the teaching and learning of natural sciences in Grade 8 and 9.

I approached this study with the following assumptions:

- Natural sciences teachers will respond to the invitation to participate in the study and will voluntarily take part in the study;
- Natural sciences teachers will agree to accept assistance with regard the improvement of the teaching and learning of the subject;
- Natural sciences teachers will learn to develop themselves as well as their profession through Action Research; and
- Natural sciences teachers will learn how to improve their teaching and learning with regard to learners through the use of self-regulated learning strategies.

Moore (2005, p. 107) expressed that, "Forms of practitioner practice are an expression of both a commitment to a particular view of reality and to ways of knowing the world, held by the practitioner". Based on the type of research chosen and the qualitative methodology (action research) a hermeneutic epistemology is applicable to this study whereby situations are sought to be understood through the eyes of the participants. Hermeneutics involves recapturing the meanings of the interacting participants, recovering and reconstructing the intentions of the other actors in the situation (Cohen et al., 2012). In this study, this was taken to indicate that meanings are significant rather than the focus on phenomenon.

Within this study, it was important to describe and understand the views and meanings that teachers attach to their experiences on self-regulated learning strategies as they teach these strategies to learners. This was done within these teachers' natural environment, which is the school, with the intention to develop a deep understanding of their meaning of self-regulated learning. In this study, the belief was held that the experiences of teacher participants could be interpreted to create other alternative understanding of self-regulated learning.

3.2.2 Action Research within the qualitative paradigm

Action research was chosen as an appropriate methodology for this study based on its nature and features, which were found to fit perfectly within the qualitative paradigm. According to

Mills (2011), action research is referred to as process in which a small group of people express a problem and then take action to resolve it, while observing how successful they get and if they are not satisfied they would try again. Action research encompasses the following characteristics:"collaborative, participatory, and open to change, reflective, responsive, emergent and cyclical" (Newton and Burgess, 2008, p.19). Based on the above explanation by Mills (2011), in action research people work together (collaborative) being involved in the research as active partners (participatory) aiming to bring change in their situation.This is done in a cyclical process wherein the steps would recur sequentially and the participants reflect critically upon the process and outcome of each research cycle (reflective). During the cyclical process, interpretations and meanings develop and become challenged and refined by the participants (emergent). Newton and Burgess (2008, p.19) state "from the literature it is apparent that all theorists of Action Research offer models or cycles in which thinking, doing, and watching are interwoven and repeated throughout the research activity". The action research cycle is described by Stringer (2007) cited in Creswell (2012) as comprising of looking, thinking, and action; this was followed by this study. Because of these features, action research as a methodology ensures its compatibility within the approach used in the study.

McMillan and Schumacher (2006) describe qualitative research as attempting to describe and analyse people's individual and collective social actions, beliefs, thoughts and perceptions. The purpose of this study aligned perfectly with this methodological perspective where I intended to obtain the views and perspectives of the teachers as participants, i.e. what they say, understand and do. This was chosen as the appropriate method to provide a detailed description of the experiences of Natural Sciences teachers when they apply self-regulated strategies to the teaching of Grade 8 and 9 learners. Furthermore, the main reason for choosing this method was to work with the teachers in applying self-regulated learning strategies as I, as the researcher, used participatory action research (PAR) to determine how the objectives of their training were achieved.Furthermore, the qualitative method enables the researcher to be on site and observe actively how the participants derive meaning from practical interactions (McMillan and Schumacher, 2006: Creswell, 1994). Based on the explanation above, I was able to observe how teachers interact with their learners through the teaching of self-regulated learning strategies and draw inferences directly from the views of participants since this type of research is based on the belief that events cannot be understood

unless the researcher understands how they are perceived and interpreted by the people who participated in them (McMillan andSchumacher, 2006).

Patton (2002) explains that "qualitative methods are open-ended questions regarding people and observation, matters of interest in real world settings in order to solve problems, or to develop policies". He expands on this by stating that qualitative methods are independent ways of discovering human interactions with their environment.From the information, this study used qualitative methods where real people in real situations, i.e. teachers in schools, were involved.

This study followed an action research methodology which allowed teachers to reveal their experiences and perspectives of their practice. A brief historical background of action research, how action research was used as a research design in this study, the types of action research and an outline of the process of action research in the study follows below.

3.3 **The historical background of action research**

The idea of using research in a 'natural' setting to change the way that the researcher interacts with the setting can be traced back to industrialist Kurt Lewin's work about how participation in decision making could lead to enhanced productivity (McNiff and Whitehead, 2002). Lewin's idea of action research was an alternative to decontextualized research, instead of focusing on surveys and statistical methods, action research's purpose was to increase social formations by involving participants in a cyclical process of fact finding, planning, exploring action and evaluation. Lewin was a psychologist familiar with the work of Vygotsky,so, like Vygotsky, Lewin focused on the ability of people to help each other throughout the learning process (McNiff and Whitehead, 2002).

A historian Lawrence Stenhouse based most of his work on education, especially curriculum development which he declared as one determining student's learning in school (Herr and Anderson, 2005). He believed that curriculum development depends on teachers working as researchers focusing on exploring their interaction with learners as well as the learning process. Wilf Car and Stephen Kemmis contributed more to the process of developing the theory and methodology of action research.They located action research in critical theory and particularly in relation to the work of Habermas. Lewin's idea of improving the people's

lives focused mainly on the promotion of social justice and the resistance of oppression (Herr and Anderson, 2005).

John Elliot changed the concept of teachers being researchers (Herr andAnderson, 2005). His contribution focused on developing the professional knowledge as well as the professional development of teachers by letting them learn through action research. He emphasized the importance of reflection in order to develop understanding and the ability to analyze agent social situations(Somekh and Zeichner, 2009).

Ferrance, (2000, p.255) explains that "lately, the practice of action research is seen to hold great value". Over time, the definition of action research has taken on many meanings. It is now often seen as a tool that could be used to develop professions focusing mostly on the teacher (Noffke and Stevenson, 1995, cited in Ferrance, 2000). It is increasingly becoming a tool for school reform, as its very individual focus allows for a new engagement in educational change as stated earlier that, "Action research emphasises the involvement of teachers in their own classrooms and has as its primary goal the in-service-training and development of teachers rather than the acquisition of general knowledge in the field of education" (Borg, 1965, p. 313, sited in Ferrance, 2000).

3.4   Action research as the research design of the study

3.4.1   Introduction

Research design, according to Creswell (2012), is described as a procedure involved in the research process including the collection of data, the analysis of that data as well as the writing of a report. This qualitative investigation rests on an action research process. Action research is depicted to bea way in which teachers search for information about their environment, their methods of teaching as well as the way their learners learn aiming at improving their situations (Mills, 2011). McNiff, Lomax and Whitehead (2003) define action research as a process teachers could use to investigate and discover their practice or a problem already identified and the action they follow to resolve it. Cohen and Manion (2007, p.13) see action research as an intervention to observe how people react in the real world considering the consequences of such an intervention. Action research helps with resolving

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day-to-day problems encountered by teachers in their classrooms and their work place. It is also a tool for professional development, which encourages collaboration among teachers.

Action research is regarded as enhancing the skills of educators to be able to reflect and solve their methodical problems. This study aligns itself with the belief of McNiff and Whitehead (2002) that "the continuous and cyclical process of action research provides a structured, disciplined approach to reflecting about the teaching and learning process". However, the participating teachers conducted action research based on the Stringer model (2007), which includes cycles of looking, thinking, and acting.

Action research is referred to by Mills (2011) as learning by doing, where a group of people identifies a problem, does something to resolve it, sees how successful their effort was and if not satisfied, they try again. In this study, I observed the application of self-regulated learning strategies in the learning process and thereafter I held reflective meetings with the participants where we reflected together on our plan and the action we took to implement the plan. We looked at challenges that were experienced and the modifications we could apply.

Somekh and Zeichner (2009, p.8) seeaction research as separated from general professional practice, consulting, or daily problem-solving with the emphasis on the scientific study, which is to say that the researcher's time is spent on the situation, and on collecting, analysing and presenting data on an on- going cyclical basis. It was therefore, on this basis, that action research was thought as an appropriate methodology to answer the research questions of this study because the research addresses a genuine issue in the researcher's professional life, as well as the teaching and learning of Natural Science in general.

Reason and Bradbury (2001) maintain that action research is combined with research where action is conducted during an investigation attempting to bring about understanding while at the same time looking at improving and bringing about change. Reason and Bradbury (2001) further outline the purpose of action research as a process producing knowledge that could help people in their daily lives. They further postulate that "action research is about working towards practical outcomes and also about creating new forms of understanding, since action without understanding is blind, just as theory without action is meaningless".

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Most descriptions of action research agree that: action research is an inquiry that is done by or with insiders to an organisation or community, but never to or on them (Herr and Anderson, 2005). It is a reflective process, but is different from isolated spontaneous reflection in that it is deliberately and systematically undertaken and generally requires that some form of evidence be presented to support assertions. Action research has its basis on action or cycle of actions that people have taken with the intension of resolving a problem. The ultimate change will be experienced within the setting or within the researchers (Herr andAnderson, 2005).

Based on the arguments above, it was gathered that action research is a structured process involving reflection on actions taken and gaining knowledge to rectify where weaknesses are identified.

3.4.2   **The action research design adopted in this study**

According to the literature, there are two basic designs in action research, that is, practical action research and participatory action research (Mills, 2011, cited in Creswell, 2012). The first design, "practical action research is an approach that involves educators examining a school situation with a view towards improving practice". Creswell, (2012) explains that "rather than a focus on individual teachers solving immediate classroom problems or schools addressing internal issues, the second design, participatory action research (PAR), has a social and community orientation and places emphasis on research that contributes to emancipation or change in our society".

It is also highlighted in Creswell (2012) that both the action research designs have basic principles and models for conducting action research,for example, the models of Kemmis and McTaggart (2000), Elliot (1991), O'Leary (2004), Sagor (2000), Mills (2003). These models have been put forward to try to find a deeper understanding of the process involved in action research. This study used the participatory action research design to answer the research questions.

3.4.3 **Participatory action research**

Stringer (2007, cited in Creswell, 2012) implies in education that the focus is on improving and empowering individuals in schools, systems of education and school communities. I chose this design based on its central features, which Kemmis and McTaggert (2005, p. 161) summarise as:

- "PAR is a social process in which the researcher deliberately explores the relationship between individuals and other people. In education, PAR might explore teachers working together as a team;

- PAR is participatory, teachers would study themselves to gain a better understanding of their practices and how this knowledge shapes and constrains their work with learners;

- PAR is practical and collaborative. This means that the inquiry is completed with others;

- PAR is emancipatory. Teachers might, for example, aim to change the bureaucratic procedures for teachers in schools so that they can better facilitate the learning of learners;

- PAR is critical in that it aims to help people to recover and release themselves from constraints embedded in social media. For example, teachers may be constrained by a subservient role in the school district so that they do not feel empowered in their classroom; and

- PAR is reflective and focuses on bringing change in practices. This occurs through spirals of reflection and action. When teachers reflect on their roles in schools, they try one action, and then the other, always returning to the central question of what they learned and accomplished because of their actions".

Of all the models of action research that were studied, the relevance of this study was aligned to the model of Stringer (2007). As explained in Creswell (2012), this model is called the interacting spirals. This model contains three phases: look, think and act and the spiral conveys that action research is not neat, orderly or linear, but is a process of repeating and revising procedures and interpretations (Creswell, 2012). This is shown in figure 3.1 below.

"Look   Look   Look   Look

Act   Act   Act

Think   Think   Think"
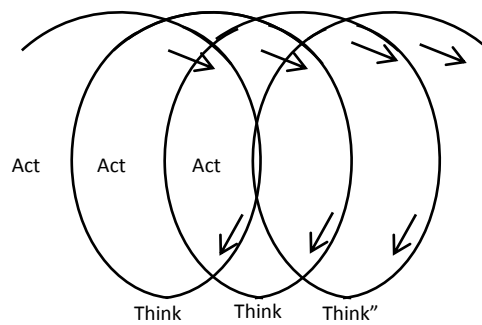
Figure 3.1: The phases of the participatory action research design according to Stringer (2007) cited in Creswell (2012)

According to Creswell (2012), Stringer (2007) placed emphasis on the importance of 'looking' to build a picture to help stakeholders understand the issues that they are experiencing. The 'look' phase consists of collecting data (e.g. through interviews, observations and documents), recording and analysing the information and constructing and reporting to stakeholders about the issue. The 'think' phase then moves onto interpreting the issues in greater depth and identifying priorities for action. The 'act' phase devises practical solutions to problems. This involves devising a plan and setting direction such as objectives, tasks and persons to carry out the objectives and secure needed resources. It also means implementing the plan, encouraging people to carry it out, and evaluating it in terms of its effects and achievements.

Returning to the central research question of this study, this states:
How do natural sciences teachers experience the application of self-regulated learning strategies to the teaching of Grade 8 and 9 learners?The interacting spiral of Stringer (2007) is discussed below according to the three phases which also indicated the three action research cycles through which this study moved.

3.4.4   **The first action research cycle**

The 'Look' Phase.
In the first part of the spiral, which was also the first cycle of the action research, as already stated in the rationale of the study in Chapter 1, the aim to pursue this study was prompted by limited observations on the continuously low performance of learners. Having seen the poor performance, the following questions came up, 'How do these learners learn? Which strategies do they use?' I then randomly selected learners to whom I asked these questions.

As it will be shown later in the study, learners did not follow any plan when learning, they did not have strategies to use in order to improve their performance, however, they were deeply concerned about their unsatisfactory performance.

Accordingly, in this phase, the researcher is supposed to collect data, record, analyse the information, and construct and report to the stakeholders about the issue. I then presented the issue to the other teachers in the cluster meeting. We discussed the issue and looked at different strategies that learners could use to improve their learning. Among the discussed strategies were self-regulated learning strategies. I then accessed articles from the literature on self-regulated learning strategies and found that these strategies have the capacity to motivate learners to not be dependent on their teachers for their own learning process. It looked like self-regulated learning strategies were the answer to relieving these teachers as they already had too much on their plates. The teachers' workload would somehow decrease as learners took on the responsibility of their own learning process to improve on their performance. When I started the study, I issued invitations for volunteer participants from within the cluster. When I got the volunteers, we started holding meetings where we used the information gathered, which was from my limited observations of learner performances, informal interviews done with selected learners and discussions with teachers in cluster meetings. The information was analysed in order to determine the area of need.

In all middle schools in our cluster, teachers reported that learners did not use learning strategies when learning. Learners were also not aware of their responsibility regarding the learning process. Based on that, collaboratively, a logical assumption was made that learners do have the potential to perform better, but did not possess the strategies that would help them to unleash that potential. As a result of this, there was a need to teach learning strategies to these learners and not any other strategies but specifically self-regulated learning strategies based on the reasons stated.

3.4.5   The second action research cycle

The 'Think' Phase
With the information gathered and analysed in the 'look' phase, we were prepared to enter the second phase of the spiral which is also the second cycle of the action research. This phase involved the process of planning, implementing, reviewing and evaluating with the

intention of moving on to interpreting the issues in greater depth and identifying priorities for action. The process is discussed below regarding the way it unfolded in this study.

a. Planning

The planning started with seeking ethical clearance to conduct the research from the University of Pretoria, sending requests to conduct research to the Department of Education and to the identified schools (Appendix A-C). Realising the methodology chosen for the study (action research) and the minimum information the teacher participants had on self-regulated learning, it became necessary to hold information workshops on these aspects. Together, we planned to have a three day information workshop where we would discuss action research, how to conduct it, self-regulated learning, self-regulated learning strategies and how to teach these strategies. This is shown in the figures below.

Figure 3.2: Teachers discussing their plan of action for teaching of SRL strategies.

Figure 3.3: Teachers discussing and planning how to integrate the SRL strategies in a learning task.

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b. Implementation

As a team, we discussed and ran ideas past each other on the method we could adopt to teach self-regulated learning strategies. From the information sessions, we agreed to use the strategies (goal setting and planning, self-motivation, help-seeking and self-evaluation). Since this was a collaborative study, we agreed to use our lesson preparation plans and incorporate the teaching of self-regulated learning strategies. We decided on the topics and together drew up lesson preparation plans which had self-regulated learning strategies. We developed questions and templates to assist learners in setting realistic and achievable goals(Appendix L). Teacher participants then individually presented the lessons to the team using flip charts to indicate their understanding of what they were going to do in the classroom.
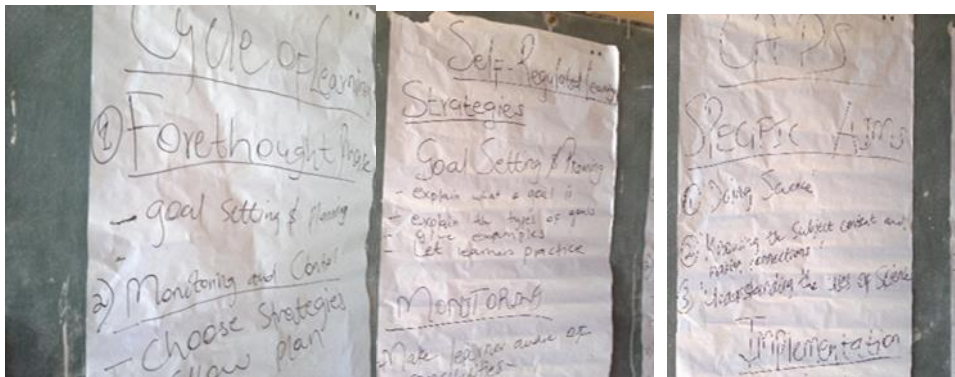
Figure 3.4: Charts prepared by participants for presentations in the workshop showing how they integrate SRL strategies in a learning task.

Figure 3.5: Teacher presenting in a workshop how SRL strategies could be integrated into a learning task.

c. Review

We all critically reviewed each teacher participant's lesson presentation and offered constructive feedback. This provided collaboration and reflection before the real action with learners in the classroom. Each participant learned about themselves concerning their level of understanding of self-regulated learning and the application of self-regulated learning strategies.

d. Evaluation

From what happened in the above stages, it was possible to evaluate the three phases to get a clear picture of where we started up to here. This helped us to determine whether the teacher participants understood exactly what they were supposed to do in the classroom. From this evaluation we were able to plan for the real action in the classroom, as such we started the 'act' phase.

Figure3.6: Teachers writing down their reflections after teaching SRL strategies in the classroom.

3.4.6 **The third action research cycle**

The 'Act' Phase

a. Planning

Together we decided on the dates when the self-regulated learning strategies would be taught to the learners. The procedure to present the lesson was the one agreed upon in the previous meetings. I observed the lesson presentations when the teachers presented the lesson presentations. We also set dates for the individual interviews. The teachers agreed to also include a tool to test the learners' understanding of what they hadlearned,this tool is called

the Quick Write. Templates were developed which were given to the learners at the end of the lesson (Appendix J). This was a tool which would help the teacher to evaluate how much the learners understood of the content learned. The teachers planned to use journals to reflect on their actions, experiences and ideas based on presentation of the lessons.

b. Implementing

The teacher participants were expected to apply the self-regulated learning strategies in the classroom. I observed the lesson presentation. On the set dates, I conducted interviews with each of the teachers (see the interview schedule in Appendix H).
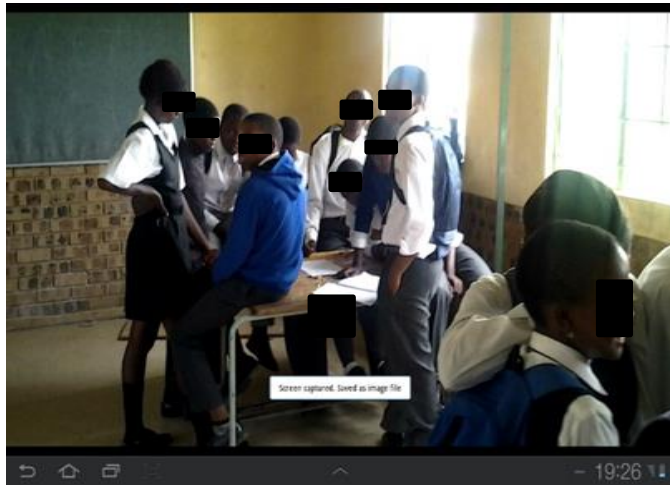
Figure 3.7: Learners working on their experiment.

Figure 3.8: Teacher guiding learners during the experiment**.**

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Figure 3.9: Learners busy with practical investigative lessons on determining the presence of starch in green leaves.

c. Review

Teachers engaged in a reflection of their actions in the classroom. I also reflected on the observations that I made.

d. Evaluation

The teacher participants evaluated their growth, development and knowledge gained in the whole study and noted that in the memo-books. I also evaluated the whole procedure followed as well as my own knowledge, growth and development. Due to the time constrains for the study, we could not engage in another planning session but agreed that each one of us would continue with the process and procedures to plan to find answers for any questions that would crop up.

3.5 **Sampling**

According to Patton (2002), different types of research require different types and numbers of samples, and it is also maintained that qualitative inquiry often employs a small sample, which is purposefully selected by the investigator. The geographical setting has influenced the choice of the schools for this study as the Nokaneng area was within easy access to the researcher. The schools consisted of African learners, of which about eighty per cent spoke Sepedi as their native language, while twenty per cent spoke Setswana as their native language. Seventy per cent of the learners were living in poverty and child headed families.

The sample in this study comprised of six teachers (P1S1; P1S2; P1S3;P2S1; P2S2; P2S3). All teachers in the sample were experiencednatural sciences teachers, three females and three males. Convenience sampling and purposive sampling were used to select the schools. Convenience sampling means choosing the sample on the basis of easy access, while purposive sampling involves handpicking the cases to be included in the sample to serve specific needs in the research (Cohen et al., 2000).

The teachers were selected because they were willing to participate in the study due to the reason that they wanted to improve their knowledge and use of self-regulated learning in natural sciences classrooms. It was necessary to involve natural sciences teachers because the study aimed to improve the teaching and learning of natural sciences and these teachers were the agents who could bring about the change in the teaching and learning thereof. Furthermore, many of the teachers' learners had an average to low achievement score in natural sciences in their previous grades.

Ercikan and Roth (2006, p.15) highlight "qualitative researchers tend to be concerned with meaning, quality and the texture of experience." The present study was interested in the teachers' views and meanings that they attached to their experiences when teaching self-regulated learning strategies to the learners. It was important for the study to find out (from the analysis of these experiences) how useful the integration of self-regulated learning strategies was, and whether it could bring about a change in the teaching and learning of Natural Sciences.

I approached the circuit manager and the principals of the three middle schools that participated in this study before commencingwith the research**.** Once the permissions were obtained (Appendix A, B, C), invitations were issued to teachers to volunteer as participants of the study**.** The data collection process was supposed to take place during July to September 2013, but due to unforeseen circumstances, and the teachers postponing the dates for classroom observations, the data collection continued up until March 2014. I explained to the teachers that their participation was voluntary and that my role was just to verify the data rather than to assess them. I visited the teachers at their schools for thecompletion of consent forms, information workshops, interviews and classroom observations.The teachers participated in a six hour (spread over three days) introductory information workshop. The six hours were split into three hours over three days. The six hours used occurred after

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theteachers' contact time with learners. We could not utilize more hours for the workshops as the participants were not local residents and had to commute to their different homes.

The development workshops provided the teachers with information on the action research process, self-regulated learning and the integration of self-regulated learning strategies into the daily teaching and learning activities of Natural Sciences. Although the teachers attended the three hours a day of developmental workshops, each teacher was requested to collect data of what happened in their classrooms for the period of the study. The teachers were also requested to write reflections of their experiences.

3.6 Data collection

Collection of data is necessary to obtain information that will provide answers to important questions (Johnston and Christensen, 2004). McNiff et al. (2003) suggest that there are a number of actions involved in generating data in action research, these include:

- Monitoring your own action;
- Monitoring other people's actions; and
- Possibly monitoring the conversations about the research. As a researcher I found it interesting that I would gather data from the process in which I was involved.

The use of different data sources helped in validating and cross-checking findings (Patton, 1990). In this case study, different types of data were collected from the developmental workshops, interviews, classroom observations and participant's journals.

3.6.1 Data gathering methods

The data gathering methods were:
- Workshop observations;
- Classroom observations;
- Interviews; and
- Teacher journals.

Below is the discussion of these methods based on their importance and the reasons why they were chosen to be used in this study.

3.6.2 Interviews used in the study

Johnston and Christensen (2004) describe interviews as being designed to develop a greater understanding and are also a measure by which the researcher enters the inner world of another person to gain that persons perspective. Cohen, Manion and Morrison (2000) also see interviews as ways for participants to get involved and talk about their views. In addition to this, the interviewees are able to discuss their perceptions and interpretations with regard to a given situation.

There are many reasons to use interviews for collecting data and using it as a research instrument, among others, Gray (2004, p.253) has given the following reasons:

- "There is a need to attain highly personalized data.
- There are opportunities required for probing.
- A good return rate is important."

However, Gillham (2000, p.137) warns that it is necessary for the researcher to prepare before the actual interview. The researcher needs to make sure the respondents have:

- "A clear idea of why they are asked.
- Basic information about the purpose of the interview and research project of which it is a part.
- Some idea of the probable length of the interview and that the researcher would like to record it.
- A clear idea of precisely where and when the interview will take place."

In this study, the primary data collection method was interviews. The goal was to understand the meanings of teachers' experiences of self-regulated learning strategies as they taught them to their learners. One formal and one semi-structured interview were conducted with six participants. Each interview was conducted individually, and the interview was conducted at the end of the study. I used an interview guide that provided some structure to the interviews. More structure eases the researcher's task of organising and analysing interview data. This would also enable readers of the report to judge the quality of the interviewing methods and instruments used (Gray, 2004).Semi-structured interviews were chosen as the instrument for data collection (see Appendix H). It was used because it allowed the researcher to probe

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forthe views and opinions of participants (Corbetta, 2003). Moreover, it gave the researcher the opportunity to gain deep information about the meanings of teachers' experiences (Creswell, 2005, p.345). The interview meetings accommodated the schedules of the participants, which included time slots that were during and after school. All interviews were recorded on a tape recorder and the data were later transferred into writing. Interview questions were designed to meet the criteria so as to gather information.

Following the transcription of each interview, each participant was asked to review the transcription. This member-check helped to ensure the accuracy of the data.

The teacher participants were interviewed to gather knowledge regarding:

- "The participants' understanding of self-regulated learning strategies;
- The participants' views on the method of integrating self-regulated learning strategies into the daily process of teaching and learning;
- Their experience of action research; and
- The participants' views on the effectiveness of self-regulated learning and whether the teachers would continue integrating the strategies after the research project".

3.6.3 Observations conducted in the study

Observations were conducted to collect data from the specific area where research was being conducted (classroom). According to Strauss and Myburgh (2003, p.176), "observation is at the basis of all research". In this case, I focused on two of the five scientific observation steps indicated by Strauss and Myburgh (2003) 1. A natural phenomenon is observed; 2. Conclusions are drawn from what happens... Moreover, Strauss and Myburgh (2003) indicate that the researcher reports what she or he observes. The researcher used a qualitative observation technique. According to Strauss and Myburgh (2003, p.179) the observation process therefore entails "the researcher or observer has a list of certain specifics that she/he will observe, often called an observation schedule when observing qualitatively, observation is much more open when compared to observation as a quantitative technique".

Additionally, Robson (2002) believes that although the term 'observation' suggests watching what happens, it also includes listening as observation data are often in the form of examples of what people have said. Accordingly, it is believed that observation is probably the most

effective way to see people do and to hear what they say (Robson, 2002). Moreover, Robson (2002, p.156) postulates"it is important that observation is as objective as possible and observers need to be aware of their own interests and biases so that the information gained is as valid and reliable as possible and not selected to prove a point". According to researcher, observers should keep on-the-spot notes to complement an observation schedule so that any additional or unusual events can be noted.The following are pointed out by Robson (2002,p.158) as advantages of observations:

- "Collect data where and when an event or activity is
- Do not rely on people's willingness or ability to provide information
- Allows you to directly see what people do rather than relying on what people say they did".

The researcher has kept the following disadvantages in mind when observations were conducted, as pointed out by Robson (2002, p.169) that observation:

- "Is susceptible to observer bias
- Is susceptible to the 'Hawthorne' effect, that is, people usually perform better when they know they are being observed although indirect observation may decrease this problem.
- Can be expensive and time-consuming compared to other data collecting methods.
- Does not increase your understanding of why people behave as they do."

3.6.3.1 **Workshop observations**

To develop teachers is an effort to improve the achievement of learners (Guskey, 2003, p.340). This study developed teachers in a two day workshop of three hours per day. The intension of the workshop was for the teachers to:

- "Receive information on the two major concepts of the study, action research and self-regulated learning;
- Engage in oral and written activities based on the concepts (Appendix F);
- Be able to present a demonstration of how they were going to teach the SRL strategies to the learners; and
- Discuss a plan of action to indicate how and when they were going to hold meetings to discuss their actions, reflections, challenges and present inputs, where necessary".

3.6.3.2 **Classroom observations**

The study used three sites (schools A, B and C) for data collection. Two classroom observations were done per school, per teacher. The first observation was carried out when the teachers taught the SRL strategies to the learners, while the second observation was carried out when the teachers guided the learners to apply the learned strategies to a practical task.Classrooms observations were conducted in this study to:

- Determine whether there would be a correlation between the educator's perceived and actual classroom practices with regard to the implementation of self-regulated learning strategies; and
- Develop a richer understanding of how the educators perceived understanding of self-regulated learning strategies.

3.6.4 **Audio Recordings**

As already indicated, the interviews were audio recorded. The purpose of recording was to ensure that the researcher captured and had access to reach the data provided. It is noted that they lead to multiple interpretations of the text; this enhanced the understanding of interactions. Furthermore, a transcription would show points that might go unnoticed during the meetings and interviews (McNiff et al., 2003). The data received from the recordings were then transcribed into text data for analysis.

3.6.5 **Research Journals**

McNiff et al. (2003) highlight the variety of uses for keeping a research journal and these include annotation of dates, recording of thought and feelings, recording narratives or events. These data can be a useful tool to help the researcher to address the research questions. I used a journal to keep an accurate time-log of events and sequences, and to record my feelings when the implementation process unfolded so that during the meetings I would have some accurate reflections. Although, McNiff et al. (2003) indicate the difficulty in maintaining a journal, participants were also asked to use journals.

3.7 **The data collection stages**

3.7.1 **Stage one of the data collection process: Developmental workshops**

I went to the schools on different days to give the teacher participants consent forms. Since all participants were contributors to the quality of teaching and learning in a school, in each school I explained the objectives of the research project and that the data would only be used for this study. I also explained the benefits of the study and gave them the letters of consent to complete as an indication of their willingness to participate in the research project. I explained to the participants that they were welcome to withdraw from participation during the course of the study if they felt uncomfortable with the research, but with prior warning (Patton, 2002).

The schools' time-tables were used to determine suitable time slots during which the contact sessions were to be held. The intervention consisted of twelve sessions of fifty five minutes each. The sessions were presented over a period of eight weeks. After each session, having been the observer, I met again with the teachers to reflect on the actions in the classroom.

Workshop - Day 1 – Participants' Task Sheet- Section A

After informal introductions, I explained how the data collection process was to be conducted. I also highlighted that the process was collaborative hence the participants were also allowed to voice their suggestions. We spent ten minutes discussing the points that participants needed clarification on (the participants needed confirmation on anonymity and also asked how it would be ensured that the transcribed data was exactly what they meant). I made sure that all the participants were well informed regarding the purpose and aims of the study, I explained ethical issues again, as well as when and how member checking would be done.Thereafter, I asked the participants to discuss among themselves what action research is and what it entails. I handed out task sheets which had two sections. They were to concentrate on the first section, section A, which had activities indicated as task 1; 2; 3 and 4. As an opening activity, the participants were requested to engage with task 1, which required them to develop a concept map containing key elements of action research. Each participant received a flip chart on which to draw the concept map. The participant had to also articulate what he/she understood by the term 'action research'. As soon as the participants completed

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task 1, I handed out the participants' guide (see Appendix J). They then engaged with task 2, which required them to compare the information in the guide to their responses to task 1. Upon completion of the comparisons, the participants formulated their own definition of action research and shared that with their co-participants. They then together developed a team definition.

I introduced to the participants the features of action research, which is described as being practical, participative, empowering, interpretive, tentative and critical. The teachers had to write the explanations of these features without looking in the guides. This activity was reflected as task 3. After they finished writing on their flip charts, I requested them to open the guides and we discussed the features together while they compared their responses to the information in the guide. Next I explained to them the cyclical process of action research. We discussed the four steps of action research (planning, action, observing and reflecting). Task 4 required them to represent the four steps in a cycle. I further explained that for the purpose of the study, we were going to use the phases of Stringer's (2007) participatory action research design (see Figure 3.1). On a flip chart I drew Stringer's model and explained the three phases: 'Look'; 'Think' and 'Act' (detailed explanation in Sections3.3.4, 3.3.5 and 3.3.6).

In this workshop I explained that we were in the 'Look' phase, which explained how the need for the study was developed in the cluster meetings that the participants were part of. After the workshop presentation, I requested the participants to reflect on the whole session and write their reflections in their journals.

Workshop - Day 2

The second session was focused on self-regulated learning. The teacher participants were requested to engage with Section B of the task sheet, which had five tasks. I handed out a worksheet (Appendix G) on which the participants had to express their responses to task 1 of Section B. They then shared their responses with their co-participants and noted their commonalities and differences. In task 2, they explained their thoughts on the benefit of developing self-regulated learning skills, then shared their responses and also compared this with the information in the guide. In task 3, the participants listed the strategies that they thought were important to develop learner self-regulation, they also described what they thought was a learning cycle by illustrating in a diagram and comparing this with their co-participants.

On completion of task 3 I introduced and presented to the participants Zimmerman's learning cycle (2002). I explained that the learning cycle was divided into three phases (Forethought, Performance and Self-Reflection), each with its own processes (see Sections 2.6.1; 2.6.2 and 2.6.3). The teachers compared their responses towards the learning cycle to Zimmerman's learning cycle. We discussed how the teachers were going to use the learning cycle. Our plan was to first teach the self-regulated learning strategies to the learners (example, types of goals, how to set realistic goals, monitoring one's progress and doing self-evaluation). Thereafter, the learners were to be given a task on the chosen topic.

Within the Forethought phase, learners would identify the requirements of the task, set achievable goals and plan the strategies they would use to achieve their goals. During the Performance phase, learners would work on the strategies by applying them to the task. They would also seek help from the teacher when necessary. The final stage of self-reflection would come after they received their feedback on the task. They would then evaluate whether they achieved their goals or not. Thereafter, if not satisfied with their performance, they could start the learning cycle all over again by setting new goals.

The participants discussed and shared ideas on how they would integrate the self-regulated learning strategies and tools linking to learning outcomes in their classrooms. The teachers used flip charts to present to each other how SRL strategies could be integrated. Importantly, the teachers developed knowledge about self-regulated learning, strategies, the tool "Quick Writes", and ways of integrating these into daily classroom practice. When we reflected on the information discussed, it became clear that the teachers needed resources (a model for goal setting, templates for Quick Writes) to enhance implementation in the classroom. We agreed to develop these together and make an appointment to meet and assess them before implementation.

Figure 3.10: Teachers responding to activities during the workshop.

3.7.2   Stage two of the data collection –Classroom observations

3.7.2.1 First Classroom Observation

Before the set dates for implementation, I visited the schools to talk to the learners about the study, its purpose, their involvement, and the need to get consent from their parents. The learners were then given consent forms to take to theirparents which had to be returned the next day to their teachers. On this day we also assessed the templates that we had developed and agreed which ones were to be used so as to allow the teachers to make enough copies.

I visited the schools on the set dates for the first classroom visits. The observations took place from August to September 2013. As I entered the classrooms, learners were relaxed and showed excitement and enthusiasm. They did not show any sign of anxiety due to having met me before, and because they knew what I was there for. I used an observation schedule to describe what happened in the classroom, for example, how self-regulated learning strategies were taught, as well as the challenges the teachers experienced with regard to the application of self-regulated learning strategies. I conducted the observations keeping in mind the disadvantages of classroom observations, as indicated by Robson (2000). I was aware that observations are susceptible to observer bias, so I tried at all costs to maintain objectivity. I was also aware of the 'Hawthorne' effect because the learners and their teachers knew that I was there to observe them, therefore they could have performed or behaved differently than when indirectly observed.

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During the last ten minutes of the period, learners were asked to write down their reflections of the whole lesson and submit these to the teacher. Each class observation lasted for thirty minutes. After the lesson, I discussed each observation with each teacher participant. We planned and arranged for second observations where all the participating teachers in a specific school were to present their lessons in which they assisted learners to apply the learned strategies on a practical task. After the presentations, I met with the participants to reflect on the challenges that they might have experienced and to come up with ways in which they could be modified.

3.7.2.2 Second classroom observations

I visited the schools for second classroom observations on the arranged dates. The teachers presented their different lessons (three Grade 8 teachers presented an investigative lesson on the test for the presence of starch in green leaves).The Grade 9 teachers presented an investigative lesson to test for the presence of fats in different kinds of food. Teachers handed out to the learners the templates including the setting of goals, choosing strategies to achieve the goals, monitoring the learning process, evaluating their action and reporting on what they learned.

The main aim for these observations was to determine how the teachers assisted the learners to apply the SRL strategies when conducting their investigations. Two teachers agreed that their lessons be videotaped. I explained to the learners that they should not interact with me as the researcher. But, since it was clear that the learners were not used to seeing such tools in their classrooms, they could not fully ignore my presence. After the presentations, I met with the participants to reflect on the challenges that might be experienced and to come up with ways in which they could be modified.

3.7.3 Stage three of data collection – Interviews

I interviewed six teacher participants since one withdrew from participating in the study. The interview meetings were conducted after the day's contact time with learners. The teachers chose places where they would feel comfortable and relaxed. The interviews were scheduled to last for thirty minutes. Before the start of the interview, I explained the reasons for the interview and the probable length. I also reminded the participants that I was going to audio

record the whole session. I used an interview guide that had open-ended questions.After the interview, I explained to the participants that following the transcription, the participants would be asked to review the transcription so as to ensure the accuracy of the data.

3.8 **Data analysis**

Data analysis, according to McMillan and Schumacher (2006, p.365), is defined as "an on-going cyclical process that is integrated into all phases of qualitative research". They further explain that qualitative analysis is a relatively systematic process of coding, categorising and interpreting data to provide explanations of the phenomenon of interest. The data collection and analysis ran simultaneously. I continued organising data for analysis while still collecting other data. I organised the collected data by site, meaning that I set aside data from interviews, observations and diaries collected from each school. The data were analysed by hand,this means that I did the analysis myself by reading the data, marking it by hand and dividing it into parts.

The data analysis intended to capture the experiences of the participants when they taught learners to apply SRL strategies to their learning of natural sciences. The reasons why the data were analyzed were to form answers to the research questions of the study and to form an in-depth understanding of the application of SRL strategies into the learners learning process.As indicated, the analysis started during data collection with interim analysis, the aim of which was to identify recurring topics, possible themes, interpretations and questions from the data. Summaries of observation and interviews were written to pull out important aspects and then rearrange them in a logical order (McMillan & Schumacher, 2006). Data coding was used for explanation building and categorising.

The data was divided into smaller parts containing some descriptive meaning. These parts were then given codes, which were later compared for duplication. Categories were then formed from the coded topics. Furthermore, discovering patterns identified the relationship among these categories. By doing so, I tried to understand the complex links among various aspects of people's situations, actions and beliefs (Creswell, 2012). As a measure of confirmation, I moved back and forth among codes, categories and tentative patterns. This helped to determine how well the data illuminated the research problem and which data were central (Mcmillan & Schumacher, 2006). Data was analysed using a constant comparative

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method (Bowen, 2005) where line sentences and paragraph segments of the transcribed interviews were reviewed to decide what codes fit the concepts suggested by the data.Each code was constantly compared to all other codes to identify similarities, differences and general patterns. I also did member checking to check the accuracy of facts obtained and the observations. In this qualitative research, negative case analysis was also used in the quest for verification (Bowen, 2005). I re-examined every case, after the initial analysis was completed, to see whether the characteristics or properties of the emergent themes were applicable to all cases. After determining that there were no negative cases or disconfirming evidence, the analysis was then considered complete (Bowen, 2005). At the end of the final analysis, the findings were shared with the participants. The participants were asked to further assess the validity of the findings. The reason behind this action was to verify the collected data and their interpretations.

The analysis of data started during data collection with interim analysis to identify topics, possible themes, interpretations and questions (McMillan &Schumacher, 2006). Then, I coded and categorised data into groups of activity units. As I read the coded data, I was able to identify meaningful activities that were prevalent throughout the multiple sources. Then I arranged units of activity into chronological order. Discovering patterns identified the relationship among the categories (Creswell, 2012). By doing so, I tried to understand the complex links among various aspects of peoples' actions and beliefs.

Of particular interest in this study was teachers' positioning of themselves in relation to self-regulated learning? This positioning helped me to assess the teachers' perceptions of self-regulated learning.The researcher constantly checked how well the data illuminated the research problem, since the analysis was guided by the following questions:

- How do natural sciences teachers experience the application of self-regulated learning strategies to the teaching of Grade 8 and 9 learners?
- How do teachers describe self-regulated learning?
- How do teachers describe the change experienced in their teaching of natural sciences,if any, in their teaching practice as related to the use of self-regulated learning strategies?
- What are the teachers' views on the usefulness of learners having an awareness of self-regulated learning strategies when learning natural sciences?

Member checking was used to check the accuracy of the facts obtained. Negative case analysis was also used to verify whether properties of emergent themes were applicable to all cases (Bowen, 2005). At the end of the analysis, the findings were shared with the participants. The participants were asked to further assess the validity of the findings in order to verify the collected data and their interpretations.

3.9 **Achieving validity throughout the research**

Barbour (2001, p.1115) posits "it is important in qualitative research to extend and embrace a broader understanding of qualitative research design and data analysis". Cohen et al. (2007) propose that qualitative research validity relates to honesty, depth, richness and the scope of data achieved. Furthermore, Cohen et al. (2007) add that validity could be achieved by the involvement of the researcher, as in action research. They argue that qualitative research should seek validity in terms of confidence rather than certainty in results. This study followed the criteria established by Mays and Pope (2000, p. 51):

- "The use of triangulation - This research used a variety of methodological tools as already described under the section on data collection. The interpretations that were made were a result of discussions with the participants;

- Respondent validation. This refers to the extent to which the results reflected the experience from the perspective of those involved. As indicated, the participants were given the transcripts to validate the information captured;

- Clear exposition of methods of data collection and analysis. I intended to provide detailed information that explained how interpretations were supported by the data;

- Reflexivity - thisrelates to the researcher being able to critically examine the research process. McNiff et al. (2003) point out that action research involves making public an explanatory account of practice. Additionally, the results and the researcher's interpretations can never be final or conclusive. They only represent that given point in time when the research is being carried out; and

- Relevance -this point links to generalizability. This refers to the degree to which the findings from this research can be applied to the other settings (Mays & Pope, 2000 p.51).

3.10 **Ethical issues**

3.10.1 **Access to the study settings**

I gained access to the study settings by writing requisition letters to the Department of Education and the Principals of the selected schools. Upon approval of these requisitions, I held meetings with the principals and teachers to outline the aims of the research and arranged dates for the data collection plan.

3.10.2 **Informed consent**

At the beginning, I briefly explained the research to be conducted to the teachers and emphasised the fact that participants could withdraw at any time. I then received consent forms from the teachers for their own participation (Bryman, 2004). The participants were given priority over the actual process of the research. While the success of the study depended upon the willingness of individuals to participate, if at any time such participation placed an individual at risk at any time or caused undue stress, participation was not to be pursued (Bryman, 2004).

3.10.3 **Confidentiality, privacy and anonymity**

The researcher should, according to Patton (2002), have a clear understanding with the participants regarding the confidentiality of the results and findings of the study. All participants' information and responses that were received during the study were kept private and the results were presented in an anonymous manner in order to protect the identities of the participants. As the researcher, I knew that it was my responsibility to maintain confidentiality.

As the teachers were known to each other, they often met for cluster meetings, confidentiality could not be ensured. However, the following protocols were followed:

- No teacher or school was identified by name;
- Interviews were held in a private area at a mutually agreed upon time, with only the respective teacher participant and myself present; and

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- All data was kept secured throughout the study.

3.10.4 Anticipating harm

According to Creswell (2009), the researcher should ensure that participants are not exposed to any undue physical or psychological harm. During the study, I strived to be honest, respectful and sympathetic towards all the participants. I tried to minimise disturbances both to the participants themselves and to the participants' relationships with their environment.

3.11 My role as the researcher

As the researcher, I was responsible for the overall study but was an active agent in so far as I kept the study on track, kept scheduled dates and activities, and offered support when needed. I was an action researcher listening and gathering data about teachers engaged in the process of taking part in the study. As Herr and Anderson (2005) indicate, these teacher participants were action learners, meaning they were learning from concrete experience and reflecting on that experience. I was also leaning from the experiences of these teachers.

I gathered all the data for this study,and did observations while teachers applied self-regulated learning strategies into their classrooms. This meant that I was situated in their classrooms but not participating. Based on that, and on what Herr and Anderson (2005) explain about insider research, I regard myself as an insider researcher. They indicate that an insider researcher often collaborates with other insiders as a way to do research that not only might have a greater impact on the setting, but is also more democratic. I tried to maintain openness and freedom of expression where teachers were free to voice their ideas, opinions and suggestionsregarding the implementation process of the study.

I handed out task sheets at the beginning of the information sessions, these required the participating teachers to explain their understanding of SRL and how they implemented it in the classroom. I was observing the teachers and also audiotaped the entire one on one interviews and then transcribed the data. During the classroom observations, only two teachers agreed that I videotape their lessons. In those two classrooms, I explained why I would be videoing and asked the learners not to interact with me. However, the learners

could not fully ignore my presence and it was clear that they were not familiar with the use of such tools within their learning context.

3.12 **Chapter summary**

This chapter gave a description of the research approach, the research design and the data collection process. The process to collect data was selected with the idea of ensuring the validity of the outcomes. The choice of schools was also explained. The data collection techniques were then described and the reason for their choice also stated. These included a questionnaire, interviews (which were recorded on tape recorder) and classroom observations (wherein an observation schedule was drawn to serve as a guideline of what is to be observed. The data collection process was elaborated as it unfolded. Data analysis and validity of the research were also discussed.

In Chapter 4 more detailed analyses, discussions and interpretation of data obtained by means of the research methodology stipulated in Chapter 3 will be given.

CHAPTER 4

RESEARCH FINDINGS AND ANALYSIS OF THE RESULTS

4.1 Introduction

The previous chapter revealed how the research was designed and the methods of data gathering that were followed to gain relevant information from the teacher participants. In this chapter, the focus is on the feedback received from the teacher participants. The purpose of this chapter is to report the analysis and interpretations of the data collected and to provide a description of how the process of action research informed and influenced the teaching of Natural Sciences in Grade 8 and 9 when integrating the strategies of self-regulated learning.The study introduced the following self-regulated learning strategies: goal setting, performance control, and self-reflection. The teacher participants were all experienced Natural Sciences teachers. An introductory short workshop with diagnostic assessment, personal interviews, classroom observations and journals were used to collect data based on the teachers' perceptions of the application of self-regulated learning strategies in day-to-daynatural sciences teaching and learning.

This chapter begins with an overview of the analysis of the qualitative data collected from the three middle schools that participated in the research project with a total number of six teachers. The results of the teachers' responses to each of the following research questions were examined:

- How is the concept of self-regulated learning understood by Grade 8-9 Natural Sciences teachers?
- How do teachers describe the change,if any, in their teaching practices in Natural Sciences related to the use of self-regulated learning strategies?
- Do teachers find it useful for learners to have an awareness of self-regulated learning strategies when learning Natural Sciences?

4.2 Data analysis procedures

The data collection process was done at three middle schools on separate occasions. The analysis and description of the data is presented per school and then a general overview of the data from the three schools will follow. The schools will be named school A, school B and school C. The meetings at all the schools were conducted after the teachers' contact time with learners. The data was collected during the developmental participatory short workshops where the teacher participants recorded their actions on flip charts (see Figures 3.4 and 3.5). The workshops ran for two days, the first day was phase one where participants engaged with activities and discussions on action research, while the second day was phase two where they engaged with activities and discussions on self-regulated learning as discussed below.

4.2.1 Phase One of the workshop - Action Research

Mills (2003) provides the following definition for action research:

> "Action research is a systematic inquiry conducted by teacher researchers to gather information about the ways that their particular school operates how they teach and how well their students learn. The information is gathered with the goals of gaining insight, developing reflective practice, effective positive changes in the school environment and on educational practices in general and improving student outcomes". (p.4)

The literature reveals that among the aims of action research is the concept of bringing about change in the classroom by empowering the teachers to become agents of change (McNiff et al., 2003). Furthermore, Parsons and Stephenson (2005, p.112) state 'another aim of action research as being to improve the teachers' effectiveness while at the same time enhancing professional growth'.These aims coincided with the purpose of the workshops because teachers learned about self-regulated learning, its strategies, as well as how the strategies could be integrated into the daily teaching and learning of natural sciences. By doing so, the workshops aimed at empowering teachers to bring about changes to the daily routine of teaching and learningnatural sciences in their classrooms. While bringing about changes, teachers would also be gradually developing and growing their profession since in today's

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environment we find that there are multiple pressures on all teachers to improve and achieve externally set targets. For example, our curriculum (in South Africa) aims to ensure that learners "acquire and apply knowledge and skills in ways that are meaningful to their own lives" (Department of Basic Education, CAPS, 2011, p.6). This is a challenge to teachers to make sure that learners use the acquired knowledge and skills in a proper manner that will lead them to be able to organise and manage themselves and their activities responsibly and effectively. This study has hence assumed that action research would be a relevant process through which an intervention on self-regulated learning could be introduced and made meaningful to Grade 8 and 9natural sciences teachers.The following section discusses how I introduced action research to the teacher participants at the respective schools during phase one of the workshops.

4.2.1.1 **School A**

I met with two female teacher participants in an office. I reminded the participating teachers about the purpose of the study and also the research questions that the study intended to answer. I handed out the participant's task sheet (see Appendix F) and flip charts. The task sheet was divided into two sections, section A (for action research) and section B (for self-regulated learning). The two sections were comprised of activities which the participants had to do during the workshops. During the first phase of the workshop, that is day one, the participants dealt with section A of the task sheet which had four tasks indicated as task 1, 2, 3, and 4. These tasks were diagnostic activities to assess what and how much the participants knew about action research.

As an opening activity, the participants were requested to engage with task 1, which required them to develop a concept map containing key elements of action research. Each participant received a flip chart on which to draw the concept map. The participant had to also articulate what he/she understood by the term 'action research'. As soon as the participants had completed task 1, I handed out the participants' guide (see Appendix J). They then engaged with task 2, which required them to compare the information in the guide to their responses to task 1. Upon completion of the comparisons, the participants formulated their own definition of action research and shared that with their co-participants. They then together developed a team definition.

I introduced to the participants the features of action research, which describe it as being practical, participative, empowering, interpretive, tentative and critical. The teachers had to write the explanations to these features without looking in their guides. This activity was reflected as task 3. After they finished writing on flip charts, I requested them to open the guides and we discussed the features together while they compared their responses to the information in the guide. Next, I explained to them the cyclical process of action research. We discussed the four steps of action research (planning, action, observing and reflecting). Task 4 required them to represent the four steps in a cycle. I further explained that for the purpose of the study, we were going to use the phases of Stringer's (2007) participatory action research design (see Figure 3.1). On a flip chart I drew Stringer's model and explained the three phases, 'Look'; 'Think' and 'Act'.

In this workshop I explained that we were in the 'Look' phase, which explained how the need for the study was developed in the cluster meetings of which the participants were members. After the workshop presentation, I requested the participants to reflect on the whole session and write their reflections in their journals.The analysis of the mind maps showed limited knowledge of action research, while the analysis of the participants' 'reflections' in their journals indicated that they gained new knowledge on action research, they were excited and also eager to learn more.

Reflection

From the data I gathered in the meeting we held after the first workshop, it was evident that teachers appreciated the time they spent learning about action research. They had not engaged in action research before, they only had limited information from their studies at tertiary institutions. It was in this workshop that the teachers learned more about action research and were also able to share their views and feeling about it as P1S1 expressed, "*Action research is good because it is practical*".It was interesting to listen to P2S1 talk about how different she saw herself after the workshop, indicating her growth and development. P2S1 said, "*I see the growth in me, I realized that as teachers we should continually evaluate ourselves in a practical work situation and we should engage more in this process (action research). I feel more informed about the process because I have for so long wanted to improve my teaching skill but did not know exactly where to start and importantly how to go about doing that*".This indicated a positive outcome of the workshop since it gave an indication that the teacher was willing and eager to learn more about her working situation. Thiscorroboratesthe

description of action research given byWinter (2003, p.118) that "it is appropriate in working with people to help them learn from their situation".

Goodnough (2001, p.39) cites"one of the benefits of action research as the enabling teachers to reflect on their practice to improve it while recognising and appreciating their own practice".P1S1admitted learningfrom the information received and said,*"I have learned that I should reflect after every piece of work I do, and I have seen I can now identify my shortcomings and improve on them.I will engage in action research because I have now thought of other things we can research on".*Another benefit of action research, indicated by Sagor (2009),is that it makes implicit knowledge explicit so as to be shared with others and this was indicated in the comment made by P2S1 that, *"Action research will help us interact more with colleagues of which is good because new ideas and skills will be shared".*

These comments convey the joy expressed by the teachers upon discovering that the workshop on action research brought some light and helped them discover themselves in terms of their developmental growth. Goodnough (2001, p.39) advocates "action research is useful to create self-knowledge to understand the nature of the self". Both teachers also felt that reflectionwas an important process, which suggests that it could be a powerful strategy in teacher education.

4.2.1.2 **School B**

I met with one male and one female teacher after their contact time with their learners. The picture I got before we started was that the male participant was excited and enthusiastic, while the female participant was not. We started the same way as with School A, a brief introduction, the action research mind map, the presentation and discussion on action research and the discussion on reflections. I reminded the teacher participants of the purpose of the study and also the research questions that the study intended to answer. I handed out the participant's task sheet (see Appendix F) and flip charts. The task sheet was divided into two sections, section A (for action research) and section B (for self-regulated learning). The two sections were comprised of activities which the participants had to do during the workshops.

During the first phase of the workshop, that is day one, the participants dealt with section A of the task sheet which had four tasks indicated as task 1, 2, 3, and 4. These tasks were diagnostic activities to assess what and how much the participants knew about action research.As an opening activity, the participants were requested to engage with task 1, which expected them to develop a concept map containing key elements of action research. Each participant received a flip chart on which to draw the concept map. The participant had to also articulate what he/she understood by the term 'action research'. As soon as the participants completed task 1, I handed out the participants' guide (see Appendix J). Then they engaged with task 2 which required them to compare the information in the guide to their responses to task 1. Upon completion of the comparisons, the participants formulated their own definition of action research and shared that with their co-participants. They then together developed a team definition.

I introduced to the participants the features of action research, which describe it as being practical, participative, empowering, interpretive, tentative and critical. The teachers had to write the explanations to these features without looking in their guides. This activity was reflected as task 3. After they finished writing on flip charts, I requested them to open the guides and we discussed the features together while they compared their responses to the information in the guide. Next, I explained to them the cyclical process of action research. We discussed the four steps of action research (planning, action, observing and reflecting). Task 4 required them to represent the four steps in a cycle. I further explained that for the purpose of the study we were going to use the phases of Stringer's (2007) participatory action research design (see Figure 3.1). On a flip chart I drew Stringer's model and explained the three phases, 'Look'; 'Think' and 'Act'.

In this workshop, I explained that we were in the 'Look' phase which explained how the need for the study was developed in the cluster meetings of which the participants were members. After the presentation, I requested the participants to reflect on the whole session and write their reflections in their journals. During the presentation when we discussed the features and the process of action research, I noticed that the female participant was the most talkative and that she was seemed to have more interest. Like the participants at school A, the analysis of the mind maps revealed limited knowledge, but I found that they listed some of the features of action research (for example, empowering and practical). The analysis of their reflections showed an increase of knowledge and a will to learn more about action research.

Reflection

In the meeting held right after the workshop, I discovered that what the teachers learned from the workshop encouraged them to engage in action research after the study. P1S2 acknowledged the value of learning about action research and stated, "*I have realised things thatI did not know previously or rather have taken for granted*".Sagor (2009) argues that researchers mustrecognise that everyday experiences are the source of legitimate knowledge and a place to begin inquiry and the construction of knowledge. Both teachers thought in-line with the argument and made the following statements:

P1S2: "*I think I need to increase the knowledge I gained from this workshop by reading more about action research so that I can be alert of everyday experiences that could require research of this kind*".

P2S2: "*It is important to share experiences as we do not operate in isolation; we need to succeed as a team to benefit the entire education system*".

The teachers indicated they needed to acquire more information on action research andthat theywere encouraged to become researchers in their own practice.

4.2.1.3 **School C**

The same procedure as at the previous two schools was also followed - a brief introduction, the mind map, the presentation and discussion on action research and the reflections. Here I met with two male teacher participants. Both participants showed a lot of interest and were eager to start. I reminded the teacher participants the purpose of the study and also the research questions that the study intended to answer. I handed out the participant's task sheet (see Appendix F) and flip charts. The task sheet was divided into two sections, section A (for action research) and section B (for self-regulated learning). The two sections were comprised of activities which the participants had to do during the workshops.

During the first phase of the workshop, the participants dealt with section A of the task sheet which had four tasks indicated as task 1, 2, 3, and 4. These tasks were diagnostic activities to assess what and how much the participants knew about action research. The participants were requested to engage with task 1, which required them to develop a concept map containing

key elements of action research. Each participant received a flip chart on which to draw the concept map. The participant had to also articulate what he/she understood by the term 'action research'. As soon as the participants completed task 1, I handed out the participants' guide (see Appendix J). Then they engaged with task 2 which required them to compare the information in the guide to their responses to task 1. Upon completion of the comparisons, the participants formulated their own definition of action research and shared that with their co-participants. They then together developed a team definition.

I introduced to the participants the features of action research. The teachers had to write the explanations to these features without looking in their guides. This activity was reflected as task 3. After they finished writing on flip charts, I requested them to open the guides and we discussed the features together while they compared their responses to the information in the guide. We discussed the four steps of action research (planning, action, observing and reflecting). Task 4 required them to represent the four steps in a cycle. I further explained that for the purpose of the study we were going to use the phases of Stringer's (2007) participatory action research design (see Figure 3.1). On a flip chart I drew Stringer's model and explained the three phases, 'Look'; 'Think' and 'Act'.

In this workshop I explained that we were in the 'Look' phase. After the presentation, I requested the participants to reflect on the whole session and write their reflections in their journals. During the presentation, they actively participated in the discussion. I noticed their faces lighting up, which showed that they received and accepted new knowledge. They related what we discussed to situations in their workplace and also gave examples to show how they thought they could use action research to deal with some of the issues.

Reflection

Goodnough (2001, p.38) comments"from the literature there are many studies that have found action research to be the impetus for positive change in teachers' improvement, overall learning, teamwork, increased job satisfaction and staff morale". A sign of positive thinking about action research from the workshop was reflected in the following comments:

P1S3 stated: *"I am going to engage colleagues in subject meetings to impress upon them the importance of AR, and how it will benefit us and our schools"*.

P2S3 explained: "*Action research helped me to identify some loopholes and I will be in a position to overcome them, so I'll continue to use it*".

However, for both teachers there appeared to be an expectation from the Department of Education that was not met. P1S3 holds the following point of view with regard to the development workshops rendered by the department:

P1S3: "*I wonder why the department does not develop us on action research but always on content. We encounter a lot of issues in our classrooms and schools that we cannot solve, and I see now that with action research they can be solved*".

P2S3: "*I tried a lot of ways to solve some issues but failed. With action research I see myself succeeding in finding the solutions. I feel like we could continue with this study until next year or so*".

It was evident from the data that teachers enjoyed working together and their responses showed a shared commitment to improving their practice. I was pleased with the teachers'comments because of their empowerment to bring theory to the conscious level and to develop educational theory that could ultimately enrich the learning milieu of learners.

4.2.1.4 An overview of the meetings

The general overview of my visits to the three schools was that I noticed that some of the participants had limited or no information on action research and how they could use it to develop themselves and bring about change and improvements to their own practice. Instead, most of them looked at action research as a form of assessment (e.g. when you give learners a project as a form of assessment). This was indicated by the assessment concepts that they wrote in their mind maps (for example, research projectsand assignments). All the participants showed more interest when they started discussing action research with me during the presentation. They indicated that there were issues in their workplace which they could take on using action research.

This first workshop with the teachers was fruitful in that teachers felt happy that the information they got helped them to clear the misconception they had all along in associating

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action research with giving out research projects to the learners. The whole experience with the teacher participants gave me courage and confidence to continue with the study as this experience showed me that there really was a need for this study and that it would surely develop me as a teacher, and the participants.

4.2.2 Phase two of the developmental workshop – self-regulated learning

Zimmerman (2000, p.64) defines self-regulation as "the thoughts, feelings and actions that are planned and adapted to the attainment of personal goals". It is also claimed that self-regulated learning is important because one of the major functions of education is developing life-long skills and self-regulated learning can increase the possibility of life-long learning (Zimmerman, 2002).Self-regulated learning is seen as essential to the learning process because it can help learners to create better learning habits and to strengthen their study skill, apply learning strategies to enhance academic outcomes, monitor their performance and evaluate their academic progress (Wolters, 2011).

Having seen through my informal observations that many learners in our schools show dysfunction in their motivation to learn (example, avoiding tasks) and also in the methods they use to learn (example, inadequate learning strategies), I assumed that these could be some of the reasons that contributed to their poor performance in Natural Sciences. Therefore, I embarked on this study to introduce an intervention in self-regulated learning wherein teachers would introduce self-regulated learning strategies to their learners aiming to develop them to become independent learners who can regulate their own learning process.

Based on the fact that self-regulated learning increases the possibility for life-long learning, teachers are expected to prepare learners for the challenges of work and life beyond school (Paris &Winograd, 2001).It was assumed in this study that it would be proper to equip the teachers with strategies they can use to identify and promote self-regulated learning. The following discussion explains how I introduced self-regulated learning to the participating teachers.

4.2.2.1 **School A**

The teacher participants were requested to engage with Section B of the task sheet (Appendix F),which had five tasks. I handed out a worksheet (Appendix G) on which the participants had to express their responses to task 1 of Section B. They then shared their responses with co-participants and noted their commonalities and differences. The responses to these two questions were directed to answering one of the secondary questions of the research study: How do teachers describe self-regulated learning?

The two questions on the template were:

(i)   What do you understand by the concept 'Self-Regulated Learning?'

(ii)   Are you developing self-regulated learning skills in your learners? Yes / No. If yes, please describe how.

The participants responded by writing on the template (Appendix G) with questions about self-regulated learning. From the data, I can infer that the participants had no clear idea of self-regulated learning and this was reflected in the following comments:

P1S1: "*I know it has to do with a type of learning but I just can't explain which one*".

P2S1*: "It has to do with the assessment of learners where you use different assessmentactivities"*. Responding to whether they developed the SRL strategies in their learners, both participants indicated that they did not. Their answer to the question was 'No'.

After this activity which tested their understanding of SRL, I discussed with them the information on self-regulated learning that appeared in the guide they had. The information included how self-regulated learning is described, the expectations for both teachers and learners, and Zimmerman's model of self-regulated learning (the learning cycle).In task 2, the participants listed the strategies they thought were important to develop learner self-regulation.On completion of task 2, I introduced and presented to the participants Zimmerman's learning cycle (2002). I explained that the learning cycle was divided into three phases (Forethought, Performance and Self-Reflection) each with its own processes (see Sections 2.6.1; 2.6.2 and 2.6.3).

The teachers compared their responses towards the learning cycle to Zimmerman's learning cycle. We discussed how they were going to use the learning cycle. Our plan was to first teach the self-regulated learning strategies to the learners (for example, types of goals, how to

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set realistic goals, monitoring one's progress and doing self-evaluation). Thereafter,the teachers would give learners a task on the chosen topic.Within the Forethought phase, learners would identify the requirements of the task, set achievable goals and plan the strategies they would use to achieve their goals. During the Performance phase, learners would work on the strategies by applying them to the task. They would also seek help from the teacher when necessary. The final stage of self-reflection would come after they received their feedback on the task. They would then evaluate whether they achieved their goals or not. Thereafter, if not satisfied about their performance they could start the learning cycle all over again by setting new goals. The self-reflection process cyclically affects the forethought and performance processes in terms of attention and action in future tasks (Zimmerman, 2002).

4.2.2.2 **School B**

The teacher participants were requested to engage with Section B (Appendix F) of the task sheet which had five tasks. I handed out a template (Appendix G) on which the participants had to express their responses to task 1 of Section B. They then shared their responses with co-participants and noted their commonalities and differences. The responses to these two questions were directed to answering one of the main secondary questions of the research study: How do teachers describe self-regulated learning?

The two questions on the template were:

(i)   What do you understand by the concept 'Self-Regulated Learning?

(ii)   Are you developing self-regulated learning skills in your learners? Yes / No. If yes, please describe how.

P1S2: "*That is learning by yourself with little or no guidance from the teachers*".

P2S2:*"Self-regulated learning is intended to make learners take responsibility of their learning process by being involvedpractically in their realization of their goals*".

 Responding to the second question which asked whether the teachers developed the SRL strategies in their learners, the four participants indicated 'Yes'. The question was extended to request that if the answer was 'yes', then a description should be given on how the teacher was developing the learners with regard to self-regulated learning skills. The teachers'

descriptions focused on assessing the learners, giving them assessment activities and using different forms of assessment

P1S2:*"I give the learners projects and assignments."*

P2S2: *"Giving out research activities to the learners"*

In task 2, the participants listed the strategies they thought were important to develop learner self-regulation, they also described what they thought was a learning cycle by illustrating this in a diagram and comparing it with co-participants.

On completion of task 2, I introduced and presented to the participants Zimmerman's learning cycle (2002). I explained that the learning cycle was divided into three phases (Forethought, Performance and Self-Reflection) each with its own processes (see Sections 2.6.1; 2.6.2 and 2.6.3). The teachers compared their responses towards the learning cycle to Zimmerman's learning cycle. We discussed how the teachers were going to use the learning cycle. Our plan was to first teach the self-regulated learning strategies to the learners (for example, types of goals, how to set realistic goals, monitoring one's progress and doing self-evaluation). Thereafter, learners were to be given a task on the chosen topic.

Within the Forethought phase, learners would identify the requirements of the task, set achievable goals and plan the strategies they would use to achieve their goals. During the Performance phase, learners would work on the strategies by applying them to the task at hand. They would also seek help from the teacher when necessary. The final stage of self-reflection would come after they received their feedback on the task. They would then evaluate whether they achieved their goals or not. Thereafter, if not satisfied about their performance they could start the learning cycle all over again by setting new goals. The self-reflection processes "cyclically affect the forethought and performance processes in terms of attention and action in future tasks" (Zimmerman, 2002, p.65).

4.2.2.3 **School C**

The teacher participants were requested to engage with Section B of the task sheet which had five tasks. I handed out a template (appendix G) on which the participants had to express their responses to task 1 of Section B. They then shared their responses with co-participants and noted their commonalities and differences. The responses to these two questions were

directed to answering one of the main secondary questions of the research study: How do teachers describe self-regulated learning?

The two questions on the template were:

(i)   What do you understand by the concept 'Self-Regulated Learning?'

(ii)   Are you developing self-regulated learning skills in your learners? Yes / No. If yes, please describe how.

P1S3:

"*According to my understanding, self-regulated learning is about thinking about one's self, planning and using metacognition methods*".

P2S3:

"*Learners are self-motivated through learning*"

The analysis of these responses from the teachers indicated two of the characteristics of self-regulated learning (awareness of thinking and motivation) as stated by Paris and Winograd (2001). This therefore suggests that some teachers had some knowledge of what self-regulated learning entails.

Responding to the second question, which asked whether the teachers developed the SRL strategies in their learners, the four participants indicated 'Yes'. The question was extended to request that if the answer was 'yes', then a description should be given on how the teacher was developing the learners with regard to self-regulated learning skills. The teachers' descriptions focused on assessing the learners, giving them assessment activities and using different forms of assessment.

P1S3: "*when the learners use projects and research and giving many* activities."

P2S3: "*By giving assignments and research.*"

There was no indication of the teacher developing the learners with skills or strategies to tackle the assessment tasks that they gave to the learners. This suggests that learners were given problems to solve without any guidance regarding being strategic towards solving the problem. This is evidence that suggests that self-regulated learning strategies or skills were not developed in these learners.

In task 2, the participants listed the strategies they thought were important to develop learner self-regulation, they also described what they thought was a learning cycle by illustrating it in a diagram and comparing it with each other. On completion of task 2, I introduced and presented to the participants Zimmerman's learning cycle (2002). I explained that the learning cycle was divided into three phases (Forethought, Performance and Self-Reflection) each with its own processes (see Sections 2.6.1; 2.6.2 and 2.6.3). The teachers compared their responses towards the learning cycle to Zimmerman's learning cycle. We discussed how they were going to use the learning cycle. Our plan was to first teach the self-regulated learning strategies to the learners (for example, types of goals, how to set realistic goals, monitoring one's progress and doing self-evaluation). Thereafter, the learners were to be given a task on the chosen topic.

Within the Forethought phase, learners would identify the requirements of the task, set achievable goals and plan the strategies they would use to achieve their goals. During the Performance phase, learners would work on the strategies by applying them to the task at hand. They would also seek help from the teacher when necessary. The final stage of self-reflection would come after they received their feedback on the task. They would then evaluate whether they achieved their goals or not. Thereafter, if not satisfied with their performance, they could start the learning cycle all over again by setting new goals. The self-reflection processes cyclically affect the forethought and performance processes in terms of attention and action on future tasks.

4.2.2.4 **An overview of the teachers' responses**

The teachers' responses indicated that not all teachers knew the concept of self-regulated learning. However, there were those who had very limited knowledge about the concept. Most of the comments used descriptors such as: 'self-discipline, self-motivated, study without supervision, committed to work, supervising oneself' when they described what they thought of self-regulated learning.

From the data, it appears that these teachers did not have knowledge of self-regulated learning skills, let alone knowledge of how to develop them in their learners. Instead, the teachers used the following descriptors in their comments: 'give learners activities to write,

research, assignment, giving project, using forms of assessment, and search for information'. Their thinking was based on assessing the learners.

4.3 Analysis of classroom observations

As indicated in Chapter 3, the purpose of classroom observations in this study was to determine if there was a link between the educator's perceived and actual classroom practices with regard to the implementation of SRL strategies.I used an observation schedule (Appendix E) which had items to observe. The items on the schedule included the following:

- Classroom environment;
- Learner behavior;
- Teacher behavior; and
- Integrating SRL strategies in teaching.

With regard to the above mentioned items of the observation schedule, the discussion on the classroom environment, which includes learner behavior and teacher behavior, is indicated within the discussion of reflections, while the integration of SRL strategies is shown in the lessons presented by the teachers.

The teacher participants were given code names (e. g. participant 1 of school 1) P1S1, P1S2, P1S3, P2S1, P2S2 and P2S3. As the schools were already named school A, B and C, in the following discussion, school A will be (S1); school B (S2) and school C (S3).The teacher participants P1S1, P1S2 and P1S3(Grade 8 teachers) presented two lessons (1) on photosynthesis where they also taught the self-regulated learning strategies, (2) an investigation to test for presence of starch in green leaves where they also applied the learned strategies to a task.P2S1, P2S2, P2S3 were Grade 9 teachers. They presented a lesson on Healthy Diet where they also taught SRL strategies and applied the strategies to a task.Each teacher was observed twice on different days.

4.3.1   **What the teachers did in their classrooms**

4.3.1.1 **School A (S1)**

All the Grade 8 teachers agreed in one planning meeting that one topic (Photosynthesis) should be selected and used for both lessons: (1) teaching the strategies and (2) applying the strategies to a task. When teaching the strategies, the teachers agreed to follow the following steps since it was their first encounter with an integration of this kind.The teachers were to:

- "Give learners a general description of what goal setting is and how to do it;
- Provide learners with examples of doing the goal setting process;
- Have learners practice the process;
- Explain how they will monitor their progress when applying the goals on tasks; and
- Explain how they will evaluate their progress".

The teachers agreed that the strategies would be taught to the learners for the following reasons:
- "To develop learning habits that would encourage learner involvement and learner independence;
- To help learners to become more strategic and to own their learning processes; and
- To be able to respond to different learning difficulties".

P1S1 had been a teacher in the school for five years. She had previously taught geography at another school for one year. She was responsible for three Grade 8natural sciences classes with fifty to fifty-five learners per class, she also taught home language (Sepedi). In her five years of teaching, she indicated that she still found some aspects ofnatural sciences to be challenging. To deal with the challenges, she indicated that she sometimes asked other natural sciences teachers to assist with the challenging parts. She also commented that she usually got frustrated by the poor performance of learners and tried by all means to do her best in those parts of the content that she felt comfortable with.

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a) Observation One of P1S1 – Teaching of self-regulated learning strategies

Grade 8   - Lesson Topic: The process of photosynthesis

(i) Description of the classroom

P1S1's classroom had a chalkboard on the wall with no posters or pictures. There were eleven old desks where learners sat in threes, ten stackable tables, and twenty learner chairs, there was no teacher desk. P1S1 was responsible for fifty-five learners in that class, twenty two boys and thirty three girls.

I entered the classroom with P1S1 and I went straight to the back and sat there. She introduced me to the learners.

P1S1 started the lesson by telling the learners that within their lesson they were going to learn about strategies that would help them to improve their performance in natural sciences. She then moved close to the chalkboard and wrote the topic of the lesson (the process of photosynthesis). She introduced the lesson by asking questions about the process. Thereafter, she wrote 'goal setting', 'monitoring' and 'self-reflection' on the board and continued by explaining that those were the strategies they were going to use in the learning of natural sciences. She then wrote the following questions on the board: What is a goal? How many types of goals do you know? Name them and give an example of each. Leaners were instructed to discuss the questions with those they were sitting with. They were given ten minutes to ponder over the questions.

After ten minutes she listened to the responses of learners and then explained goal setting, the types (short term and long term) and also gave example of each. She then asked the learners to set goals for the topic written on the chalkboard. She explained that they should keep the goals in mind so that they could be assessed at the end of the lesson. She proceeded and explained the process of photosynthesis. She asked the learners if they have ever thought of plants making food. The learners responded that they thought plants needed only water to survive. One learner asked: 'How can we know that really the leaves have food?' The teacher answered: 'thank you for your question, we are going to conduct an investigation to test for the presence of starch in green leaves, you will be answered, and please use that question to set a goal for the next lesson'. P1S1 then told the learners that she would bring along a checklist for goal setting and help them to use it to assess their goals. END OF LESSON.

(b) Observation Two

(ii)   The integration of self-regulated learning strategies in the task

(iii)   Lesson Topic: Photosynthesis – Investigation of the presence of starch in green leaves.

P1S1 introduced the lesson and explained that the aim of the lesson was to conduct an investigation to test for the presence of starch in green leaves. The teacher moved around and placed equipment for the experiment on three desks and then instructed the learners to form groups and start to conduct the experiment following the steps indicated in their text books. She handed out templates of self-regulated learning and instructed the learners to fill them in while doing the experiment.

The teacher repeated the instruction but it still looked as if the learners were confused as they waited for some minutes before they started. It looked like the learners still expected the teacher to give further directions as to where to start. When the learners were slow to start, the teacher became impatient and started shouting. The learners then started with the experiment following the steps in the text book. When the bell rang to indicate the end of the period, most of the learners started to fill in the template. The teacher then told the learners they would continue with the template the following day.
END OF LESSON.

In a meeting that I held with P1S1 immediately after the second observation, she provided the following response when asked about her feelings about the two lessons: P1S1

> *"The first lesson was ok, although I was a little scared of being observed doing something I was not so sure about. I realised after the lesson that I put more focus on goal setting and did not explain the other two strategies, the monitoring and self-reflection.*
>
> *In the second lesson, I got so frustrated by the large groups knowing it would be difficult for all learners to take part. There was no other way I could handle that because we do not have enough equipment,*

some we borrow from the neighboring school. I panicked a lot when I instructed them to start and they just stood and looked at me and did not start, at that moment something inside me was asking, what is it that you did not do right? Finding no immediate answer, I kind of lost it and shouted. When they were busy I was fighting my mind asking myself, what is it? What is it? I thenrealized at the end of the period that the learners were totally not at fault to stare at me like that, they expected me to guide them."

Figure 4.1: Large group of learners in P1S1's class**.**

When questioned about how she feels about practical assessments contributing to the learners' term mark, she responded in the following way:

"*I was thinking the period will end before they completed the experiment and I would have tostart all over again the following day, that's what discourages meabout doing experiments. Experiments take time, sometimes they don't finish within the lesson and you have to start over the next day. With many learners and very few equipment, it is really discouraging.*"

When questioned if she thought she managed to do all that was discussed in the workshops, she provided the following response:

> "*I did not even think about the learning cycle, my mind was just on seeing them completing the experiment and when they were reluctant to start, I got frustrated and panicked. The period ended and I could not give them the 'quick write' template because they were not done with the experiment.*
>
> *I am now going to sit down and note all that I did not do and that I think I did wrong. Tomorrow I'll correct my mistakes. This is a new experience for me; I take it as a learning curve.*"

Reflection

P1S1 managed to provide good explanations, examples and allowed learners to practice setting goals. However, she focused on goal setting only and did not explain the other strategies. Her learners looked lost and needed her to direct them through the lesson and she did not provide that, and as a result the learners took time before they could start. This data was consistent with the contention that learners need support in making decisions concerning how to proceed in an inquiry context (Singer, Marx, Krajick & Chambers, 2000).The teacher displayed a lack confidence in herself and this was shown in her responses, which somehow indicated she may be acknowledging her mistakes and was willing and prepared to make a fresh start. In her responses, she indicated that she sometimes becomes discouraged to do experiments because they take time and they have a shortage of equipment.The literature, according to Wenham (2005), has identified a lack of self-confidence as a challenge in the teaching of science and, as a result the impact of this challenge,this impinges on the topic the teacher chooses and the strategies employed. For example, if teacher P1S1 is not confident about her knowledge of SRL, she will experience a challenge in teaching SRL strategies to the learners. Hence, the lack of confidence in teaching science was seen by Wenham (2005) as the reason why most teachers tend to focus more on teaching scientific vocabulary and facts while avoiding causal explanations and teaching that will bring about understanding.

4.3.1.2 **School B (S2)**

P1S2 has taught natural science for fourteen years, she also teaches technology. He has been responsible for Grade 7 and 8 for most of the fourteenyears. He indicated he has never had a smaller class since he started working in the school and hisgreatest challenge is the shortage of equipment for experiments, which sometimes forces them to rely on reading the experiments from the book.

    (a)   Observation one of P1S2- The teaching of self-regulated learning strategies.
            Grade 8- Lesson Topic: The process of photosynthesis.

    (i)   Description of the classroom.

The classroom had five windows, of which two had some broken window panes; the door did not have a handle. The floor surface was rough and not plastered. There were thirty old desks on which learners sat in threes and others sat in pairs, there was no teacher desk. The class had sixty-two learners, twenty-nine boys and thirty-three girls. The walls were painted cream and brown and there were no posters or pictures, only a chalkboard.

We entered the class and P1S2 went to the chalkboard while I went to sit at the back. On the left part of the chalkboard he wrote: 'Photosynthesis' and on the right part, 'Goals', 'Monitoring', and 'Self-reflection'. He explained that the new topic was photosynthesis,thenhe started discussing the process of photosynthesis, the factors affecting it and the products thereof.

He went on to explain goal setting as a strategy that learners should learn to use in their learning of natural sciences. He told the learners that they should start monitoring and evaluating their learning when they want to pass with better marks. He then instructed the learners to set goals on the new topic of photosynthesis. Learners were told to work in pairs. He continued to explain that the goals that the learners were setting would be assessed. He then handed out the checklists for goal setting, the 'quick write' template and instructed the learners to quickly fill in the 'quick write' as the bell had already indicated the end of the period. He further informed the learners that they were going to conduct an experiment as a task in the following lesson. END OF LESSON.

(b) Observation Two of P1S2.

(ii)   The integration of SRL strategies in a task.

(iii)   Lesson Topic: Photosynthesis- Investigating the presence of starch in green leaves.

P1S2 introduced the lesson by asking the learners to name the steps of writing a scientific report. The learners mentioned writing (the aim, hypothesis, apparatus, method, observation, conclusion and discussion of results). He explained the aim of the experiment as well as the hypothesis. He brought along four small boxes with apparatus for the experiment. The boxes were meant for four groups. He instructed the learners to divide into four groups. He handed out the self-regulated learning worksheets.

He then further instructed the learners to use the apparatus in front of them to conduct the experiment and then to fill in the worksheets. He held the text book in his hands reading the steps while walking among the groups; although the class was full he managed to get to the groups. The period ended before they could finish the experiment because he found himself repeating a step three to four times because some learners could not grasp quickly what to do and that made the whole process slower. END OF LESSON.

In a meeting that we held after the second presentation, P1S2 provided the following response when asked about his feelings about the two lessons:

> *"I feel good about the lessons because I did what I am used to doing except for the strategies, which I am still unsure of whether I did right or not."*

I indicated to him that the learners did not participate in the lesson and he made the following comment:

> *"It is a challenge to involve all the learners, get their full participation and keep them focused especially with large groups and some learners do not participate at all."*
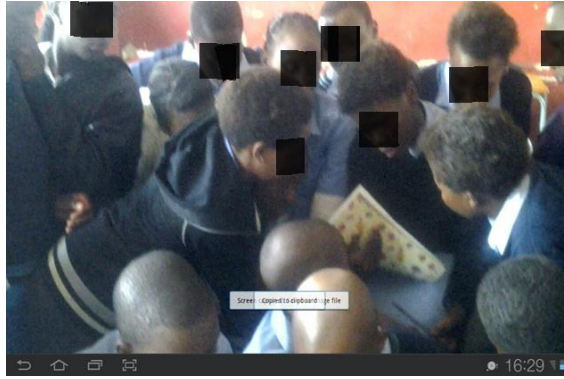
Figure 4.2: Large group indicating not all learners will actively participate.

When asked if he thought he managed to do all what was discussed in the workshops, he provided the following response:

> *"I think I managed to do some. What I remember is that I did not instruct them to write in self-regulated learning worksheets. Time was too limited for all of that, practical tasks take time."*

Reflection

P1S2 acknowledged there might have been some things thathe might have left out during his presentations. He also indicated that he was not sure whether he did it correctly or incorrectly. The implication presented by his responses is that he might have still not yet understood the strategies and their implementation. The teacher further responded that he was challenged to actively involve the learners and this he attributed to the overcrowding he experienced in his classroom. In this case, a further implication could be that the learners would not be able to explore their understanding about how they learn (Paris and Paris, 2001). Accordingly, teachers need to be able to describe appropriate strategies, what they are, how they operate and when they should be applied and be able to lead discussions (Paris and Paris, 2001).

The teacher preferred to explain the investigation to the learners instead of asking them to explore and inquire about the issues on their own. It is assumed that the teacher might have thought that the learners would not be able to work by themselves and that could have been because the teacher knew the learners were not well enough prepared to conduct investigations. This shows that the teacher also might have been experiencing a challenge in

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teaching investigative lessons. This observation resonates with the observation done by Anderson (2002) where it was found that it was still hard for many teachers to get the learners to challenge themselves with their tasks.The learners were given little opportunity to bring their views and to make a discussion (Anderson, 2002).

4.3.1.3 **School C (S3)**

P1S3taught natural sciences for only one year and was responsible for two Grade8 classes. He hadtaughtarts and technology in the past. He indicated that he was not comfortable with teaching natural sciences because it had not been his favorite subject even during his school days. He further explained that the school had a shortage of teachers and, on top of that, two teachers had gone on pension. As soon as the replacements were found he would leave natural sciences to teachtechnology.

    (a) Observation one of P1S3 – The teaching of self-regulated learning strategies.
       Grade 8 – Lesson Topic – The Process of photosynthesis.
    (i)   Description of Classroom

The classroom looked bright as it was painted in cream. The classroom had a bucklered door and windows; the floor was tiled and neat. There were twenty stackable tables with forty chairs and a teacher table. P1S3 was responsible for forty learners in the class, eighteen boys and twenty-two girls. The walls of the classroom had posters of different subjects;it also had a chalkboard and a notice board.

    (b)   Observation Two of P1S3.
    (ii)   The integration of SRL strategies in a task.
    (iii) Lesson Topic – Investigating the presence of starch in green leaves.

> P1S3 introduced the lesson by writing the topic on the board and thereafter writing the steps of the experiment underneath the topic. He asked the learners to divide into groups of six and each group received its set of apparatus and the SRL worksheet. Then he instructed the learners to follow the steps on the board to conduct the experiment while filling in the worksheets. The teacher then walked around the class looking at what the learners were

> doing. Later on, when the experiment was done, he asked learners to explain the results. Thereafter he ended the lesson with the conclusion and a discussion. END OF LESSON.

P1S3 gave the following response when asked about his feelings about the two lessons:

> *"I think I have done my best, even though I don't know how much*
> *was expected. It always becomes a challenge for me to prepare the*
> *lessons because my passion is somewhere else. In most cases I talk to*
> *my colleagues about the topics to try and make sense of them because*
> *I find it easier to understand when we talk about it."*

When asked if he thought he managed to do all that he learned from the workshop, he provided the following response:

> *"I think I have tried, however, I'll note what I did not do and I'll do*
> *that in the next lesson."*

Reflection

P1S3 indicated that he does teach natural science only because of certain circumstances. Again, he indicated that he always depended on other colleagues for the lesson planpreparation; this indicates that he never did the planning by himself.

4.3.1.4 School A (S1)

P2S1 had been teaching natural sciences at the school for thirteen years. She did an ACE diploma in natural sciences. She was also the Head of Department of Mathematics, Science and Technology in the school. She was responsible for three Grade 9 classes in the school, each with about sixty learners.

(a)   Observation one of P1S3 – The teaching of self-regulated learning strategies Grade 9 – Lesson Topic – Healthy Diet.

(i)   Description of Classroom

The conditions of the classroom she used were the same as that described in the observation of P1S1 since they were in the same school. The classroom had sixty learners, thirty-two girls and twenty-eight boys. There were thirty stackable tables and sixty chairs. Learners sat in pairs.

P2S1 started the lesson by walking around handing out the checklists for goal setting, and a worksheet on healthy diets. She then went to the front of the class to get the learners' attention; she wrote the lesson topic on the board and directed the learners' attention to the worksheet and checklist. She instructed the learners to fill in the worksheet on healthy diet which was her diagnostic assessment on the topic. She also instructed the learners to set goals for the lesson. She then walked around looking at what learners wrote on worksheets and their goals for the lesson. She discussed the topic explaining what a healthy diet is and what factors affect diet (economic, cultural, political, ecological and social).

Thereafter she discussed the concept of goal setting, types of goals and gave a number of examples of the two types (short and long term goals). She continued by asking the learners to set other goals considering her examples and the checklist. She discussed the cyclical nature of the cycle of learning using goal setting, monitoring and self-reflection. She then explained to the learners that they were going to apply the strategies to a task in the next lesson. She asked them to bring along pieces of different kinds of food as they were going to test for the presence of starch in food. She then gave them the 'quick write' templates to fill in. END OF LESSON.

(b) Observation Two of P2S1.

(ii) The integration of SRL strategies in a task.

(iii) Lesson Topic – Healthy Diet- Investigating the presence of fats in different kinds of food.

P2S1 started the same way as in the previous lesson, walking around handing out worksheets, one was for a scientific report and the other was for self-regulated learning. She then introduced the topic of the lesson. She explained the need for a balanced diet. She asked learners to mention diseases associated with nutrition. She explained that malnutrition could cause kwashiorkor while excessive fatty food may cause obesity.

She handed out the apparatus for the experiment. She guided the learners in conducting the experiment, moving around reminding and still guiding them to fill in the worksheets. Her guidance was mostly based on leaners making strategies to see that their goals were met. END OF LESSON.

When asked how she felt about the two lessons she provided the following comment:

"I honestly thought it was going to be a tough job. I felt a little scared at first, but I got better as the lesson went on. It was really a wonderful experience. Although my disappointment is only in the shortage of equipment and limited time, eh…m. we really get challenged when we are supposed to conduct experiments in big classes like this. As for the strategies, it was not as difficult as I thought it would be. I think as soon as I get used to them and give the learners more tasks for practice, all will be well. Eh….m… The learners need support, encouragement and more activities".

Figure 4.3: Learners showing enjoyment in their work.

When asked if she thought she managed to do all that was discussed in the workshops she provided the following response:

"Eh….m… Yes …Yes…Absolutely, I think I got it all, eh…m… but I am still going to reflect on the lessons and note what I missed. I am pleased because I saw my learners were excited about the lesson."

Figure 4.4**:** Learners busy with the worksheets.

Reflection

P2S1 made thorough explanations, gave the learners more examples of goals, went deeper in her explanations of the cycle of learning. She also explained all the strategies and guided the learners on worksheets throughout the lesson. Learners showed excitement and did not ask for help that much, which gives an indication that they received clear explanation and understood what was expected of them.In her responses,P2S1 indicated that she was happy

and confident. The only setbacks were the shortage of equipment and overcrowding. She also showed a determination to continue to support the learners to learn the strategies, because she felt a sense of achievement. The achievement was indicated in her response that she was pleased to see her learners excited. That could mean that the learners' excitement gave her an increased confidence as they understood her lessons and that being the case, it also gives an implication that she also understood the strategies and implemented them well. This determination to give continuous support to the learners is consistent with Meyer and Turner's (2001) attribution that for learners to regulate their own learning in order to learn effectively learn, the teacher must play an active role in providing continuous support.

4.3.1.5 **School B (S2)**

P2S2 had taught natural sciences and mathematics for six years in School B. She indicated that she likednatural sciences, although she did not major in science, but for the period that she had been teaching it, she developed the love and interest which she hoped her learners would adopt. She was responsible for four Grade 9 classes.

- (a) Observation one of P2S2 – The teaching of self-regulated learning strategies.
  Grade 9 – Lesson Topic – Healthy Diet.
- (i) Description of the classroom.

The conditions of the classroom were the same as those described for P1S2 as they were in the same school. The class she used for the observation had fifty-six learners, twenty-seven girls and twenty-nine boys.

P2S2 started the lesson by writing the topic 'Healthy Diet' on the board. She then introduced me to the class. She asked the learners to describe what they think a healthy diet is. A learner answered saying, "it is when you balance the food groups." The teacher then explained that there are important factors that affect peoples' diet (social, economic, cultural, political and ecological). She explained how these factors affect our diet.

She continued by telling the learners that they were going to learn more new concepts. She then wrote 'goal setting', 'monitoring' and 'self-reflection' on the chalkboard and

indicated that they were strategies that learners could use to perform better. She instructed them to set goals for the lesson and she handed out checklists for goal setting. She then walked around the class scanning what the learners wrote as goals. She told the learners that they had to assess whether the goals were met at the end of the lesson. She explained that the learners were to start using the goals in the tasks and in their learning. She handed out the 'quick write' template for learners to write what they had learned from the lesson. END OF LESSON.

(b)   Observation two of P2S2.

(ii)   The integration of SRL strategies in a task.

(iii)   Lesson Topic – Healthy Diet – Investigating the presence of fats in different kinds of food.

P2S2 introduced the lesson by writing the steps for writing a scientific report on the board (aim, hypothesis, apparatus, method, observation, conclusion and discussion of results). She explained the aim of the experiment as well as the hypothesis. She handed out the worksheets for self-regulated learning and scientific report. She explained that the learners should indicate their goals for the lesson and the ways they were going to see to itthat they achieved the set goals.

She then further instructed the learners to use the apparatus in front of them to conduct the experiment and then fill in the worksheets. She asked the learners to seek for help whenever they were not sure about a step in the experiment.She then moved around the classroom offering help to the learners.The learners managed to complete their activity and the worksheets were all completed. END OF LESSON.

When asked how she felt about the two lessons she provided the following comment:

> *"I don't feel very happy for the reason that I did not have enough*
> *time to prepare as I was on sick leave. I have not come to work for*
> *some time, so to say...Eh….. I mean I stayed for quite sometime not*
> *teaching but otherwise I love natural sciences. As for the strategies,*
> *I need to learn more about them because I can already see that they*

could bring a difference once the learners master them and I continually encourage them although it is most of the time difficult to introduce a new systeminto people".

When asked if she thought she managed to do all that was discussed in the workshops she provided the following response:

"Eh.....I have learned to do reflection in the workshop so I am going to plan better and repeat this lesson again, I am not totally satisfied."

Reflection

P2S2 did not give a thorough explanation of the strategies and the worksheets, no examples of goals were given and the checklist did not serve any purpose as most learners found it difficult to set the goals. Although she invited the learners to seek help, this worked against her as all the groups called her to give a deeper explanation on how to set goals and give examples. I observed the teacher looking very tired as she moved from one group to the other because she presented the lesson all over again to each group and that wasted a lot of time for the learners to start engaging with the worksheets.

In her responses, P2S2 indicated that she needed to learn more on SRL strategies. This shows that she might not have yet understood the strategies herself because she also realized that the work she did in the classroom was not good. This is supported by her own responseas she indicated that she did not feel good about her presentations and she felt she could do better the next time. The teachers' behavior in the learning environment could guide or at the same time constrain the process of learners learning to become self- regulated learners (Pintrich, 2004). Singer et al. (2000) also discourage the behavior of P2S2 in stating that by simply providing the learners with the opportunity to inquire will not necessarily enhance learning. Conversely, teachers need to lead discussions, and provide the necessary support for the learners to be able to explore their understanding as indicated by Paris and Paris (2001).

4.3.1.6 **School C (S3)**

P2S3 had been teaching Natural Sciences and mathematics for thirteen years. He was the Head of Department of mathematics, science and technology in the school. He was also once a cluster leader for natural sciences in the circuit. He had also enrolled for a BEd (Honours) science module.

    (a) Observation one of P2S3 – The teaching of self-regulated learningStrategies.
         Grade 9 – Lesson Topic – Healthy Diet.
    (i)   Description of the classroom.

The classroom looked the same as that of P1S3 since they were at the same school. P2S3 was responsible for three Grade 9 classes. The classroom he used for the observation had forty-one learners, twenty-two girls and nineteen boys. The usual setting, twenty-five stackable tables and forty-one chairs with learners sitting in pairs. On the day of thesecond observationthe setting was unusual, there were only four big tables with experiment equipment, scientific report worksheets and self-regulated learning worksheets. Learners stood in groups around the tables.

P2S3 introduced me to the learners when we entered the classroom. I sat at the back as usual. The lesson was introduced with a series of questions based on the day's topic, 'Healthy Diet' (e. g. What is a balanced diet? What does it include?'). The teacher moved around freely in the open space between the tables as he talked. He explained a balanced diet after the learners' responses. He further asked, what causes obesity? What is the disease caused by malnutrition called? After obtaining the learners' responses, he gave the answers and explained that they were going to learn about strategies that would help them in life - goal setting, monitoring and self-reflection. He explained each of the strategies. He gave them a few examples of goals and instructed them to set their own goals for their futures.
He then handed out 'quick write' templates and explained that they should write what they had learned from the lesson. While the learners were still writing, the bell rang to indicate the end of the period. The teacher collected the 'quick writes' and we left the class. END OF LESSON.

(b) Observation of P2S3:

(ii)   The integration of SRL strategies in a task.

(iii)   Lesson Topic – Healthy Diet – Investigating the presence of starch in different kinds of food.

P2S3 introduced the lesson by writing the topic on the chalkboard (investigating the presence of fats in different kinds of food) and then reminded the learners that it was the day of the experiment as they could see that the tables were all set, the only missing aspect was that the learners had not yet started experimenting. He explained about the scientific report worksheets and how the learners should fill them in as the lesson progressed, they had to state the aim of the investigation, the hypothesis, name the apparatus they were using, explain their method step by step, indicate what they had observed, make conclusions and discuss their conclusions. He further explained that the same had to be done for the self-regulated learning worksheets, they should start setting their goal for the lesson, come up with strategies to indicate what they were going to do in order to achieve the goal, monitor themselves as to whether they were implementing their plans as the lesson progressed, ask for the teachers' assistance where necessary, check at the end of the lesson whether they managed to achieve their goal and indicate in the 'quick write' section what they had learned from the lesson.

The teacher continually gave the learners time to work on their own and gave guidance at the learners' request. He kept moving between the tables looking at the busy learners. When the bell rang, he collected the worksheets. END OF LESSON.

When asked about his feelings regarding the two lessons he provided the following response:

"I feel good about the lessons since I always wanted something that could commit these learners more although I know that my slow learners are going to be challenged, anyway I will help them since this is the way we are going to do our lessons until the learners get used to the strategies. It is then that I will start to observe their performance and see whether the strategies do help them improve or not."

When asked if he thought that he managed to do all what he learned in the workshops he provided the following response:

> *"I think so, when we were in the workshop it seemed like it's a lot of difficult work, but when I took it to the learners I felt it was a neat experience and that it wasn't so hard after all. I kind of liked it because it got easier as the lesson went on. I am going to practice it more with my learners, as I indicated we have started, no turning back. I saw my learners worried, looking a little scared when I explained that they should be doing this, thinking it's way too much for them. I know they were not used to doing this lot but with time they will understand it's….eh…it's for their own benefit and I know that is when things will easy up."*

Reflection

In his lessons,P2S3 managed to explain in detail what the learners were expected to write in the worksheets. As I observed, when the learners started working they looked so sure of what they were going to do, which showed an understanding of the teacher's expectations. When the teacher kept on reminding them to seek assistance, I saw the learners becoming more relaxed and excited and they did call on the teacher for guidance. The learners' excitement and enthusiasm displayed that they were eager to receive new knowledge, although there were those few who did not show excitement, these may have been scientifically challenged learners that required more support from the teacher. The teacher also showed plenty of confidence when he did the presentations. P2S3 showed determination to continue training his learners to use self-regulated learning strategies and was even more determined to help those who were slow to pick up the topic.It is possible that he could see the benefits of his efforts since his responses wereconsistent with the research findings that showed that self-regulated learning strategies can be improved throughcontinuous training and that there is a requirement for training these strategies (Dignath and Buttner, 2008).

4.4 **Interviews with the participating teachers**

Conducting interviews was one of the methods I used to gather data for the study. The interviews were done after the classroom observations. The reason for this was to capture the

perceptions the teachers' had of their experiences when they integrated the self-regulated learning strategies in the investigations performed during class observations. The interview questions are presented in Appendix H. The interviews focused, in summary, on the following with respect to the teachers:

- Their understanding of self-regulation;
- Teaching SRL strategies in natural science;
- Using SRL as motivation; and
- Their future use of SRL strategies.

The interviews were conducted individually with the six participants. They were conducted at the three schools in the afternoon after the teachers' contact time with learners. The interviews were also audio recorded and later transcribed verbatim by myself. Following the transcription of each interview, each participant was asked to review the transcription of his or her interview. This member-checking helped to ensure the accuracy of data. The interviews provided context, and therefore a better understanding of the use of SRL in the study.

Table 4.1:Relations of emerged themes, research questions, SRL strategies and SRL concepts.

Research Questions	Concepts		Themes
"How do Grade 8 and 9 natural sciences teachers understand the concept of self-regulated learning?	Concepts of SRL	Strategies	Moreinformation on self-regulated learning
	Cognition	Self-reflection	
How do teachers describe the change experienced,if any, in their teaching of natural sciences as related to the use of self-regulated learning?	Cognition	Goal setting and planning Performance monitoring	Teacher actions towards strategy use
What are the teachers' views on the usefulness of the learners having an awareness of self-regulated learning strategies when learning natural sciences?"	Behavioral And Motivation	Help seeking	Collaboration Positive feedback

As indicated by Svinicki (2003) in Chapter 2, one of the beliefs of the cognitive theory is that learners should become aware of their learning and actively direct it, it was upon this basis that it was the aim of the present study to see the teacher participants become aware of their learning about self-regulated learning and directing their learning with the expectation that their experiences would be passed on to the learners.

According to Zimmerman (2002, p.66), the self-regulated learner incorporates the following processes:

- "Metacognitive processes.

This is where the learner becomes able to plan, set goals, self-monitor, self-evaluate as well as organize their learning.

- Motivational Processes.

This is where the learner shows intrinsic interests in the tasks, takes responsibility for success and failure, and also shows high self-efficacy, which will lead to greater effort.

- Behavioral Processes.

This is where the learner becomes able to create optimal learning environments and seeks out help and advice in order to attain optimum levels of achievement".Table 4.1 indicates how the research questions of the study are linked to the SRL concepts (cognition, motivation, behavioral), as well as the SRL strategies and the emergent themes from the data. The aim of the present study to involve the teacher participants in self-regulating learning to develop SRL skills was based on a comment made by Dignath and Buttner (2008).They posit that teachers should focus on their self-regulated learning skills because it allows them to more deeply reflect on their own teaching practices, which can lead to increased learner performance. It was therefore the assumption of the study that having learned the SRL skills, these teachers would be able to help their learners improve their performance by teaching them those skills.

The analysis of data in this study was done using transcribed interviews, classroom observations, and the participants' journals. The data were grouped and matched according to the themes that emerged through the analysis process. A total of seven themes were identified with supporting data.

4.4.1   **Teacher knowledge growth**

    a) Changes in teachers' understanding of self-regulated learning

Paris and Winograd (2001) argue that the more the teacher understands about their own thinking, the better they can model for the learners. The implication of this statement is that teachers' understanding of what they know makes it easy for them to transfer their knowledge to the learners. Thus, the present study saw the importance of teachers' understanding of self-regulated learning in order to be able to teach it to the learners.

When the teachers were asked to describe their understanding of self-regulated learning, they indicated that more information was gained on SRL, however, they further indicated the need to learn more on the concept of self-regulated learning.

P1S1 said, *"I need to understand, practice the strategies by myself first, to feel confident to teach the learners.*

P1S3 indicated, *"I think we need a formal workshop over a longer period to help us master these strategies and it will be easy to implement".*

These responses indicate that there is a need for more information and practice with regard to the application of self-regulated learning strategies by teachersthemselves before presenting to the learners.P2S2 seemed to be a little dissatisfied and unhappy, the reason might have been that she didn't feel good about her lesson presentations, this is what she said, *"I see the process will help me improve my teaching skill, I just want the learners to understand me".* P1S2 acknowledged that she was not sure that what she did during the presentations was correct, and expressed her need to learn more about self-regulation. She said, *"I always wanted better ways to teach my learners. I have to learn more because I want to see them pass".*P2S1 admitted that self-regulation was a good approach and expressed the following opinion, *"I am glad my learners showed to love and accept this process, I'll surely learn more to master the skills so that I can help the learner'".*P2S3 made the following statement, *"I thought it was going to be difficult but I believe we still have to learn more about the strategies so as to be clearer when we do another task".*

By comparing the three schools, insights were gained into the extent to which the participating teachers felt that they needed to learn more about self-regulated learning strategies.

4.4.2   **Teachers' views on the practice of teaching**

When the teachers spoke about how they saw change in their teaching practices as related to their integration of SRL strategies, three themes emerged from the data: a) change in teaching practice, b) learner independence and c) motivation.

    a)   Change in teaching practices.

Paris and Paris (2001) explain that the self-regulatory processes of learning give learners a sense of control, and encourage the learners to pay attention to their methods of learning, teachers can therefore teach learners to learn by training them to use different learning strategies. Paris and Paris (2001) explain that self-regulatory processes could bring about changes in the teaching practice. The perceptions of the teachers are indicated below.

The data indicated that teacher P2S3 perceived that, given enough time to implement SRL strategies, a positive change in the teaching practice can be anticipated.Heexplained that, "*In the long run, a meaningful change can be experienced once we and the learners get used to the method"*. P2S2 expressed the following comment, *"Since we know that the scientific process requires the learners to collaborate to solve problems, I think self-regulated learning will help us to extend that practice to make it more successful but for now the change cannot be seen clearly as this is happening within a short time. Hopefully when we continue practicing self-regulated learning, it will be clearly seen"*.P1S1 stated,*"I think self-regulated learning can help our learners to become responsible and strategic in their learning, however, that must be observed over time."*

P1S3 made the following statement**,** *"When we as teachers can know the strategies well and be able to demonstrate to the learners that could bring about change because the learner will start working on their own or as groups and stop depending too much on us"*.P2S1 voiced her opinion regarding change and said*,"I did not know the strategies before, and when I presented the lessons, it was like I was doing something new. Self-regulated learning brought a change, I felt it, because I moved away a little bit from the way I taught to include the*

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strategies".P1S2 pointed out that, *"If I see the teaching of strategies in a positive light and teaching them correctly with passion to the learners, they will copy and obviously looking at how it is going right now, I'm sure change will be seen."*

Based on the above comments, it was a common perception among the participants from all three schools that the integration of self-regulated learning strategies can bring about a positive change in their teaching practice, although most indicated that at the time of the study, they could not see the change as it has to be observed over time.

b) Leaner Independence

It was evident from the data that most of the teachers were very pleased with the effect that self-regulated learning strategies may have on the learners. The teachers perceived that once learners hadmastered the strategies, they would become more independent, this was indicated in the following responses:

P2S3:*"The strategies will inculcate a sense of independence and they can take ownership of learning processes".*

P2S1:*"Learners will be able to discover certain things on their own. When they are aware of the strategies and how to use them, they'll become encouraged to be less dependent on the teacher; learners will push towards achieving their goals so as not to be outdone by others".*

The teachers perceived that the independence of the learners would reduce the learners' dependence on them. This implies that the teachers' role too would be shifted from monitoring and regulating learners' learning to that of being activators of learning opportunities (Tillema, Kessels and Meijers, 2000).

The responses revealed a sense of positive standing wherein the learners would strive to do their best, and would also develop an urge to succeed in their learning. However, learners cannot do that without support from their teachers and this is indicated by Zimmerman (1998, 2000), whoemphasises that teachers should give fewer directives and provide learners with multiple opportunities for self-evaluation as a basis of developing self-regulated learning skills.The following responses echo the agreement among researchers that learners should have a sense of autonomy and responsibility for how and what they learn (Buttler and Winne, 2005; Boekaerts and Corno, 2005).

P2S2:*"With the strategies, learners will be able to apply self-assessment and improve on their weaknesses".*P1S2: *"Learners want to feel in control and when they do, they'll continue using the strategies until they achieve their goals".*

P1S3:*"Learners need support towards independence because learners like freedom".*

"At first I thought this is something difficult, but know I realize it will help a lot since learners will be able to work on their own".

P1S1: *"Learners enjoy participating in class when they are given the opportunity to be in control".*

From the data, one can infer that the teachers were happy about the new approach that has the possibility tohelp learners be less dependent on them and be able to work by themselves.

d) Motivation of learners

Aleven et al. (2003) advocate that motivation influences the ways that the learners act within the learning setting. The participants' comments below were found to be in line with this:

P1S2:*"If learners use the strategies they can be open to come up with suggestions because they will feel in control and they'll work hard to showthe teacher".*

P2S1*: "Once learners are in control, they'll be motivated from within to study harder and once they understood the strategies clearly, learning will be easy".*

P2S3:*"Learners will be eager to prove to their peers and won't allow being outdone. Realising that they can perform better, they will become more motivated".*

P2S2: "Learners *will be more interested and maybe their attitude towards natural sciences can change".*

P1S3**:** "*When they are motivated, the learners will start to see the value of their learning".*

P1S1: "*I think when I am motivated to use the strategies myself, I will be able to motivate the learners too and they'll enjoy their learning*".

The participants discussed the effects of motivation, and the data also revealed that they acknowledged its importance. This resonates with Mansfield (2010, p.45) who highlights that "it is widely acknowledged that an issue of great concern to teachers is developing and maintaining learners' optimum motivation". However, Trend (2005, p.271) explains"the stability of motivation can be exploited by teachers". This exploitation could possibly be the result of teachers not being motivated themselves.Another factor of concern,as indicated by Hidi and Harackiewicz (2000, p.152),is that "as children get older, their interests and

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attitudes towards school in general or towards specific subjects, e.g. mathematics, art and science, tend to deteriorate". Recent research in science education confirms this, Murphy and Beggs (2003, p.109) report that"a decline in children's interest in science is well established before (UK) school transfers at eleven years of age". Mansfield (2010, p.46) also reports "many learners experience a lack of motivation to engage in academic activities and fail to reach their academic potential". Therefore, on that basis, this study argues for the importance of inculcating a sense of independence in the learning process whereby the learners will be developed to motivate themselves to regulate their own learning while also receiving external motivation from the teachers.

4.4.3 Continuity in integrating self-regulated learning strategies in future lessons

The data revealed that all the teachers were eager to continue to integrate self-regulated learning strategies in future lessons. The teachers perceived the strategies as helpful and that they could bring about improvements in the learners performance.

P2S2: *"I'll continue using the strategies to improve lessons in class"*.

P2S3: "*As I indicated before, I'll have to learn more first"*.

P2S1: *"Yes, I think that will benefit me too a lot"*.

P1S1: "*I need time to learn, maybe we can organize meetings or workshops, which will make the learning easier"*.

P1S2: "*We'll discuss the strategies in our cluster so that we can work together and help each other"*.

P1S3:*"I am going to involve teachers of other subjects"*.

The above comments indicate that the teachers accepted that they could develop their own actions (teaching), be motivated and be able to motivate learners, and have experienced the value of using self-regulated learning strategies in natural sciences. This stands as a positive indication for the intervention conducted in this study.

4.5 Teachers' Journals

The teachers kept journals wherein they recorded their experiences of their teaching of self-regulated learning strategies to the learners;they also indicated their feelings and thinking regarding self-regulated learning and the responses of learners towards their actions. I made an analysis of the data from the Grade 9 teachers, teacher P2S1, teacher P2S2 and teacher

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P2S3, and the data revealed a common focus in their records. On more than one occasion the three teachers asked the leaners about their feelings regarding goal setting; working towards the achievement of goals (that is seeking strategies to achieve the goals), as well as the evaluation of the outcome (meaning evaluating whether the goals were achieved or not).

The teachers reported that their learners indicated that they felt involved in their learning because they were requested to determine their own goals, and as such they were allowed to decide on what they wanted to learn from the topic or experiment. An example from teacher P2S2:

Teacher, *"How do you feel about setting goals before we handle a topic or task?"*

Learner, *"I feel good because we are given a chance to say what we want to know about thetopic"*

The analysis here indicates that learners were given a chance to be involved in their learning and to make decisions about what was to be learned. A further indication is that, upon discovering the opportunity presented to them and realising that they had a say in what to learn, this brought about a feeling of happiness and confidencein the learners. It can thus be said, without doubt, that this emotion could result in learners' motivation to learn what they choose to learn.

From the recording of teacher P2S3, an example of the response of learners towards seeking strategies to achieve the set goal is described.

Teacher, *"Learners, you determined your own goal, now look for ways you will use to achieve those goals."*

Learner, *"How do we do that? Where do we find those ways?"*

Teacher, *"Think hard about the goals and think what you can do to achieve the goals".*

The teachers reported that setting up strategies had been a challenge for most of the learners. P1S2 reported that he gave his class a group task and only one group managed to set up their strategies quickly, he then asked the group to present their strategies to the class. The teacher confirmed that the presentation became an eye opener for most learners and they managed to set strategies towards the achievement of their goals.Teacher P2S3 reported that he gave his learners feedback on an activity which they did practicing the SRL strategies. He told the learners to check their goals and determine whether they had been achieved or not. If they were not achieved, the learners had to determine why and where they went wrong and they

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had to set up new goals. These teachers discovered that the learners were eager to be the judge of their own performance. Those who were not satisfied with their performance decided to find out why they did not do well and to set new goals. P2S3 reported, "*I realised this exercise brought about a strong concern among learners who did not perform to their expectations, event those who initially never minded.*"

As for the Grade 8 teachers, their data indicated that it was a tough exercise to teach learners to set goals. Paris and Winograd (2001) confirm that setting goals is difficult for children and adults are often unaware of these problems. Paris and Winograd (2001) further indicate that teachers can understand the difficulties encountered in setting goals when they engage in the process themselves, SRL requires abundant practice for the children to become proficient. Wallace (2003, p.8) argues that the development of teacher knowledge is a gradual process of "tinkering and experimenting with new strategies, trying out new ideas, refining old ideas, problem setting and problem solving."According to Wallace, new experiences can disturb old experiences, hence new structures arise and teachers' knowledge changes over time.

4.6 Summary and Conclusion

From the data analysed from the pre-intervention assessment activity, interviews and classroom observations, the following deductions can be made. Firstly, the implementation of self-regulated learning strategies was influenced by the teachers' understanding of the concept. The teachers showed that they gained knowledge from the information sessions but some were challenged when they had to implement their knowledge by teaching it to the learners.

It also transpired that the development in teaching inquiry lessons still requires attention, and this was evidenced when teachers displayed limited confidence when presenting their lessons. Sharp and Hopkins' (2007, p.6) report supports this statement as they relate that "some teachers feel less prepared to teach science through inquiry". The data generated from this study clearly suggests the need for more development in implementing self-regulated learning strategies. Teachers need quality support to improve the teaching and learning of the natural sciences curriculum through engaging in action research. In Chapter 5, a general overview of the results of this study will be presented followed by recommendations that are indicated by these results. Areas of further research will also be indicated.

4.7   Chapter summary

This chapter dealt with the findings of the research based on the experiences of natural sciences teachers when they applied self-regulated learning strategies in the classroom. The discussion explained the analysis of the teachers' understanding of the concept of self-regulated learning, how it was implemented, as well as the teachers' reports regarding their experiences.

CHAPTER 5

DISCUSSION OF RESULTS, MAIN FINDINGS, RECOMMENDATIONS AND IMPLICATIONS

5.1 Introduction

This chapter intends to summarise the findings of the research study where Natural Sciences teachers were investigated regarding the application of self-regulated learning strategies when teaching Grade 8 and 9 learners. This chapter is presented in three parts: a) summary and discussion, b) conclusion and implications for practice, c) recommendations for further study.

5.2 Summary and discussion of results

5.2.1 General overview

The purpose of this study was to evaluate the experiences of natural sciences teachers when applying self-regulated learning to teaching Grade 8 and 9 learners. The analysis of data gleaned from this study, as presented in Chapter 4 suggests that the teacher plays an important role in guiding and supporting learners towards self-regulated learning.

The primary research question addressed in this study was: "How do natural sciences teachers apply self-regulated learning when teaching Grade 8 and 9 learners?" The discussion that follows focuses on the relation of the findings to the components of SRL, the themes that emerged from the analysis of data, and the secondary questions of the study.

Self-regulated learning is a self-directed process and a set of behaviors whereby learners transform their mental abilities into skills (Zimmerman,2000) and habits through a developmental process (Butler, 2002) that emerges from guided practice and feedback (Paris and Paris, 2001).Paris and Paris (2001) describe the self-regulated learner as a learner who is able to analyse task requirements, set productive goals, and select adapting or interesting strategies to achieve his or her objectives. These learners are also set to monitor their progress

as they work through the task, managing intrusive emotions and waning motivation as well as adjusting strategies processed to foster success (Paris and Paris, 2001).

Many of the self-regulated learning strategies are useful across various content domains. Specifically, SRL consists of three components: cognition, metacognition and motivation (Butler,2000).The cognition component includes the skills and habits that are necessary to encode, memorise and recall information, as well as to think critically (Butler, 2000). Within the metacognition component are skills that enable learners to understand and monitor their cognitive processes (Dignath and Buttner 2008). The motivation component surfaces the beliefs and attitudes that affect the use and development of both the cognitive and metacognitive skills (Butler, 2000).

5.2.2 The first sub-question: How is the concept of self-regulated learning understood by Grade 8 and 9 teachers?

This question aims to establish the teachers' understanding of SRL the reason being that the teacher's understanding and knowledge of SRL are assumed to influence the effectiveness of teaching and learning.The data associated with this question suggests that the teachers' understanding of self-regulated learning plays a pivotal role in the classroom application by learners, as the teacher is the one who brings about the change in teaching and learning, it is the teacher who has to understand what and how to do that. As Saunders and Nduna (2006,) explain that no matter how willing you are, if you do not understand what is required from you, you will struggle to make the changes intended. Therefore, it was important for the teachers to thoroughly understand the concept of self-regulated learning before introducing it to the learners in the classroom.

The data generated from this study, however, suggests that the teachers' understanding of the concept introduced to their teaching and learning influenced their confidence and ability to teach natural sciences through the inquiry-based method. This was evident in the presentation of teacher P1S1 (Grade 8) who became impatient and shouted at the learners. The teacher in this instance appeared to be nervous and this could be attributed to either fear of change (as the teacher was supposed to amend their teaching style) or the lack of understanding of the whole process of applying self-regulated learning strategies in the daily teaching and learning

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activities through enquiry-based teaching. Anderson, (2002,p.2)states that "the teachers' understanding of any area of science influences their classroom practice".

Although,according to Paris and Winograd (2001),every process of change has to confront the natural resistance of those who participate in it, since they have to accept the challenge to walk a partially unknown path.It was the first time that the teacher participants in this study dealt with the SRL intervention programme and thereforethe time that they had to learn about it before they could implement it was too limited.However, theteachers' comments convey their determination to continue to learn and understand self-regulated learning, as well as to continue to integrate these strategies into their lessons. This determination highlights the mega-cognitive concept indicated in the conceptual framework, since the teachers were aware of what they knew and were also motivated to increase their knowledge. It was indicated earlier that the two concepts of mega-cognition and motivation affect each other.

5.2.3 The second sub–question: How do teachers describe the change experienced in the teaching of natural sciences,if any, in their teaching practices as related to the use of self-regulated learning?

Teachers are viewed as "important agents of change and thus are expected to play a key role in changing schools and classrooms" (Wenham, 2005). However, Wenhamargues that"the very same teachers are also viewed as major obstacles to change because of their adherence to outdated forms of instruction that emphasise factual and procedural knowledge at the expense of deeper levels of understanding".

In the present study, the data revealed that teachers had limited understanding of the concept of self-regulated learning. Furthermore, considering the self-regulated learning strategies and their application in the classroom, teachers had no idea how this was done at the beginning of intervention programme. All the lessons presented required the teachers to use the inquiry-based method of teaching as the lessons were all investigative lessons (testing for the presence of starch in green leaves – Grade 8, testing for the presence of starch and fats in different types of food – Grade 9).

It was evident from this study that teaching using an inquiry-based method was still not a common approach among teachers. This study therefore supports the findings of van Zee

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(2003) that an inquiry approach to teaching science has not yet become the norm in schools, as many teachers are still striving to build a shared understanding of what science as inquiry means, and at a practical level, what it looks like in the classroom.The teaching of science through an inquiry-based approach, according to Anderson (2002, p.3),"requires the teacher to keep the abilities and understanding of inquiry in the foreground and the scientific content in the background". This was not applicable in this study as the teachers displayed a lack of understanding of how to teach science using an inquiry-based method. However, three Grade 9 teachers (P2S1, P2S2and P2S3) attempted to use the approach as the lesson was observed to display a few descriptors describing this teaching approach, as indicated in the previous discussions on inquiry based-learning (see Chapter 2).

Wolters (2011, p.266) explains that SRL helps learners to "create better learning habits and to strengthen their study skills. In order to produce self-regulated learners, teachers must be able to gear the teaching and learning process towards this goal". Many teachers may not be able to do so as they are not aware of the factors related to self-regulated learning (Zimerman, 2000). The participating teachers in this study were also unable to effectively gear the teaching and learning process because they did not have any prior knowledge of self-regulated learning except for the limited knowledge they had gained during the developmental workshops, which were also conducted over a very limited period of time. Many studies, according to Crawford, (2000),(2005),"have also documented the barriers to implementing inquiry pedagogics in the classroom, which are difficult in part because inquiry requires the teachers and learners to take on new roles in the classroom".

Learners' interactions with their teachers are the most important experiences that affect self-regulated learning (Zimmerman, 1989). Additionally, Zimmerman (1989) explains that"learners may be more inclined to self-regulate if teachers promote learner-centered learning, provide them with appropriate feedback during the teaching and learning processes, and teach learning strategies". In the present study, the data revealed that the teachers foundthat a positive change in the teaching and learning of natural sciences can be anticipated given that teachers receive enough training and support to implement self-regulated learning strategies. By taking part in the study, these teachers were forced to see themselves as agents capable of transforming learning in their classrooms. The teachers' experiences inculcated a strong belief that researching their own practice could make a difference in their lives as well

as the lives of their learners. This belief is deemed by the study to be the limited effect of action research.

5.2.4 The third sub-question: What are the views of teachers on the usefulness of learners having an awareness of self-regulated learning strategies when learning natural sciences?

The aim of this question was to explore whether teachers regard SRL as a useful approach to developing leaners to become responsible and autonomous, and again to find out the views of teachers on the importance of SRL in natural sciences. The data revealed that the teachers held the view that it is important for learners to have an awareness of self-regulation because they saw that self-regulation could help them to increase learner engagement.P2S2 expressed the following, *"I saw learners becoming motivated and I think if they could grasp the strategies, they could even be more interested in the subject itself"*.

The teachers indicated that self-regulated learning may enhance learner involvement and this may also result in an increased effort, which not only could lead to better results, but more long lasting knowledge and fun gaining this knowledge.

P1S2: "If learners use the strategies they can be open to come up with suggestions because they will feel in control and they'll work hard to show the teacher".

P2S1: "Once learners are in control, they'll be motivated from within to study harder and once they understood the strategies clearly, learning will be easy".

P2S3: "Learners will be eager to prove to their peers and won't allow being outdone. Realizing that they can perform better, they will become more motivated".

P2S2: "Learners will be more interested and maybe their attitude towards Natural Sciences can change".

P1S3: "When they are motivated, the learners will start to see the value of their learning".

P1S1:"I think when I am motivated to use the strategies myself, I will be able to motivate the learners too and they'll enjoy their learning".

Self-regulated learning was also seen to be motivating to the teachers themselves: *"Working with SRL is motivating. As a teacher you start thinking about the strategies and then you start trying to put that into practice. A disadvantage I see is that it takes more time to get learners to master them. But once the learners master the strategies, you get satisfaction and this is*

an advantage"(P2S3).The teachers mentioned that they would be able to identify and develop more possibilities to use SRL in the future.

5.3 **The hindrances to the effective implementation of SRL strategies in this study**

The lack of equipment and science laboratories, and overcrowded classrooms proved to also be impediments to the implementation of the intervention. The schools did not have laboratories and proper equipment to conduct inquiry-based learning. The overcrowded classrooms were also a hindrance to quality teaching and learning.

With SRL,the learners needed constant guidance since SRL is based on the principles of constructivist learning, which is based on the understanding that learners bring their own ideas and expectations to the science classroom. Thus the teacher is expected, according to van Zee (2002, p.589),"to draw out and work with learners' pre-existing understandings and make learners' thinking visible and central to the learning". Within the observations in this study, that was not evident as the teachers themselves displayed limited understanding of inquiry-based learning, which is also a constructivist method, and the application of SRL strategies in the classroom as compared to the understanding they displayed during the information workshops.

The time factor also contributed to the teachers being unable to put into practice what they learned during the developmental information workshops. The information workshops ran for only three days, which was not enough as the teachers had to learn and implement in the class what they had learned, which was something new that they had never experienced before. The teachers did not have enough time to practice the implementation, reflect on their actions and make proper improvements. As a result, I saw that the intervention required a longer period of time to implement.

5.4 **Discussion of the results**

The discussion that included the general overview of the research results focused mainly on the constraints encountered during the research process. These constraints came as obstacles to the effective implementation of self-regulated learning. However, this study has made suggested recommendations (discussed below) to remove such obstacles. Acting upon the

recommendations would ensure that the teachers and learners would learn new and better ways to facilitate learning and would also help the learners to develop lifelong learning skills.

The data generated from this study revealed a few critical issues regarding the implementation of self-regulated learning strategies. Firstly, the different themes that emerged from this study, such as teacher knowledge and growth, learner independence, change in teaching practice, and continuity in integrating SRL (as discussed in Chapter 4) were found to play a major role in the practical implementation of self-regulated learning strategies within the daily teaching.Another factor that is of great concern is the teachers' understanding of teaching science using enquiry-based methods. Data from this study revealed a lack of confidence, which also reflected limited knowledge in the use of the inquiry-based method. The newly introduced Curriculum and Assessment Policy Statement (CAPS) requires teachers to focus more on practical investigative parts of the content, which requires teachers to have the skill to use an inquiry-based method in their teaching. According to this study, the effective use of inquiry-based method could make it easier for teachers to integrate self-regulated learning strategies within the daily teaching process.

There were also few setbacks with regard to interview appointments being honored. The participating teachers kept postponing our appointments and as a result, I had to wait for a suitable time for them to participate in the interviews. This study has highlighted the attempts of teachers to introduce self-regulated learning strategies into their daily teaching practice. As a positive indication of the effect of the study on the participating teachers, a slight change in their knowledge and beliefs was evidenced in the data. The participating teachers tried to bring about change in their teaching practice, or as Lumpe, Haney and Czerniak (2000, p.275) put it, "they were dealing with the emotive components of belief reconstruction". The participating teachers strongly agreed that action research (AR) would improve the teaching and learning processes. They indicated that through frequent use of AR, they would be able to realise the best ways of delivering their subject content so that learners could easily learn and understand.Moreover, the participating teachers also indicated that AR helped them to assess their own performance and effectiveness in teaching. It was their belief that, through more practice, they would be able to discover their own areas of weakness and strive to ameliorate them. With regard to self-regulated learning, these teachers expressed content as they made discovery of a model that could help them improve their teaching method as well as help learners to become independent self-regulators of their own learning process. Some

participants indicated that they did not know the self-regulated learning strategies and were determined to learn more about self-regulation themselves and then teach this to the learners. Generally, these teachers saw self-regulated learning as a positive method that could help learners to realise their real potential given enough and relevant support and motivation.

Therefore, on the basis of the data collected and analysed, this study suggests realistic and continuous support with regard to the implementation of self-regulated learning strategies because this will enhance the teachers' understanding of these strategies and their ability to improve their teaching of natural sciences in Grade 8 and 9.

5.5 **Recommendations and implications**

5.5.1   **Professional development**

High quality professional development has been seen to "produce superior teaching in classrooms, which could in turn translate into higher levels of learner achievement" (Supovitz and Turner, 2000). Districts could arrange conferences to develop teachers' skills and knowledge in teaching, as well as training in self-regulated learning. Conferences would "present opportunities for teachers to develop professional relationships with others, also providing much needed peer support and encouragement as the teachers would experience similar obstacles and challenges when facilitating self-regulated learning in the classroom".

Butler (2003, p.82) posits "professional development, based on the specific goals that teachers set for their learners, could help them to construct instructional strategies, enact them in the classroom, monitor outcomes and revise instruction accordingly". The implication of this experience is that when professional development is situated in practice, teachers actively construct approaches to teaching and when their attention is focused on their own learning in that context, they simultaneously revise knowledge about learning and teaching that in turn influences their teaching practice. Additionally, it should be borne in mind that professional development requires time for teachers to try out, reflect on and revise approaches to teaching.

5.5.2   Support from principals

As leaders in the school environment, it is important for principals to equip classrooms by providing a physical environment well suited to teaching and learning, as well as to provide resources that are conducive to autonomous learning (Ediger, 2000). School leaders may help to identify and remove obstacles towards the teaching and learning of self-regulated learning. Encouraging continuous discussions and in-service- training on self-regulated learning would ensure that teachers become properly prepared to facilitate self-regulated learning in the classroom. The implication of this is that the performance of teachers would improve and that would improve the curriculum in attaining successful outcomes (Ediger, 2000). Moreover, the learners would develop a love of learning and could develop skills that would help them to face the challenges of life beyond school and become lifelong learners.

5.5.3   Collaborative mechanisms

Collaborative mechanisms for teachers, such as review workshops, are needed to enable teachers to meet regularly and share experiences of the implementation of self-regulated learning strategies in daily teaching practice. Yang (2006, p.257) states that "research is uncovering the benefits that accrue from teachers working with others". The implication here is that social interaction between teachers may foster a sustained commitment to challenging issues of their practice, and the new understandings gained may lead teachers to want to measure the effects of their efforts and the impact on how their learners learn.

5.5.4   Parental support

Schools need to address the learners' parents on how they can support and motivate the children at home. There is a wealth of evidence which highlights that parental engagement in schooling positively influences learners' achievement and attainment (Maynard, 2001). For example, Fan and Chen (2001) advocate that "it is without doubt that parental engagement in children's learning makes a difference and remains one of the powerful school improvement levers that we have". However, Harris and Goodall (2008) argue that"effective parental engagement will not happen without concerted effort, time and commitmentfrom both parents and schools, and it will not happen unless parents know the difference that they make, and unless schools actively reinforce that all parents matter". The self-regulated learning process

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of goal setting, using strategy and self-evaluation can be taught by parents, friends and teachers (Zimmerman, 2002).The implication is that there will be a strong collaboration and partnership between parents and teachers which will automatically narrow the distance between the two parties. Additionally, Msengi (2007, p.33) asserts that"learners could receive common messages through common patterns of communication aiming for educational success and promoting academic success itself".

5.5.5   Teacher training institutions

Perry et al (2006, p. 256) states that"traditional conceptions of education are robust and difficult to change". This has been the experience of the present study, where it was noticed that the participating teachers found it difficult to accommodate the intervention of the application of self-regulated learning strategies. Hence the study suggests that teacher training institutions should provide the opportunity for pre-service teachers to learn about self-regulated learning. This suggestion is in line with an indication made by Perry et al. (2006, p.257) that "a highly effective approach to learning associated with success in and beyond school is self-regulated learning". Above that, Paris and Winograd (2001) argue that teachers need to become aware of SRL so as to become models of effective strategies, to analyse their own learning and to implement classroom activities that contextualise learning.

The implication is that the courses offered at teacher training institutions could be designed and taught to focus on teaching and learning strategies that promote SRL. This would then provide pre-service teachers with authentic opportunities to explore and expand their beliefs on education, which would enable them to meet the demand of the learners by the time they got to schools. Kitchen and Stevens (2008) add that being equipped with SRL strategies, teachers would be able to passively affect their learners' growth.

5.6 Areas of further research
- There is a need for this research to be carried out in other circuits and districts to compare and test how much the research findings of this study can be generalized.
- There is a need to research how teachers carry out self-regulated learning strategies in various subjects.

- The role of learners, administrators and parents in self-regulated learning needs to be researched.

5.7 **A reflection on my own learning in the research study**

As a teacher and novice researcher, I have experienced participatory action research as the best way for teachers to expand their existing knowledge. Through action research I experienced an influence on my thinking skills and my attitude towards change. The continuous contact I had with the teachers and the reflections done helped me to learn about other teachers. I have seen other teachers' different reactions towards the action of changing the ways we conduct our daily lessons in the natural sciences classroom.

I learned to talk to other teachers about teaching and teaching strategies in an open manner and that made me see that isolation is one of the serious downsides to teaching. Working as a team with others strengthened our relationship. Action research helped me to really take a look at my own teaching and that ofthe other teachers in a structural manner since opportunities to evaluate ourselves in schools are often very few and most of the time only happen in an informal way. Working together helps people to determine ways to continually improve. It is my belief that using self-regulated learning as a basis for action research could reveal insights for other teachers. Following Paris and Winograd (2001), I suggest that a focus on self-regulated learning would provide a theoretical framework through which teachers might explore their own teaching and their understanding of how their learners learn.

Having had enough time, we could have engaged in many cycles of action research until all of the participating teachers, and myself, were comfortable and confident with what we were doing. It was quite unfortunate in this study that we had to engage in a new programme (action research) as well as implement an intervention on a new model of teaching (self-regulated learning) within a short period of time.

Learning about self-regulated learning, especially during the information workshops at the beginning of the study's data collection process, seemed to be going very well. Participating teachers seemed to understanding the new model. Their active participation and responses to the questions and the presentations that they did as colleagues were evidence of that. However, things took another turn when the participating teachers had to present what they

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had learned practically in the classroom. The participating teachers displayed different reactions in their classrooms that could be attributed to different causes. This experience I also attribute to the time factor. My belief is that having had enough time to learn and practice the application of SRL,the results could have been different. Therefore, I recommend further studies concerning the implementation of SRL in order to fully embrace self-regulated learning.

5.8 Limitations of the study

- The study was conducted on a small sample, only six participants, hence this renders it incapable of providing a generalised conclusion.

- In relation to the process of action research, the process proved to be a bit chaotic as teachers were faced with the challenge of making structured reflections, and for some participants this seemed to be difficult. The study experienced a delay during the data collection period as a result of participants who felt uncomfortable and withdrew from the study.

- The study involved only three out of six middle schools in the Nokaneng circuit. The reason was that the chosen schools were convenient to the researcher, while the other three were far apart and it would have been difficult for the researcher to access these schools.

- Time constraints created a challenge in collecting data as data was rushed and minimal. The meetings with the teachers were sometimes short as teachers continually complained about their tight work schedules.

5.9 Concluding remarks

This chapter discussed the general overview of the results of the data analysis conducted in Chapter 4. The discussion focused mainly on the limitations experienced during the research process, based on the results. The conclusion includes suggestions to overcome the limitations; recommendations; areas for further research and a reflection on my own growth

and development in the research project. The positive feelings indicated by the teachers towards action research and self-regulated leaning were also discussed. The experiences of the teachers in applying self-regulated learning strategies has provided a necessary foundation for improvement in the teaching and learning of Natural Sciences in the three middle schools that participated in the study. It is my belief that the study has been a learning experience which requires support in the form of developmental workshops by school leaders and education administrators.

The outcome of this research was partly positive as most of the participating teachers could not fully grasp the concept of self-regulated learning, the implementation of its components and the process of action research. Although there were positive indications from other teachers, there is still a lot that needs to be done in order to experience an effective implementation of self-regulated learning strategies. On that basis, more research is needed to test the explanations that I have offered for the data obtained in this study.

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APPENDICES

APPENDIX A

MPUMALANGA PROVINCIAL GOVERNMENT

ENQ: K.W. MASHIKE
CELL: 082 968 9126
Fax NO. 086 549 5045
Email:kwenamash@voda
mail.co.za

P.O.BOX 75
LEFIFI
NOKANENG
0435

DEPARTMENT OF EDUCATION
NOKANENG CIRCUIT

TO   Department of Education
             University of Pretoria
             Faculty of Science, Maths and Tech.
             Att. William Fraser

FROM   Circuit Manager
             Nokaneng Circuit

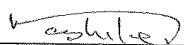**DATE**   18 June 2013

SUBJECT :REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN OUR
             SCHOOLS

Permission has been granted to Motlhatlhedi B.M for conducting Natural Science research at Dikotelo, Ditholo and Molebye combined schools.

Hoping that this research will benefit both learners and teachers in our circuit.

Thanking you in advance

Yours sincerely

Mrs. K.W. Mashike
(Circuit Manager)

DEPARTMENT OF EDUCATION
NOKANENG CIRCUIT OFFICE
CIRCUIT MANAGER

2013 -06- 1 8

NKANGALA REGIONAL OFFICE
P/BAG X499 HAMMANSKRAAL 0400
MPUMALANGA PROVINCE

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APPENDIX B

EDUCATION

DEPARTMENT OF EDUCATION
MPUMALANGA PROVINCE
NOKANENG CIRCUIT
DIKOTELO MIDDLE SCHOOL
EMIS NUMBER 800002543

P.O. BOX 383
SEABE
0417
256 ITSOSENG SEC
SEABE
REPUBLIC OF S.A

Lefapha la thuto   *Enq: Kwakwa M.J @ 073 304 9330 or Masoabi O.T @ 082 872 4833 or Mashitisho K.G 079 152 9974*   *Department of education*

To: Department of Education
University of Pretoria

From: The Principal
Dikotelo Combined School

Date: 20 June 2013.

Subject: Permission to conduct research in our school

SGB and SMT of the above mentioned school has granted Motlhatlhedi B.M permission to conduct a Natural Sciences research.

We hope the research will benefit both learners and educators in our school

Thanking you in advance

Yours sincerely

Mr. Kwakwa M.J (Principal)

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APPENDIX C

Ditholo Combined School

Success through hardwork

Enq: Maubane S.N
Cell 083 351 5423

P.O BOX 64
LEFIFI
0435

TO   : Department of Education
University of Pretoria
Faculty of Science,Maths and Tech.
Att.William Fraser

FROM   : The Principal
Ditholo Combined School

DATE   : 20 June 2013

SUBJECT : <u>REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN OUR SCHOOLS</u>
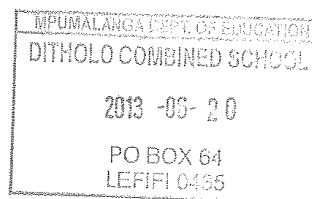
Permission has been granted to Motlhathledi B.M for conducting Natural Science research at our school.

Hoping that this research will benefit both learners and teachers.

Thanking you in advance.

Yours in service

MAUBANE S.N (PRINCIPAL)

MPUMALANGA DEPT. OF EDUCATION
DITHOLO COMBINED SCHOOL
2013 -06- 2 0
PO BOX 64
LEFIFI 0435

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APPENDIX D

Faculty of Education
Department of Science, Mathematics &
Technology Education

APPENDIX C

TO WHOM IT MAY CONCERN (teacher)

INFORMED CONSENT

I.. hereby agree to participate in research regarding *"Natural Sciences teachers application of continuous assessment and self-regulated learning when teaching grade 8 and 9 learners"*.

My participation in this research project is of my own free will and I am in no way being coerced to do so.

I am aware that I can terminate my participation in this research project at any point should I not want to continue and this decision will not in any way affect me negatively.

I understand that this is a research project and that my participation in the project will not benefit me personally.

I understand that my identity as well as my responses during the interview will remain confidential.

I understand that if possible, feedback will be given to me on the findings and recommendations on the completed research.

I have received the details of a person to contact should I need to speak about any issue that may arise from my participation in the research project.

Signature of participant:..
Date:...

Signature of Researcher:..
Date:...

Signature of Supervisor:..
Date:...

Building and office no
Groenkloof Campus, University of Pretoria
PRETORIA 0002
Republic of South Africa

Tel number:
Fax number:

E-mail address:
www.up.ac.za/education

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APPENDIX E

CLASSROOM OBSERVATION SCHEDULE

1. How is the classroom environment? Is it conducive for teaching and learning?

_____

_____

2. Are learners excited and enthusiastic?

_____

_____

3. Are they anxious for new knowledge?

_____

_____

4. Is the teacher enthusiastic and motivated to teach science?

_____

_____

5. Does the teacher use self-regulated learning components in teaching? If so, which ones?

_____

_____

6. How do learners respond to these components?

_____

_____

7. Do learners show understanding of what they are supposed to do?

_____

_____

8. Do learners show interest in using new strategies of learning?

_____

_____

9. Is the teacher guiding the learners towards being independent?

_____

_____

10. Are the learners guided towards reflective discussions?

_____

_____

APPENDIX F

Participant's task sheet for information sessions.

SECTION A

1. Action Research (AR)

1.1 Task 1

- Develop a concept map containing key elements of action research

- Articulate what you understand by the term 'Action Research'

1.2 Task 2

- Compare the ideas in the participant guide to your statement from task 1.

- Formulate your own definition of Action Research, share with team members and develop a team definition.

1.3 Task 3

-Features of AR (practical, participative, empowering, interpretive, tentative, and critical). Brainstorm what you understand by each feature.

1.3 Task 4

-Develop a cycle using the four steps of AR, (planning, action, observing, reflecting.

SECTION B

2 Self-Regulated Learning (SRL)

2.1   Task 1

- Describe what you understand by the term self-regulated learner.

-Describe the strategies you use to develop the skill of independence in your learners.

- Share your reflections with your partner noting commonalities.

2.2   Task 2

-Explain why you think learners may or may not benefit by developing SRL skills.

-Compare the ideas in participant guide to your own statement from task 1.

2.3 Task 3

-List the strategies you think are important and can be used to develop learner self-regulation, explain why?

-Describe what you think and understand by the cycle of learning using a diagram.

-Share with your partner and compare the cycles.

2.4 Task 4

-Compare the cycle of Zimmerman and your cycle and note similarities and differences.

2.5 Task 5

-Reflect on the sessions and comment on:

a. New and clearer understandings about AR and SRL.

b. How these sessions may or may not change your teaching practice.

c. Challenges you envisage when integrating SRL strategies in your classroom.
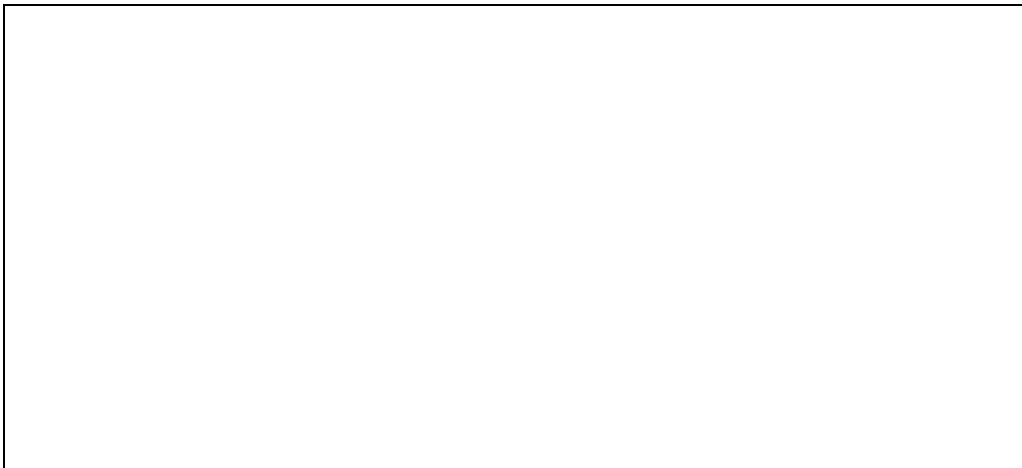
THANKYOUFORYOURPATIENCEANDCOOPERATION!!!

APPENDIX G

Self-Regulated learning

Question One

What do you understand by the concept Self-regulated learning?

Question Two

Are you developing Self-Regulated learning skills in your leaners? Yes/No

If yes, please describe how.

APPENDIX H

THE TEACHER INTERVIEW

Thank you very much for agreeing to participate in this research. You are welcome and feel free to participate. The topic of my research is the application of self-regulated learning strategies in grade 8and 9 by Natural Sciences teachers.

This interview will be about your understanding and use of self-regulated learning strategies when you teach Natural sciences to grades 8 and 9.

1. Explain what self-regulated learning means to you now.

2. What is your view on the method you used to integrate self-regulated learning strategies in daily process of teaching and learning?

3. How do you perceive the use of self-regulated learning in the teaching and learning of natural sciences?

4. Do you think it is necessary for the learners to have an awareness of self-regulated learning strategies? Explain.

5. How did the research project research project affect the way you teach?

6. Do you think self-regulated learning is effective to motivate leaners? Explain.

7. Would you continue integrating the self-regulated learning strategies after the research project? If yes (Why), if no (Why not).

8. Is there any other comment you'd like to add?

APPENDIX I

LESSONTEMPLATE FOR INCLUDING SRL STRAGIES IN TASK

Integration - Template

1. The task requires us to:

_____

_____

2. Our Goal(s) is/are:

_____

_____

3. Steps to follow to achieve our goals are:

_____

_____

4. Check: Are we going according to our plan?:

_____

_____

5. Check and note mistakes we have done?

_____

_____

6. Do we need help?

ON: _____

_____

7. Isour model complete?

_____

_____

8. This is how we feel about our model:

_____

_____

9. This is how we feel about the lesson:

_____

_____

10. Did we achieve our goal(s)?

_____

_____

11. This is what we think we can do better next time:

_____
_____

12.**QUICK WRITE**

In this lesson we have learned:

_____

_____

APPENDIX J

QUICK WRITE TEMPLATE

In this lesson I have learned:

_____

_____

_____

_____

_____

_____

APPENDIX K (**TEACHER INFORMATION)**

How-to use Instruction for Self-Regulated Learning Strategies

Your role in helping students to gain self-regulation will be challenging and it is clear that your first attempt to teach a learner a self-regulation strategy may not be successful. Why? It takes time and practice to gain effective habits. Initial efforts must be refined based on students

Feedback, performance, and personal reflection.

Five common instructional practices that

Have been cited as effective in helping students learn self-regulation are:

1. Guide learners' self-beliefs, goal setting, and expectations

*help frame new information or feedback in a positive rather than a negative manner (e.g., "keeping track of your homework

*assignments will help you manage this course successfully," rather than "if you don't keep track you will fail")

* provide specific cues for using self-regulatory strategies

2. Promote reflective dialogue

* Teacher modelling of reflective practices (think aloud)

* Student practice with reflective dialogue

* Group discussions to think through problems/cases (collaborative learning)

3. Provide corrective feedback

*performance standards must be clear and perceived as attainable

*phrase feedback (positive or negative) as a statement about the task of learning, not about the learner

4. Help learners make connections between abstract concepts

* use case-based instructions or examples that students come up with themselves

*use hands-on learning activities

*help students learn to separate relevant from irrelevant information (i.e., help them know where and how to focus their attention; guide their reference standards)

5. Help learner's link new experiences to prior learning

*use experiential learning activities

* focus on application of knowledge in broader contexts

* integrate real-life examples with classroom information

Using this approach, teachers:

1. shift the responsibility to the student - e.g., encourage students to exercise choices about how to accomplish learning activities; help student shift the focus of their regulation away from the teacher and onto salient cues in the learning task

2. adopt a systematic instructional approach; a cyclic self-regulatory approach to learning

3. demonstrate model (sequence is important: student observes model, imitates, practices in structured settings, then self-regulates by adapting to changing personal and contextual conditions)

4. demonstrate effectiveness of self-regulatory techniques; keep records of student's progress

5. Use verbal persuasion; support and encouragement, especially when student perceives that new strategies are not working

APPENDIXL

GOAL SETTING (LEARNER ACTIVITY)

Goals are specific objectives that help us to plan our activities and strategies.

A short term goal is a goal that only takes a few days or weeks to achieve, for example, to complete daily homework assignments or to spend more time on daily homework assignments and complete better quality work.

A long term goal takes several weeks, months, or even a full school semester of year, to achieve. An example would be to improve a grade by the end of the semester.

The following series of questions (from Heacox, 1991) is designed to give guidance. The questions will help your learners successfully set goals:

1. What is one area of my school performance I want to improve? This goal should be long term, reasonable, attainable, and stated in a positive way.

2. What is one thing I can do to accomplish my long term goal? This short term goal should also be reasonable and reachable, but should also include a way to measure your progress.

3. How can this short term goal be broken down into a step-by-step plan? Learners could make a list of steps so they can check off each step when it is completed.
 Setting Short and Long Term Goals

4. What is good about doing this? What are the benefits to me? If you are only doing this to please someone other than yourself, then you are not as likely to reach your goal.

5. What are the things that might get in my way as I work toward my goal?
By identifying possible obstacles, you can plan ahead, and think of ways to get around the obstacles.

6. What special materials or help will I need to reach my goal? Make a list of books, materials, and people you may need for help.

7. How will I reward myself when I achieve my goal? State your reward in a positive way, and try to make your incentives activities that you enjoy rather than money or things.

8. How will I check on my progress and make sure that my plan is working?
Write down people you need to check with and specific dates for your checkpoints (at least once a week is recommended) and have your plan signed and dated by the people you are working with.

9. How will I remind myself of my goal? Write your goal on a piece of paper and put it somewhere obvious (e.g., inside your locker, on your bedroom mirror, inside your homework book) to remind you regularly.

10. Does my plan need to be revised? Is the goal still necessary, important, appropriate? Is the incentive right? Is the plan working? Have I reached my goal?

GOAL SETTING QUESTIONS
Goals are specific objectives that help us to plan our activities and strategies.

A short term goal is a goal that only takes a few days or weeks to achieve, for example, to complete daily homework assignments or to spend more time on daily homework assignments and complete better quality work.
A long term goal takes several weeks, months, or even a full school semester of year, to achieve. An example would be to improve a grade by the end of the semester.
The following series of questions (from Heacox, 1991) is designed to give guidance. The questions will help your learners successfully set goals:

1. What is one area of my school performance I want to improve? This goal should be long term, reasonable, attainable, and stated in a positive way.

2. What is one thing I can do to accomplish my long term goal? This short term goal should also be reasonable and reachable, but should also include a way to measure your progress.

3. How can this short term goal be broken down into a step-by-step plan? Learners could make a list of steps so they can check off each step when it is completed.

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4. What is good about doing this? What are the benefits to me? If you are only doing this to please someone other than yourself, then you are not as likely to reach your goal.

5. What are the things that might get in my way as I work toward my goal?
By identifying possible obstacles, you can plan ahead, and think of ways to get around the obstacles.

6. What special materials or help will I need to reach my goal? Make a list of books, materials, and people you may need for help.

7. How will I reward myself when I achieve my goal? State your reward in a positive way, and try to make your incentives activities that you enjoy rather than money or things.

8. How will I check on my progress and make sure that my plan is working?
Write down people you need to check with and specific dates for your checkpoints (at least once a week is recommended) and have your plan signed and dated by the people you are working with.

9. How will I remind myself of my goal? Write your goal on a piece of paper and put it somewhere obvious (e.g., inside your locker, on your bedroom mirror, inside your homework book) to remind you regularly.

10. Does my plan need to be revised? Is the goal still necessary, important, appropriate? Is the incentive right? Is the plan working? Have I reached my goal?

GOAL SETTING QUESTIONS
These questions are to guide learners when setting their goals.

What is one area of my school performance I want to improve?

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What is one thing I can do to accomplish my long term goal?

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How can this short term goal be broken down into a step-by-step plan?

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What is good about doing this? What are the benefits to me?

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What are the things that might get in my way as I work towards my goal?

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What special materials or help will I need to reach my goal?

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How will I reward myself when I achieve my goal?

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How will I check on my progress and make sure that my plan is working?

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How will I remind myself of my goal?

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Reflection Questions

How is my plan working? Is it working well? If not, why not?

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Does my plan need to be revised?

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Is the goal still necessary, important, and appropriate?

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Is the incentive right? Is the plan working?

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Have I reached my goal?

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