Investigating self-regulated learning strategies to support the transition to problem-based learning

Lisa Kay Thomas

University of Wollongong
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Investigating self-regulated learning strategies to support the transition to problem-based learning

A thesis submitted in fulfilment of the requirements for the award of the degree

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Declaration

I, Lisa Kay Thomas, declare that this thesis, submitted in the fulfilment of the requirements for the award of Doctor of Philosophy, in the Faculty of Education at the University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Lisa Kay Thomas

April 2013
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Abstract

This study investigated how self-regulated learning strategies could support student transition in a problem-based learning context. Problem-based learning is a pedagogical approach in which the learner is responsible for identifying and addressing the gaps in their own knowledge. Research suggests that students often experience stress, uncertainty and use ineffective learning strategies when they are not supported to understand how to direct their own learning. This study sought to investigate the outcomes for learners when the development of self-regulated learning was supported in the early phases of a problem-based learning curriculum in higher education.

This study was underpinned by a social-cognitivist perspective with a focus of the contextual nature of self-regulated learning. It used a multiphase, mixed-methods research design, allowing for the use of quantitative and qualitative data to explore the context and inform the research over four phases of investigation. Different research questions were investigated in each phase of the research, which ultimately informed the over-arching research question: How can self-regulated learning strategies support students in a problem-based learning curriculum?

This study’s findings suggest that learners can demonstrate increases to cognitive and metacognitive functioning, as well as self-efficacy through engagement with a program to support self-regulated learning in problem-based learning. However, the researcher also found that there are significant challenges to encouraging all students to engage with such a program.

This study contributes to the knowledge of how learners can be supported during transition to student-directed learning environments in higher education. Further investigation could increase our awareness of how greater participation in such programs can be enhanced.
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Chapter One: Introduction

This study investigates how learners can be supported to develop effective self-regulated learning skills in a problem-based learning environment. This chapter outlines the purpose and intent of this study by presenting the background to the study, the significance of the investigation and the questions that guided the research. The chapter also introduces the strategy and context, and discusses the limitations of the study. A definition of terms and an outline of the structure of the thesis concludes this chapter.

1.1 Background to the study

Workforce and workplace requirements in the modern world are changing more rapidly than ever before. Workers are expected to perform in new tasks and roles throughout their working lives. For successful workplace participation in the 21st century, individuals require the skills to initiate and direct their own learning beyond the conventional classroom environment.

The ability to initiate and direct learning beyond formal education requires control over one’s own learning processes. Individuals with skills to instigate, monitor and sustain learning toward learning-goal achievement are described as self-regulated learners (Zimmerman, 1990). Self-regulated learners display metacognitive, motivational and strategic control in their learning (Zimmerman, 1986). This control is accomplished through goal setting, planning, monitoring, regulating and evaluation when learning (Boekaerts, 1999; Eilam & Aharan, 2003; Hadwin & Winne, 2001; Perry, Hutchison & Thauberger, 2008; Zimmerman & Schunk, 2001). Successful learners understand a range of effective learning strategies and know how to select the most appropriate one. An aspect of selecting appropriate strategies relates to the learning context in which these strategies must be used.

A social-cognitivist perspective on self-regulated learning advocates the importance of context. A variety of influences, including personal, environmental and behavioural factors, can affect the learner’s ability to perform the necessary processes for successful self-regulation (Bandura, 1991). Researchers suggest that learners do not attend to self-regulated learning in the same manner in all domains (Schunk, 2001).
While a learner may be accomplished and experienced using strategies in one learning context, those same strategies may not necessarily be effective for learning in another environment. Learners require support in understanding effective learning strategies, when to use them and how to select strategies depending on the context for learning.

Learners are not always conscious of the strategies that they employ, nor are learners necessarily well informed of the possible strategies from which to choose. Evidence suggests that even accomplished learners can be unaware of the study tactics they use, and often employ ineffective strategies for the task at hand (Winne & Jamieson-Noel, 2003). However, educators are well positioned to support students with the skills to identify and use learning strategies known to be effective in the given context.

Informed educators look to contemporary learning theories to guide practice. Theories of learning and education have significantly evolved throughout the decades. In the 1960s, psychological theory shifted from conditioning to more-cognitive approaches to learning (Schunk, 2008). These newer views of learning focus on learners as being active in their approaches to seek and process information, as opposed to being passive recipients. Contemporary educational theories stress the importance of individuals taking control of their own learning in the acquisition of knowledge and skills (Zimmerman, 1990). Through this lens, learning is seen to occur through learners’ active engagement in acquiring and processing information. Contemporary educational theories underpin pedagogical practice that aims to support the development of skills for learning beyond the classroom.

In current post-compulsory-education environments, pedagogic practices that require self-direction in learning are a common response to learners' needs. Various pedagogical approaches have been designed to help learners become independent in their own learning processes. Problem-based learning (PBL) is one such strategy (Barrows, 1986).

Problem-based learning, originally developed in medical education, is a pedagogical approach whereby a problem or scenario is presented to stimulate learners to seek information as they attempt to understand the issues pertinent to the situation. It was designed to respond to the need for graduates to be self-regulated learners in their
ongoing practice beyond medical school. The focus was on developing professionals who could communicate, cooperate and take responsibility for learning as they adapted to working beyond the classroom environment. By his own admission, the pioneer of problem-based learning, Howard Barrows, described its origins as being pragmatic rather than born from an understanding of educational psychology or cognitive science (Barrows, 2000). As the purpose of problem-based learning is to promote the development of skills for professional lifelong learning, the approach has become a context of interest to researchers of self-regulated learning.

Researchers have become interested in the development of self-regulated learning through participation in problem-based learning. Studies have shown that many learners do develop skills in self-regulated learning within the context of problem-based learning (Blumberg, 2000; Hmelo & Lin, 2000). These studies have reported that medical students engaged in a problem-based learning model have well-developed skills to direct their own learning when they enter the workforce. They do not, however, report on students who withdrew from their medical studies, and thus cannot ascertain the impact of the curriculum structure on these students' decision.

Research has also shown that many find it difficult to develop self-regulated learning using problem-based learning. Learners are expected to employ effective strategies for studying in an unfamiliar environment. Evidence suggests that not all students automatically acquire the necessary skills for this context, or else do so through a great deal of unnecessary stress (Evensen, Salisbury-Glennon & Glenn, 2001; Lloyd-Jones & Hak, 2004). These studies present the challenges for students’ emotional well-being and academic success as they transition from a traditional teacher-led environment to a student-directed curriculum structure. This suggests the need for explicit support for the development of skills and strategies for self-regulated learning in the context of problem-based learning.

Attempts to teach students skills that allow them to actively seek and process information is a complex task. Constructivist principles that promote an unguided discovery of understanding have been used to address this area. However, these have been shown to be less effective than approaches that guide learners through learning processes (Kirschner, Sweller & Clark, 2006). A cognitivist perspective advocates
that with effective instruction and support, learners will develop skills that can then transfer to other formal and informal learning contexts (Schunk, 2001). It is then the responsibility of formal education systems to equip learners with the skills to continue learning beyond the classroom environment (Boekaerts, 1997).

The challenge for educators is to prepare students with skills in self-regulated learning so that the students may confront and manage learning beyond the formal classroom context. This study investigates the design and implementation of pedagogical support for students to develop self-regulated learning skills within the problem-based learning environment at an Australian medical school. It achieves this through a multiphase research design that is informed by the principles of a social-cognitivist perspective on self-regulated learning. The researcher sought a contextual perspective on the student experience in transition to problem-based learning. This was translated into an intervention program that was integrated into an existing problem-based curriculum. Engagement with and outcomes of the intervention were investigated to understand the efficacy of a program designed to support the development of self-regulated learning.

1.2 Significance of the study

This study makes a significant contribution to knowledge of how learners can be supported in the development of self-regulated learning skills. This study is unique in that it investigates integrated, contextualised and explicit support for students in the development of self-regulated learning skills.

Current approaches to developing students’ self-regulated learning skills include student-directed curriculum designs. Such approaches require students to discover successful learning strategies for themselves as they attempt to solve problems or guide their own learning with minimal teacher support. Studies in this area have observed the development of self-regulated learning in such contexts, including contexts void of explicit support (e.g. Eilam & Aharon, 2003; Rapp, 2005; Sungur & Tekkaya, 2006). While some students are successful in their endeavours, not all are. For learning contexts requiring self-regulated learning, students may benefit from support to understand and work within the processes.
Courses or workshops aimed at teaching learning skills are another response to helping students to develop self-regulated learning skills. These approaches involve decontextualized instruction, which the learner must then adapt to the particular learning context. Researchers who have investigated this approach have reported positive benefits to learners in the understanding of a greater range of learning strategies (Hofer & Yu, 2003). Such studies, however, do not investigate the learner’s ability to transfer these skills to the learning context in which they are required.

Teachers of students with significant challenges in learning have realised the benefits of contextualised support for self-regulated learning. Investigations involving young students with learning difficulties have reported improvements in learning when self-regulated learning skills are explicitly and contextually supported (e.g. Perry, Nordby & VendeKamp, 2003; Ruban, McCoach, McGuire & Reis, 2003). Furthermore, adults enrolled in online, hypermedia courses can also experience significant learning challenges when studying in a faceless environment. Researchers in these contexts report on benefits to learners when support for self-regulated learning is integrated into online activities (e.g. AzeVEDO, Moos, Greene, Winters & Cromley, 2008; Dabbagh & Kitsantas, 2005). This evidence indicates there are benefits to learners when supports for self-regulated learning are explicitly and contextually bound. This supports an argument for such guidance to be considered in other learning contexts.

Problem-based learning was designed with the intention that students would develop the skills of a self-regulated learner for lifelong learning. Researchers who have observed students' experiences of transition to a problem-based-learning medical curriculum have called for explicit instruction in self-regulated learning to alleviate the high levels of stress that these students encounter (Evensen et al, 2001).

Few studies have attempted to understand the impact on learners when self-regulated learning skills are explicitly supported within a student-directed curriculum structure. This study addresses a gap in the literature whereby the principles of a social-cognitive perspective deem context and guidance to be important factors in the development of self-regulated learning skills.
This study addresses the need for explicit and contextualised support for learners in the development of self-regulated learning skills. This study is significant because it addresses the need for such support for students to develop the necessary skills for success both within and beyond the formal learning environment.

### 1.3 Research questions

This study was guided by an over-arching research question:

How can self-regulated learning strategies support students in a problem-based learning curriculum?

To address this question a four-phase, mixed-methods research study was undertaken, with each phase guided by research sub-questions.

*Phase One*

The purpose of Phase One was to gain a contextual understanding of the experience of novice learners in a problem-based learning curriculum. This investigation sought to understand how students chose which learning strategies to use to direct their own learning, and how they felt other students could be supported in this transition. The research questions specific to Phase One were:

- How do first-year medical students experience problem-based learning?
- What strategies do students use to support their learning in a problem-based learning medical curriculum?
- What strategies do students think could support learners entering a problem-based-learning medical curriculum?

*Phase Two*

In Phase Two the researcher designed a program to support self-regulated learning in a problem-based learning curriculum. The design of the program was informed by relevant literature and the findings of Phase One of this study. Once the program was in draft form, the researcher sought advice from participants in Phase One to suggest any modifications for the final program.
**Phases Three and Four**

The purpose of Phases Three and Four was to test and refine the program that had been developed in Phase Two. This investigation sought to understand how the students participated in the activities and whether they had achieved the self-regulated learning outcomes. The research questions specific to Phases Three and Four were:

- How do students engage in self-regulated learning activities that are integrated into a problem-based learning curriculum?
- What outcomes are achieved by students who participate in self-regulated learning activities that are integrated into a problem-based learning curriculum?

**1.4 Research strategy**

This study was conducted using a mixed-methods inquiry design. A mixed-methods approach was chosen as a means of collecting a variety of data for a greater understanding of the research problem (Creswell, 2009). The data collected included focus-group discussions, questionnaires, work samples and interviews. The quantitative and qualitative data was analysed to understand the experiences of learners in a problem-based learning curriculum and the outcomes of supports for self-regulated learning.

Mixed-methods and qualitative research designs are contentious approaches in medical education. Those conducting research in medical education often apply the principles of laboratory-based investigations when attempting to understand and inform teaching and learning practice (Cook, Bordage & Schmidt, 2008). Such approaches fail to acknowledge the human component of the learning environment. This study looked to the social and human sciences to understand how best to investigate human behaviours in context.

The four-phase, mixed-methods design allowed the researcher to first gain an understanding of the student learning experience and support needs within this context. This understanding then informed the development of a program aimed at supporting students in the development of relevant self-regulatory skills. The final two phases involved testing the program to understand how learners engaged with the activities and the outcomes of their participation. The multiphase design allowed the
researcher to understand the learning experience from three separate cohorts of new students over a three-year period, hence providing a wide-ranging perspective in the findings. The specific design of this study is presented in detail in Chapter Three of this thesis.

1.5 Context

The context of the study was a graduate-entry medical program in an Australian university. The Bachelor of Medicine and Bachelor of Surgery (MBBS) degree enrolls graduate students from any discipline area. At the time the research was conducted, the school was newly established, with its first enrolled students having commenced study the previous year. The school aimed to produce practitioners to meet the medical needs of the Australian community, with particular focus on regional, rural and remote areas. The curriculum structure was based on a problem-based learning model being used in a well-established medical school in the United Kingdom. The model had undergone a number of changes in its early development to ensure compatibility with the Australian context.

1.5.1 The model of problem-based learning

The MBBS curriculum integrates medical sciences, clinical competencies, professional development and research skills into a problem-based learning curriculum. Appendix 1.1 provides an overview of the degree.

In the first phase of the degree (the first year and a half), each problem-based learning cycle focuses on the case of a different patient, selected from one of 93 core problems designed specifically for each stage of the course. The cases are developed to stimulate student learning of a specific body system or disease process.

Each problem-based learning cycle is conducted over one fortnight. It includes a large-group introduction (on the first Monday of the fortnight), a small-group tutorial (typically on the second Monday of the fortnight) and a wrap-up session, sometimes referred to as the feedback session (on the final Friday of the fortnight). The problem-based learning activities are interwoven into the fortnight with more directed learning activities including lectures, anatomy study, clinical skills, clinical placements and
online tasks that are related to the presenting problem. Appendix 1.2 shows a fortnightly schedule of all formal learning sessions in which students are expected to participate. In this schedule, problem-based learning sessions are referred to as case-based learning (CBL) sessions and include: CBL Intro, CBL Tutorials and CBL Feedback (The use of the term CBL is clarified in the definition of terms in Section 1.7). In total, students are required to participate in 25 hours of structured, formal classes. In addition, they are expected to engage in 20-30 hours of self-directed study each week. A description of the student activities within each of the problem-based learning sessions allows for greater understanding of how and where student support for self-regulated learning may be offered.

1.5.1.1 The large-group introduction

The large-group introduction occurs at the beginning of each fortnightly curriculum cycle. The students are presented with a clinical scenario in which a real or simulated patient is interviewed by a clinician in front of the students. This session is facilitated by two presenters who each play different roles – one, a general clinician whose role it is to take the patient history and clarify the material on behalf of the students; the other, typically a specialist clinician or medical scientist, who facilitates the problem-solving part of the session.

The large-group introduction commences by bringing a patient into the lecture theatre to sit at centre stage with the general clinician. The general clinician takes the patient history as though in a normal consultation scenario. When the basic information has been elicited from the patient, the other presenter begins to lead the group in the problem-solving activities.

The problem-solving sessions involve whole-group and small-group activities. During the problem-solving session the patient remains in the room, but moves from centre stage and takes a seat in the lecture theatre. The first activity following the initial history is designed for students to work in small groups to consider their initial hypotheses about the underlying processes involved in the patient case. Students then discuss what else they might like to know from the patient. The patient returns to the centre seat so that the general clinician can ask further questions put forward by the students.
When students are satisfied that they have a detailed enough patient history, the specialist clinician or medical scientist leads them in a discussion about what they would do next if they were the doctor. This is designed to stimulate students to consider what examinations or investigations they would conduct. Specifically they must consider why they would do it, what it would add to their knowledge and what they would be ruling out. Once this clinical-reasoning process has been conducted, students identify overarching learning objectives that will drive their learning for this problem-based learning cycle.

Students collaborate in the large-group session to develop eight to 10 learning objectives for the fortnight. The presenters facilitate this process to ensure that the students create high-quality objectives that revolve around the key themes for the fortnight. Students then record these objectives and are expected to use them to guide their learning throughout the fortnight. While this process ensures the creation of up to 10 overarching learning objectives, students must then individually and independently consider their current understanding of the topic and set their own personal learning goals directed toward the learning objectives. The personal processes to ascertaining current understanding and planning for learning are unsupported in this model of problem-based learning. This, therefore, leaves scope for investigation into how learners may be supported to develop skills to initiate their own learning.

1.5.1.2 The small-group tutorial
The small-group tutorial takes place at the beginning of the second week of the problem-based learning cycle. Students meet with their tutor in a small group of eight to 10 students. (Students are allocated to tutorial groups by staff at the medical school prior to the academic year, and remain with the same group throughout the first phase of their medical degree.)

The small-group tutorial is facilitated by a problem-based learning tutor. The aim of the small-group session is to allow the students to discuss the case, work collaboratively, share resources and assess their progress in learning. There is not a
set format for the activities within the small-group session, as the tutorial format is typically decided by each individual tutor.

There can be a great variation of methods and designs within the small-group tutorial due to differences in tutors and tutoring approaches. Some students may not have the opportunity to develop skills in assessing their own learning progress. Of interest to research in self-regulated learning, the small-group tutorial provides an opportunity to investigate how students can be supported to monitor the progress of their learning throughout the fortnightly cycle.

1.5.1.3 The wrap-up

The wrap-up session is a large-group activity designed as a conclusion to the problem-based learning cycle. In this session two facilitators (a scientist and a clinician) conduct a presentation and promote discussion to bring closure to the clinical case. As part of this, they explain the clinical-reasoning process involved in history taking and examination, as well as hypothesis generation, diagnosis investigation and management. The session is also used to reinforce the medical sciences relevant to the case, contextualise them and discuss their relevance. In this session students have the opportunity to ask questions to clarify their understanding. The wrap-up session is the final activity within the fortnightly problem-based learning cycle, with a new case to be presented in the following fortnight.

At the conclusion of the wrap-up session learners must consolidate their understanding and consider how well they achieved their learning goals. Within this model of problem-based learning, learners are not explicitly supported to reflect on their learning and new-found knowledge. The wrap-up session provides a context for investigation into how learners may be supported to develop skills to reflect upon and consolidate learning.

Summative student assessments are used to identify whether students achieve the curriculum outcomes required to progress to the next phase of the program. The first summative examination in the course is placed at the end of year one. The content of the exams are drawn from the curriculum and are based on the medical sciences that underpin the cases within the problem-based learning scenarios. The written mode of
The exam provides opportunity for students to demonstrate that they have acquired, and are able to apply, the necessary understanding and skills to progress to the next part of the course. In this model of assessment, learners are required to draw on their strategies and knowledge to respond to a case-based modified essay question, case-integrated medical science short-answer questions and a selection of more traditional medical science focussed multiple choice questions. The exam is therefore closely aligned to the problem-based learning model of the curriculum.

The fortnightly model of problem-based learning in this Australian medical school provided a context for the current research. This context was appropriate for this study because self-regulated learning is considered critical to success in problem-based learning. At the time of the research, there were no formal structures in place to support the development of self-regulated learning in this context, which included participants who were in transition from traditional teacher-led learning environments to a learner-directed, problem-based curriculum. This allowed for a rich understanding of the student experience upon entering the problem-based learning curriculum, and offered insight into how students could be best supported in the development of self-regulated learning. The implications and findings of this study can be useful in other domains of research and practice where self-regulated learning is a feature of the learning environment.

1.6 Study limitations

The key limitation of this study is that it was restricted to one context for the development of a program to support self-regulated learning. Entry to medical education is highly competitive, and usually attracts high-achieving students. This context is unique in its ability to select only the top applicants from around the country based on their demonstrated academic success and personal fortitude. As has been acknowledged in the literature pertaining to a social-cognitivist view, self-regulated learning is contextually bound. Although the program's findings are certainly appropriate for other academic domains seeking to foster self-regulated learning skills in their students, it may not be directly suited to other learning contexts; this limits the generalisability of the findings.
1.7 Definition of terms

*Self-regulated learning* is the process whereby students are the masters of their own learning (Zimmerman, 2000). Self-regulated learning involves skills in goal setting, planning, monitoring, regulating and evaluation. A social-cognitive theory of self-regulated learning underpins this study.

The terms *self-directed learning* and *self-regulated learning* are used interchangeably in literature on problem-based learning (Zimmerman & Lebeau, 2000). As the underpinning foundations of this study are informed by theories of self-regulated learning, self-directed learning is not accepted as a theory for this research. However, where used synonymously in the literature, this thesis is also informed by research presented as examining self-directed learning where, in fact, the principles aligned with self-regulated learning.

*Problem-based learning* is an inquiry-based pedagogical approach founded in the context of medical education. In the context where this study was conducted, the terms *problem-based learning* and *case-based learning* have been used interchangeably. For the purpose of this study, problem-based learning is referred to as the underlying curriculum structure of the context.

*Case-based learning* is an inquiry-based pedagogical approach similar to problem-based learning. Due to the interchangeable uses of terminology in the education context, features within this medical school’s curriculum are sometimes referred to as case-based learning (CBL) within this thesis.

1.8 Thesis structure

This thesis consists of seven chapters. This chapter gave an overview of the study. Chapter Two provides a review of research into self-regulated learning and problem-based learning, which was used to form the theoretical and empirical basis for this study. It also identifies the contribution that this study makes to the field. Chapter Three is comprised of two main sections. The first section presents the overall research design of the study. (Due to the multiphase design of the study, the detail of the methodology for each phase is discussed in the chapter that relates directly to the
specific phase.) The second section, along with Chapters Four, Five and Six provide a full report of each phase of the research, presenting the research sub-questions, context, design, results and discussion of each investigation that informed the overall findings of the study. Chapter Seven brings together the findings from each phase and presents the discussion and conclusions of the study with reference to the overarching research question. This final chapter also suggests implications of the findings and possible further research. Supporting documents are referred to throughout the thesis and are found in the appendices.
Chapter Two: Literature Review

This chapter provides a review of the literature relevant to the study, focusing on conceptual and empirical research pertaining to self-regulated learning and its development. Different perspectives of self-regulated learning were explored to determine the theoretical underpinnings of this study. The literature also informed a greater understanding of the processes and strategies of self-regulated learning. A more-specific understanding of self-regulated learning within the problem-based learning context was then sought to gain a contextual perspective. Strategies to support self-regulated learning in problem-based learning were investigated through an analysis of previous studies similar to this investigation. Through this review of the literature, the researcher identified gaps in the research in this area to determine how this study would make a contribution to the field.

2.1 Self-regulated learning

Human behaviour can be regulated through self-generated and external influences. The ability to exercise control over one’s own thoughts, feelings, motivations and actions within the external environment relate to acts of self-regulation (Bandura, 1991). Contemporary educational theorists have become interested in how humans self-regulate their behaviour, specifically related to controlling ones’ personal learning processes. Such skills are important for learning both within and beyond the formal learning environment.

Self-regulated learners are described as being a “master of their own learning” (Zimmerman, 1990, p.4). These are students who take control of metacognitive, motivational and behavioural aspects of their learning (Zimmerman, 1989). Their self-generated thoughts and actions are orientated toward attainment of learning goals. Self-regulated learners are active seekers and processors of information. Self-regulated learners instigate, monitor and modify learning through to goal achievement. These characteristics are important for learners who are near to completion of formal studies. As they enter the workforce, they are expected to bring with them skills to perform in new tasks and new roles throughout their working lives.
There are various perspectives on self-regulated learning, each offering a unique view of the processes and influences involved. Each perspective was explored to decide upon the appropriate one to underpin this research.

### 2.1.1 Perspectives on self-regulated learning

Self-regulated learning has been investigated through different theoretical perspectives. These perspectives include operant, phenomenological, information processing, constructivist, volitional, Vygotskian and social-cognitive.

The social-cognitive perspective, which was chosen as the theoretical foundation for this study, supports the view that self-regulation is not a fixed trait, but is influenced by ever-changing factors both internal and external to the learner. Furthermore, a social-cognitive perspective presents the view that self-regulated learning is a process that requires support for learners to acquire the necessary skills in any given context. The social-cognitive perspective was chosen over the other perspectives as each had limitations (Table 2.1).
<table>
<thead>
<tr>
<th>Perspective</th>
<th>Key ideas</th>
<th>Focus</th>
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| Operant         | • Students are motivated to learn through the influence of external reinforcing stimuli (e.g. self-administered rewards)  
                   • Internal processes can be observed through learners’ overt behaviours (Mace, Belfore & Hutchinson, 2001)                                           | • Placing influence on and subsequently observing learners’ overt behaviours related to self-regulated learning                                                                                     |
| Phenomenological| • Emphasis is on one’s perceived identity (self-concept)  
                   • Motivation to enhance one’s self-concept is the primary stimulus of self-regulated learning (McCombs, 2001)                                                                                           | • Strategies to develop the self-concept of learners to influence self-regulated learning                                                                                                           |
| Information     | • Underpinned by theories of human cognitive architecture  
                   • Learners will self-direct learning to commit information to long-term memory when motivated to close a gap in their knowledge (Winne, 2001)                                          | • Designing instruction to enhance learner motivation to self-regulate learning to address a gap in their knowledge                                                                                 |
| Constructivist  | • Intrinsic motivation to learn is driven by cognitive conflict or curiosity  
                   • Learners will develop skills to self-direct learning in an attempt to resolve disequilibrium (Paris, Byrnes & Paris, 2001)                                                   | • Establishing learning tasks to support the inherent human motivation to make sense of their experiences by directing their own learning                                                              |
| Volitional      | • Emphasises learners’ knowledge of the factors that influence learning and their ability to control these  
                   • Motivation is responsible for self-regulatory decision making; volition is responsible for enacting these decisions (Corno, 2001)                                      | • A learner’s awareness of their own barriers to learning and a knowledge of learning processes to overcome them                                                                               |
| Vygotskian      | • Language is not only a method of communication but also serves a function of self-direction  
                   • Children use the external speech of adults and internalise it into their own thoughts to direct and regulate behaviour (McCaslin & Hickey, 2001)                  | • Self-regulation in children and links to language development                                                                                                                                  |
Table 2.1 explains the key ideas and focus of the perspectives not chosen for this study. The social-cognitive perspective offered the view that self-regulation is not a fixed trait; rather, it is a process influenced by interactions between personal, behavioural and environmental processes (Bandura, 1991). Such interactions are ever-changing: at any point in learning, influences from any of these factors may be stronger than the others. Therefore a social-cognitive perspective considers self-regulated learning to be highly contextual, rather than simply a skill that one does or does not possess (Schunk, 2001). Hence, self-regulated learning is viewed as a process rather than a skill that is adapted depending on the requirements of the context.

Self-regulated learning requires the learner to purposefully instigate and sustain learning. This is achieved through selecting strategies to attend to information and establishing study environments that are conducive to learning. Self-regulated learning occurs when a student can regulate behaviours and the learning environment through the use of personal processes (Zimmerman, 1989); this skill depends on a learner’s ability to organise and implement the necessary actions for success in a specific learning context.

An experienced learner can find it difficult to understand the processes required when transitioning to a student-directed learning environment. Research investigating the student experience in problem-based learning has shown that students entering a postgraduate medical degree often experience stress and uncertainty relating to learning processes (Evensen, 2000). Furthermore, students are not always successful in realising effective learning strategies for the context, and may resort to using less effective methods that they are more familiar with (Evensen et al., 2001). This demands an understanding of how learners can best be supported in developing effective self-regulated learning processes when entering a student-directed learning context.

Problem-based learning offers a context for investigating the impact of supports for self-regulated learning in a student-directed curriculum. Students studying in this environment are expected to acquire skills for lifelong learning beyond the classroom.
This investigation was concerned with learners in a postgraduate medical curriculum. These learners had proven to be successful in their previous academic domain. Upon transition to a problem-based learning curriculum at medical school, students were expected to adapt their learning strategies to the new environment without explicit guidance for the development of self-regulated learning skills.

A social-cognitive perspective was chosen for this study due to its consideration of the interactions between the person and the context. This view supports the assertion that a learner’s self-regulated learning skills can, and will, change upon transition to a new learning environment. Furthermore, it argues for learners to be explicitly supported in the development of self-regulated learning skills so that they may use these beyond the formal learning environment.

2.2 Developing self-regulated learning

The ability to self-regulate learning depends on the learning context. However, it is often assumed that learners who have been successful in one learning context (e.g. a prescriptive, lecture-based course) will automatically adapt their strategies for success in another (e.g. a student-directed, inquiry-based course). Challenges arise when learners who do not have an understanding of the processes involved in self-regulated learning are expected to apply them in formal learning situations and beyond.

New learning contexts require learners to apply different learning processes. Evidence demonstrates that learners can experience difficulty in adapting self-regulated learning skills from one context to another when left unguided (Ennis, 1990). When a skilled and successful learner enters a new context for the first time, their lack of contextual experience reduces them to the status of a novice learner (Boekaerts, 1997). For such learners to become expert in the new context, they require an understanding of effective learning strategies for that particular context.

Learners benefit from guidance when developing skills in self-regulated learning. Research shows that when left unguided in the early phases of new skill acquisition, learners are more likely to set themselves ineffective goals and experience higher levels of failure, and are more likely to experience negative feelings about themselves
(Zimmerman & Kitsantas, 1997). Similarly, Schunk (2001) writes, “Although some self-regulatory processes (e.g. goal-setting) may generalise across settings, learners must understand how to adapt specific processes to specific domains and must feel efficacious about doing so” (p. 126). Curriculum designers must consider support strategies for self-regulated learning in the early phases of a course, as well as methods of making the skills in self-regulated learning more obvious to learners. Without such guidance, learners are left to discover strategies for themselves, often with varying levels of success.

Learners entering a new context look for structure to direct their learning. This is achieved in traditional classrooms through lectures and assessment tasks that dictate what is to be known and how knowledge is to be demonstrated. In a more contemporary, inquiry-based context, it is the student who directs the learning. Dolmans and Schmidt (2000) showed that novice learners in a student-directed curriculum will initially seek external methods to help them regulate their learning, and that even though that such students turned to faculty-provided resources, including textbooks and lecture notes, for guidance, they often adopted ineffective learning methods in the early phases of their degree. While such approaches were reported to change over the four years of their degree, students would have been much more aware of effective learning strategies had they been made explicit at the outset.

Learners should be supported to gain effective self-regulated learning skills. A well-designed learning environment is one in which the development of self-regulated learning skills is explicitly guided (Boekaerts, 1997; Dabbagh & Kitsantas, 2005; Ennis, 1990). When learners understand the necessary skills for the context, they are able to set effective plans for learning. This indicates that support for the development of self-regulated learning requires explicit instruction in effective cognitive strategies that are relevant to the new context. This study focussed on self-regulated learning for novice learners in a problem-based learning context.
2.3 Self-regulated learning processes and strategies

Self-regulated learning, a cyclical process involving a dynamic interplay among three phases of learning: forethought; performance or volitional control; and self-reflection (Zimmerman, 1998). Figure 2.1 illustrates the relationships between the phases in a model of self-regulation, reflecting the actions that effective learners engage in throughout the learning process.

![Academic learning-cycle phases](Zimmerman, 1998, p. 3)

The learning process is initiated with a period of forethought: the processes that influence the learner’s efforts to act upon learning. The forethought phase involves elements of task analysis and self-motivational beliefs. Learners consider their knowledge and perceptions, as well as self and context aspects, in relation to the task (Pintrich, 2000; Van den Boom, Paas & van Merriënboer, 2007). Once such a diagnosis has been conducted, learners must consider the elements and confront them in a plan to address learning. In planning for learning, the self-regulated learner must be adept in setting goals and developing an effective plan to achieve them.

Forethought is followed by the performance or volitional-control phase, which involves processes to attend to and maintain learning. In this phase learners engage in learning and monitor their progress toward attaining their learning goals. Self-regulated learners observe the various aspects of their learning process and realign their learning as necessary (Van den Boom et al., 2007). The performance or volitional-control phase requires the learner to decide whether their current learning strategies are effective in helping them to achieve their goal, or if another strategy may be required. Throughout this phase, the self-regulated learner must monitor and adjust their strategies to ensure learning goals are met.
The final phase of the cycle is the self-reflection phase. In this phase learners judge and react to the experience of their performance efforts. Within this process they evaluate the task, self and context aspects to consider what factors contributed towards the results (Van den Boom et al., 2007). Self-reflection in turn influences the forethought in the subsequent learning attempt, thus continuing the cycle of self-regulated learning. Self-reflection is therefore an important process for future episodes of learning.

Self-regulated learning involves specific sub-processes that learners undertake to attend to each phase. These sub-processes are the important acts over which the learner must exert control. The task of identifying and understanding all of the sub-processes within the phase of self-regulated learning is complicated. Researchers have identified a method of principled skill decomposition by which cognitive processes can be dissected to understand the sub-processes involved in complex cognitive skills (Van Merriënboer, 1997). The principled skill decomposition method was used to understand the sub-processes of self-regulated learning and resulted in the development of a *Self-regulated learning profile chart* (Van den Boom et al, 2007). Figure 2.2 shows an adapted version of the chart showing the first three levels of decomposition. (Appendix 2.1 contains a full version of the chart, in which the third level is further elaborated.)
In Figure 2.2, Level One of the chart represents the starting, performing phase and finishing phases of the learning process. These phases relate directly to the forethought, performance/volitional control and self-reflection phases in Zimmerman’s model as shown in Figure 2.1.
Level Two of the self-regulated learning profile chart demonstrates the main processes within each of the phases. In the starting phase, self-regulated learners orientates themselves and plan towards learning. In the performance phase, learners monitor their learning and make adjustments accordingly. In the finishing phase, learners evaluate the learning process they undertook.

The processes shown in Level Two are further decomposed into a third level that shows the elements involved in each of the processes. Level Three of the chart was informed by the self-regulated learning framework of Pintrich (2000), the self-regulated learning models of Boekaerts (1997) and Winne and Hadwin (1998) and the multidimensional approach of learning competence presented by Masui and De Corte (2005) to inform the elements necessary for each phase of self-regulated learning (Van den Boom et al., 2007). The full reproduction of the self-regulated learning profile chart (Appendix 2.1) provides greater detail in the third level to reveal a more specific description of each element.

The self-regulated learning profile chart provides researchers with a clear understanding of processes in which self-regulated learning can be supported. It was created with task, self, contextual and planning aspects included. These components align with a social-cognitive understanding of self-regulated learning. The chart was developed by researchers specifically to understand detail of the sub-processes within self-regulated learning (Van den Boom et al., 2007), who used it to inform research investigating the effect of elicited reflections and suggestive feedback on the development of self-regulated learning in the higher-education context. The researchers found that when compared to a control group, students who were supported in the reflective processes of self-regulated learning demonstrated positive outcomes in self-regulated learning skills. Those who also received tutor feedback on their reflections outperformed other students in terms of learning outcomes. By using the self-regulated learning profile chart, the researchers were able to clearly identify the specific sub-processes that they were supporting within their study.

Self-regulated learning is a complicated and multi-faceted interplay of cognitive processes. The self-regulated learning profile chart provides a structure for understanding the different sub-processes that occur within the phases of self-
regulated learning. The chart has been previously used to understand how learners’ self-regulated learning can be supported in higher-education contexts from a social-cognitive perspective. Given its inclusion of aspects of task, self and context in self-regulated learning, the chart provides a clear understanding of the various sub-processes in which students can receive support. As explicit and contextual support for self-regulated learning was the focus of this study, the chart provided the framework on which a deeper understanding of self-regulated learning sub-processes was achieved. Based on this, the researcher was able to design explicit support that attended to the self-regulated learning needs of learners in the problem-based learning context.

2.3.1 Starting phase of the learning process
The starting phase requires learners to clarify their learning direction and to decide on strategies for achieving success in learning. The starting phase of learning is concerned with the learner’s sub-processes as they orientate, and as they then plan for learning. In the problem-based learning model examined in this study, the starting phase of learning begins at the beginning of a fortnightly learning cycle when the students are introduced to a patient presentation. An understanding of the aspects involved in orientating and planning allow for direction in how students can best be supported in these sub-processes.

2.3.1.1 Orientate
Orientation occurs in the starting phase prior to the learner embarking on a new learning task. Self-regulated learners execute a diagnosis of aspects of the task, themselves and ways the context may help or hinder learning. A diagnosis of the task aspects involves the learner exploring elements such as the learning goals, required time, required resources, ideal study environment and the prerequisite knowledge and cognitive processing strategies required for the task (Van den Boom et al., 2007). A diagnosis of the context requires a learner to consider the physical study environment, the available resources, the social environment and sources for help such as peers and teachers (Van den Boom et al., 2007). Both the task and context diagnoses influence each other, and are influenced by the diagnosis of self.
During orientation the diagnosis of self has a heavy influence on learners' choices about the learning process they will use. Learners explore their personal learning goals, their mastery of cognitive processing strategies, their prerequisite knowledge and how much time they have available. Underlying the self-diagnosis process are self-motivational beliefs including:

- **Self-efficacy** – one’s belief about their ability to perform a task (e.g. I have the knowledge and skills required to solve this problem)
- **Outcome expectations** – one’s belief about the ultimate outcome of learning (e.g. I will become a doctor)
- **Intrinsic interest** – one’s personal interest in learning for self rather than external acknowledgement or reward
- **Goal orientation** – the focus of goals (Zimmerman, 2000).

In their diagnosis of self, self-motivation beliefs affect the learner’s ability to engage in learning. A learner’s drive to plan and engage in learning processes and sustain their actions to achieve a goal depends heavily on their self-efficacy (Bandura, 1997). Self-efficacy can change depending on the context. For example, a learner who is operating at a very high level and achieving top results in an undergraduate degree may feel confident with their approaches to learning. Upon a move to a more difficult course where one is surrounded by other equally successful and high-achieving learners, such as medical school, a learner may feel their confidence falter. Thus a perception of self is influenced by the context, which in turn influences other learning choices.

During orientation a student’s positive diagnosis of self, task and context can be influenced by their perceived ability to effectively plan for learning. Research has shown that when learners are taught and can demonstrate effective goal-setting and planning skills, they display increases in self-efficacy beliefs, skill acquisition, positive self-reaction and intrinsic interest (Zimmerman & Kitsantas, 1997). A positive diagnosis of self, task and context during orientation can lead to more effective plans for learning. The more self-efficacious a learner is, the higher the goals they set themselves, and the more committed they will be to attaining them (Bandura, 1991). Support for the sub-process of planning for learners in problem-based learning
is therefore beneficial to a learner's ability to plan for learning, while also influencing a positive orientation.

### 2.3.1.2 Plan

After orientation, the self-regulated learner confronts the diagnosis of the task, self and context and designs an action plan for learning. To do this they are required to set themselves personal learning goals and create a plan to achieve them.

Self-regulated learners set goals in the starting phase of learning. Goal setting is the process by which one determines the specific outcomes they aim to achieve as a result of their learning experience. Most learners enter an educational course with an overarching outcome goal; for example, “I want to learn the content associated with this course.” In order to achieve this outcome goal the learner must set smaller and more focussed process goals to guide their progress towards the main outcome.

Process goals allow learners to achieve small goals in the journey toward a larger outcome goal, setting a pathway and providing evidence of progress towards the attainment of higher-level outcomes (Zimmerman, 2000). Research on the developmental phases of goal setting in self-regulated learning has shown that in the early stages of learning, self-efficacy, skill and intrinsic interest increase as a result of setting process goals (Zimmerman & Kitsantas, 1997). By setting process goals to direct their learning, students in this study were able to measure points of success along the way and continue to attend to learning until success was achieved. For students in problem-based learning the development of effective goal-setting strategies is important for its effect on self-perceptions in achievement and its impact on learning.

The next stage is to design a plan to achieve goals. This involves consideration of the goals, time and resource availability, the physical and social environment and appropriate learning strategies. For learners to create an effective, plan they must have knowledge of a range of strategies for various learning purposes. Theories of human cognition identify the importance of active organisation of new information into existing knowledge structures for learning to occur (Sweller, van Merriënboer, & Paas, 1998). Learning strategies, such as concept mapping and creating tables and
charts, are examples of information-organisation strategies that achieve this. Students must have an understanding of a range of strategies if they are to be expected to select the most appropriate one for the situation.

The choice of the most effective cognitive strategy depends on the context and task. To learn independently, learners require knowledge of cognitive strategies that are based on an understanding of the context in which one is learning (Boekaerts, 1997). For learners entering a new context these strategies are not always apparent and obvious. Consideration is required to determine how learners can be supported to set goals for learning, select appropriate cognitive strategies and make effective plans to attend to their learning goals. This study focuses on support for students to identify gaps in their knowledge and to create a plan to address these in the orientation phase to enable effective learning in the performing phase.

2.3.2 Performing phase of the learning process

The performing phase, which requires the learner to oversee and control the progress of their learning, focuses on learners’ processes as they monitor and adjust their learning. The performance phase of the learning cycle is therefore concerned with self-observation and self-control (Zimmerman, 2000).

In the problem-based learning examined in this study, the performing phase occurs within a fortnightly cycle that commences with a patient presentation and concludes with a final discussion of the students’ findings. Between these two sessions, learners must monitor their achievements towards their learning goals, and make adjustments where necessary. An understanding of the aspects involved in monitoring and adjusting learning provide insight into how learners can be supported to attend to these sub-processes.

2.3.2.1 Monitor

Self-regulated learners continually monitor their progress towards goal achievement within the learning process. Self-observation refers to the monitoring processes whereby learners consider their performances, the conditions in which they occur and the resulting effects of their actions (Bandura, 1991). Self-observant learners monitor their set goals, their progress towards achieving them and the factors that affect this
(Schunk, 2001). Their observations then inform the adjustments required to continue learning and ultimately succeed in accomplishing the set objectives. Monitoring processes drive learners’ attempts to control, regulate and change learning, and are therefore imperative to the performing phase of the learning cycle. Effective monitoring strategies were important to the problem-based learners in this study, who were required to independently attain knowledge and understanding throughout each fortnightly cycle.

Monitoring occurs through acts of reflection. Within this the learner reflects on aspects of the task, themselves, their plan and the context. Research has shown that when prompted to record their reflections, learners demonstrate positive outcomes in self-regulated learning (Zimmerman & Kitsantas, 1996). Self-recording allows learners to assess the efficacy of their strategies and give themselves feedback in a meaningful manner, and ensures that they are actively engaged with the monitoring process. As they monitor their own learning, self-regulated learners determine recurrent patterns that affect their successes and failures in their approaches to learning. This promotes a better understanding of how to operate in their learning environment, and helps them stay focussed on their original learning goals and intentions. Moreover, they can evaluate their findings to make adjustments to their learning processes where necessary.

2.3.2.2 Adjust
The performing phase of learning often involves ongoing iterations of monitoring and adjusting. Through ongoing monitoring, self-regulated learners continue to adjust their approaches to learning. As with the previous phases, adjustment occurs within aspects of the task, self, context and plan (Van den Boom et al., 2007). With respect to the task, learners adjust learning goals and cognitive processing strategies where required. Alongside this, they attend to themselves as they maintain motivation, self-efficacy, concentration and volition to continue to work towards their goals. They must also adjust the context where possible to suit their learning needs; this involves accessing appropriate and available resources and addressing distractions within the physical study environment. Self-regulated learners must maintain an environment of social support and call upon peers and teachers for guidance when needed. With such
a large number of factors requiring consideration and competing for their attention, learners must demonstrate qualities of self-control.

In the performing phase, learners demonstrate self-control over the task, themselves and the context by selecting and using strategies that help them to achieve learning while controlling internal and external influences. Self-control processes help learners focus on the task at hand and to engage in actions that optimise their efforts towards goal achievement (Zimmerman, 2000). Literature supports the idea that the ability to select various strategies for a variety of learning situations is essential for effective learning (Corno, 2001; Pintrich, 2000). To apply self-control, learners instruct themselves to execute set tasks and purposefully focus their concentration in an effort to cancel out other factors competing for their attention. When learners are aware of, and able to use, effective learning strategies appropriate to their environment, they are more likely to block out other distractions and invest more effort towards learning (Boekaerts & Corno, 2005). Learners are well equipped to avoid distractions to their learning when they are made aware of them and know effective strategies to control them.

The performing phase of learning relies heavily on the quality of the goal setting and planning in the forethought phase. When learners have set clear and specific goals, they can monitor their progress toward achieving them. With a clear plan for learning, students can monitor the efficacy of the strategies they have chosen. This study is therefore concerned with how learners can be supported to monitor and adjust during the performing phase based on the goals and plans created in the forethought phase. Learners can then reflect on their approaches in the finishing phase.

2.3.3 Finishing phase of learning process

In the finishing phase, a self-regulated learner executes an evaluation of their learning. In the iterative nature of self-regulated learning, these evaluations in turn affect the learner’s approach to future learning episodes.

An evaluation of learning involves acts of self-judgement. People judging their own performance towards achieving their goals often use four types of criteria: mastery, previous performance, normative and collaborative (Zimmerman, 2000).
• *Mastery criteria* provide evidence of their learning progress through graduated achievements. Such evidence of sub-goal achievement provides an index by which learners may view their progress towards task mastery.

• *Previous performance criteria* are the self-comparison of current performance against earlier performance. For example, one may compare one's current learning strategy selection with previous strategies, based on their respective efficacy in achieving learning goals.

• *Normative criteria* involve the comparisons of one’s own performance to the performance of others. This is often manifested in a competitive manner and can lead people to focus on the negative aspects of their performance.

• *Collaborative criteria* are concerned with cooperation in a team environment and are not always applicable to academic settings, where, instead, the focus is on performance in a competitive team endeavour.

The type of goals that a learner has set in the earlier phases of learning influences the criteria they choose for self-judgement. When learners focus on an overarching outcome goal there is a predisposition to compare their performance against that of others using normative criteria selection (Zimmerman, 2000). As this comparison often focuses a learner’s attention on negative aspects, it can unconstructively affect their self-judgement. The importance of well-designed support for goal setting in the forethought phase is emphasised here for the impact goals can have on self-judgement.

Process goals provide personal benchmarks with which the learner can compare their achievements through mastery and previous performance criteria. This allows them to focus on personal growth and achievement rather than an ineffective comparison to others. As discussed, when learners set themselves hierarchal process goals in the starting phase, and work towards achieving them in a sequential order, learning and motivation are enhanced (Zimmerman & Kitsantas, 1997). The effect of positive goal-setting skills in the starting phase is directly related to the quality of evaluations in the finishing phase. Therefore, they have a significant impact on future attempts at learning. This adds further agency to the argument for support for learners in developing effective goal-setting skills.
The processes within the finishing phase in turn influence future attempts at learning. When learners are satisfied with the efficacy of their learning they will be in better stead to accept the challenge of further learning episodes. In an evaluation of learning, self-reaction results from learners' satisfaction with their performance and to what cause they attribute their results (Pintrich, 2000). This has implications for their motivation and choice of future learning strategies. Learners’ motivation is enhanced when they are satisfied with their approaches to learning; however, future learning may be inhibited when students perceive that they do not have the ability to succeed, or that harder work is required (Schunk, 2001). Helping learners to identify enablers or blocks to learning can further support them in their control over their own learning.

Adaptive attributes are those elements that learners believe they have control over and can make changes to; for example, poor strategy use, rather than lack of ability. Learners who credit their performance to adaptive attributes are more likely to demonstrate positive benefits from cognitive strategy choices, motivation and self-belief (Zimmerman, 1998). Research demonstrates that when learners engage in an explicit reflection activity, their ability to regulate their learning is improved, their attributions become more constructive and their sense of being in control over successes and failures is increased (Masui & De Corte, 2005). Self-reactions cyclically effect the forethought phase of self-regulated learning, and can greatly affect the learner’s progress toward goal achievement.

This model illustrates the aspects of the task, self and context within self-regulated learning. Effective self-regulated learners independently control elements within these; however, their ability to do so changes as the aspects themselves do. As changes occur in one aspect, the learner must evaluate the situation, and adjust their plans accordingly. For learners entering a new context or pedagogical approach, a change in the context or task can greatly affect the aspect of self. If they are unaware of the requirements for self-regulation within the context and are not prepared with strategies to confront it, learning and belief in themselves can be affected. For researchers investigating supports for self-regulated learning, paramount importance must be placed on an understanding of the learning context and which effective self-regulated learning strategies that can be applied within it.
2.4 Self-regulated learning in problem-based learning

Problem-based learning as a pedagogical approach was conceived in medical education in the 1960s. Members of the curriculum committee at McMaster University’s medical school set about developing a pedagogical strategy that would stimulate and motivate students to learn whilst they acquired professional attributes relevant to the medical role for which they were training.

Since its original development, the concept and practice of problem-based learning has been contextually modified, adapted and applied in educational settings around the world. Problem-based learning is now used in areas such as business, law, psychology, engineering and education (Schmidt, Loyens, van Gog & Paas, 2007). Due to context- and discipline-specific adjustments, problem-based learning as it first emerged now has a number of variations. Regardless of these variations, problem-based learning by its broadest definition is a process whereby a problem, or scenario, plays a central role in stimulating learners to seek information in an attempt to understand the issues relating to the situation, hence developing knowledge that can then be generalised to other situations (Davis & Harden, 1999).

There is great debate about the compatibility of problem-based learning with human cognition. Some say that problem-based learning is an unguided form of discovery learning that is difficult for learners who are not aware of or familiar with the required strategies. Problem-based learning is believed to place excessive cognitive load upon inexperienced and novice learners (see Kirschner et al., 2006). Others say that in problem-based learning, learners are guided in the acquisition of the necessary skills. They describe problem-based learning as an approach in which learners are highly scaffolded by a tutor or more-experienced other (see Hmelo-Silver, Duncan & Chinn, 2007; Schmidt et al, 2007). It is important to clarify here that problem-based learning in the context of this study is a guided, collaborative strategy that is supported by the facilitation efforts of a tutor (Hmelo-Silver et al., 2007; Schmidt et al., 2007), rather than a do-it-yourself approach to learning as put forward by Kirschner et al. (2006).

The ability to facilitate the development of self-regulated learning can vary from tutor to tutor. Many tutors in medical education are highly competent in their professional
field, yet may not have engaged in formal training in the principles of education (McLeod, Steinert, Meagher & McLeod, 2003). Furthermore, learning to teach using a problem-based approach can add additional challenge for many who are unfamiliar with such open-ended teaching strategies (Spronken-Smith & Harland, 2009). Research that has focussed on the variation in tutoring in problem-based learning has demonstrated that despite even the best training efforts, there is still great variance in tutor quality (De Grave, Dolmans & van der Vlueten, 1999). These findings support the argument for explicit support for the development of self-regulated learning that does not depend on the quality of the tutor. Such support, directly integrated into the curriculum and accessible to the learners, should aim to enhance the outcome of self-regulated learning skills for students in problem-based learning.

Studies have investigated the outcomes of problem-based learning versus a traditional approach to medical education. Researchers have reported that while attainment of clinical knowledge is equivalent amongst learners from both groups, problem-based learning students develop better skills in problem-solving and teamwork (Beachey, 2007; Rideout et al., 2002). These studies characterise problem-based learning students as life-long learners who display the ability to recognise gaps in their knowledge and aptly employ strategies to fill these gaps. These qualities are also relevant to the theoretical body of self-regulated learning.

Various studies have investigated the development of self-regulated learning in problem-based learning. A review of the associated literature provides a clearer picture of the issues. An analysis of research literature on problem-based learning found that a problem-based learning curriculum supported the development of learners who were able to direct their own learning, employ deep-level processing study strategies and apply their knowledge in a variety of contexts (Blumberg, 2000). However in one case study in which six first-year medical students observed throughout their first semester in a problem-based learning curriculum, when support was not explicit the development of self-regulated learning strategies took many different forms, which were not always positive in promoting learning and academic achievement (Evensen et al., 2001). The authors reported that merely creating an environment in which self-regulated learning was required did not necessarily foster effective strategy development.
Social-cognitive theories of self-regulated learning acknowledge the contextual nature of the skills required for successful control over one’s own learning. There is support to suggest that self-regulated learning develops through active interactions with the concepts and structure within a specific content domain (Boekaerts & Cascallar, 2006). This understanding highlights the need for researchers and teachers in problem-based learning curriculums to take closer notice of theories of self-regulated learning, and to work towards the integration of pedagogically sound programs for the development of effective self-regulated learning skills. Furthermore, the context must be explored to inform the needs of learners prior to developing such programs.

This study was underpinned by a social-cognitive perspective of self-regulated learning, and addressed the need for explicit instruction of the processes to support novice learners in a problem-based learning curriculum. As a result, this study was conducted with a phase of inquiry to understand the learner experience within the context. The researcher then developed and investigated a program aimed at supporting self-regulated learning in problem-based learning, specific to the medical-school context. The program focussed on explicit tasks that reflected the processes and strategies of self-regulated learning as outlined earlier in this chapter. In this manner participants were guided through the iterative cycle of self-regulated learning to investigate whether there were any outcomes associated with direct instruction.

2.5 Research related to this study

Problem-based learning was designed so that learners would develop life-long learning skills required for the medical profession. The premise of problem-based learning is that the development of effective self-regulated learning skills is an explicit outcome for students in this pedagogical approach (Loyens, Magda & Rikers, 2008). This assumption creates the view that the problem-based learning pedagogical strategy itself will support the development of self-regulated learning skills, and therefore explicit support is not required. This section presents the limitations of this view to justify the importance of this research project in addressing a need to understand the outcomes for learners when they are offered explicit and contextualised support for self-regulated learning within problem-based learning.
2.5.1 Development of self-regulated learning within problem-based learning

Research on student control over learning is emerging in medical-education contexts that use problem-based learning as their pedagogical approach. Much of this research often describes characteristics of self-directed learning (SDL). A review of literature describing self-directed learning showed it to be consistent with the processes within self-regulated learning (Zimmerman & Lebeau, 2000). Therefore, the two terms have been used interchangeably in the literature. Due to this alignment, research in the fields of both self-directed learning and self-regulated learning are used to inform this study. However, as a theory of self-regulated learning underpins this study, the term 'self-regulated learning' is used throughout.

Self-regulated learning is an assumed outcome of a problem-based learning curriculum. This assumption has led to clear gaps in the literature. There is limited research investigating explicit support for the development of self-regulated learning, and thus limited understanding of how learners might engage with such support or the outcomes for their learning. Researchers interested in self-regulated learning within problem-based learning commonly observe the development of self-regulated learning, free from the presence of support programs (e.g. Evensen et al., 2001). An analysis of evidence-based literature was conducted to respond to the question ‘Are problem-based learning students self-directed learners?’ (Blumberg, 2000). In this review the author focussed on research that compared problem-based learning students to traditional-education students, along with research that assessed problem-based learning students against problem-based learning graduates. Literature on teacher and student perceptions of self-regulated learning in problem-based learning further informed the review. The results of this analysis demonstrated that both teachers and students felt that self-regulated learning skills developed as a result of a problem-based learning curriculum. Students were shown to actively seek resources, employ deep-level processing strategies for studying, and perceive themselves to be effective in regulating and directing their own learning.

A number of researchers have made comparisons between learners in traditional contexts and those in problem-based learning contexts, finding that learners using problem-based learning were more likely to identify hypothesis-related learning
issues, develop well-specified plans for learning and integrate new information into their problem-solving, when compared to the non-problem-based learning students (Hmelo & Lin, 2000). Such research found significant support for the assertion that problem-based learning fosters self-regulated learning skills for many medical students. However, the experience for learners entering the problem-based learning environment and how self-regulated learning develops both need further consideration.

Tutors are expected to play a critical role in the development of self-regulated learning skills. A social-cognitive view represents that self-regulatory skills are best developed initially through observation of persons with greater experience in the environment (Schunk & Zimmerman, 1997). Research on tutoring styles in problem-based learning has confirmed that tutors who focussed on the learning process were perceived by their students as being much more effective than tutors who focussed on content (De Grave et al., 1999). Problem-based learning tutors are encouraged to use strategies such as think-alouds to model their thought processes in clinical reasoning to their students (Barrows, 1988). However, in a case study of six learners in a problem-based learning curriculum over one semester, researchers did not witness this practice (Evensen et al., 2001). These findings suggest that student knowledge of self-regulated learning skills are important to their learning, but are not always effectively modelled by their tutors. Without an effective model, and void of any other support in self-regulated learning, students are burdened with the task of having to discover for themselves how to adapt their learning for success.

For a novice learner entering a new learning environment there is a great amount of new information to attend to. Observation of the student experience upon entering a problem-based learning medical curriculum has shown that there is a great deal of angst and uncertainty amongst first-year students with relation to what and how to learn (Lloyd-Jones & Hak, 2004). Researchers have sought to understand how the students directed their learning in a problem-based learning medical context (Dolmans & Schmidt, 2000). In their investigation of 150 students ranging from first year through to fourth year, Dolmans and Schmidt (2000) found that in the early phases of problem-based learning learners relied heavily on faculty-provided resources and their peers to guide learning. These tendencies reduced over time as the
learners became more adept at the processes involved. To understand this in greater
detail, further research investigated how learners in their first semester in a problem-
based learning curriculum self-regulated their learning (Evensen et al., 2001).
Through the case studies of six novice students, researchers found that while students
did become more attuned to effective learning strategies specific to the environment,
this was not without some cognitive and affective stress. While some students
discovered new and effective strategies, others retreated to previously learnt strategies
that were less effective in the new context. A trial-and-error approach for finding and
adapting learning strategies did not always result in success. Ultimately, this research
concluded that in terms of the student experience in the first semester of a problem-
based learning medical curriculum:

Some achieved that potential by finding a balance that optimized their
capabilities and combined them with learning opportunities of the program.
Others failed to reach that potential by the end of their first semester but might
have if the environment had been more fully sensitive to student needs and
programmatic shortcomings. Theories of situated self-regulation might
provide the guidance necessary to help educators create such environments
(Evensen, Salisbury-Glennon & Glenn, 2001, p. 674).

This study aims to build upon current research that demonstrates flaws in the
assumption that self-regulated learning is a natural and almost effortless output of this
pedagogical approach. Self-regulated learning support in other learner-directed
environments is further investigated to inform the development of a program for the
problem-based medical-education learning context.

2.5.2 Interventions to support self-regulated learning
There is limited research investigating explicit support for self-regulated learning in
the context of problem-based learning. For this reason, this study looked beyond
problem-based learning to investigate literature pertaining to supports for self-
regulated learning in other contexts. Such supports varied in their approach and
efficacy, and required consideration.
Inquiry-based pedagogical approaches are a common context for investigations of self-regulated learning. These approaches are often developed on the premise that self-regulated learning will develop when students are left to their own devices in an unguided, constructivist activity. Research was conducted with ninth-grade students in a group science inquiry that was specifically designed to foster self-regulated learning (Eilam & Aharon, 2003). This program involved students pursuing a complete line of scientific inquiry from the planning stages through to investigation and report over an entire term, and “although teachers recommended actions, students could literally do whatever they liked” (p. 308). The researchers found that high-achieving students demonstrated more self-regulated learning skills than their average achieving peers. This finding supports the argument that not all learners will be successful in developing skills in self-regulated learning when unguided in this process.

Other attempts to support self-regulated learning involve courses that are designed specifically to teach learning skills. A 'Learning to Learn' module in an undergraduate psychology course was designed and investigated to understand how it promoted learning-skill development (Hofer & Yu, 2003). Learners could attend a course that ran for four hours a week over one semester, the goals of which were to teach students the concepts of cognitive and motivational psychology and increase their knowledge and repertoire of learning strategies. The results of their data demonstrated that students who participated in this course increased in mastery orientation, self-efficacy and use of cognitive strategies. This study was limited by the absence of a control group, and also by the decontextualised nature of the program. The social-cognitive perspective focuses on the contextual nature of self-regulated learning skills. While the researchers reported benefits for the learners in the course, they were unsure as to the learner’s success when required to adapt the skills to another learning context. This study presents the possibility that self-regulated learning may be supported; however, further consideration is required to ensure that the contextual nature of self-regulated learning is acknowledged.

Supports for self-regulated learning that are contextual and integrated into the learning activity have a positive effect on learning and self-efficacy. Zimmerman and Kitsantas (1997) investigated the effect of goal setting and self-monitoring in the
acquisition of complex motor skills among 90 high-school girls, finding that when the
girls set themselves process goals, and shifted to outcome goals, they were more
likely to develop higher self-efficacy and skill development, positive self-reactions
and intrinsic interest. This was further enhanced when explicit self-recording was
integrated into the process. This study highlights the value of support for self-
regulatory processes in the development of skills.

Support for processes within self-observation and self-monitoring also enhance self-
regulated learning. Researchers investigated the effect of training on reflection and
attribution in an undergraduate business-economics course (Masui & De Corte, 2005).
They found that as a result of their intervention, students demonstrated greater
aptitudes in these areas than the control group. Further studies have investigated the
effect of reflection prompts and feedback for students in a web-based distance-
education course (Van den Boom et al., 2007). The researchers reported that explicit
support in these areas led students to positive gains in self-regulated learning.
Furthermore, in the area of hypermedia, researchers demonstrated that learners
became better at self-regulated learning when an adaptive scaffold was present as they
adapted their learning of complex tasks in a new learning environment (Azevedo,
Cromley & Seibert, 2004). Each of these studies highlights the benefits to self-
regulated learning when learners receive explicit support in the various processes.

A review of the relevant literature identifies a clear gap in current research. Whilst
various studies show the benefits of explicit, contextualised supports for self-
regulated learning skills, research in problem-based learning in medical education is
yet to address this need. This study addresses this by investigating the outcomes of a
program to support self-regulated learning in a problem-based learning medical
curriculum.

2.6 Conclusion

This chapter provided an overview of the literature relevant to this study. The
literature review established the theoretical underpinnings of the study, the nature of
the research context, and the gaps in current research. These considerations were
applied to an investigation of supports for self-regulated learners in a problem-based
learning curriculum. This was designed to contribute to further understanding in this area.

A social-cognitive perspective was chosen to underpin this study, as it promoted the dynamic and contextual nature of self-regulated learning. A decomposition encompassing aspects of the task, self and context (Van den Boom et al., 2007) guided an understanding of the sub-processes within self-regulated learning. This was considered in the context of problem-based learning and the student experience in this environment.

A review of the literature revealed the assumption that self-regulated learning is an outcome of problem-based learning. Observations of the student experience in this environment have shown that significant stress is placed upon the learner and effective self-regulated learning strategies do not always result (Evensen et al., 2001; Lloyd-Jones & Hak, 2004). Researchers in other environments have established that explicit support for self-regulated learning promotes effective strategy development (Azevedo et al., 2004; Masui & De Corte, 2005; Van den Boom et al., 2007; Zimmerman & Kitsantas, 1997). With interventions for self-regulated learning shown to be effective in other contexts, this research sought to understand how this could be applied to the problem-based learning context.

This study contributes to the field of knowledge in self-regulated learning. The research context was identified as a student-directed, inquiry-focused curriculum approach in which self-regulated learning was assumed to develop. Research in other contexts demonstrated positive learning outcomes for students when they are explicitly supported in the development of self-regulated learning skills. This study identified a void in research that investigates explicit support in self-regulated learning for students as they enter the problem-based learning environment. This study addresses this by investigating the outcomes of a program designed to support self-regulated learning in a problem-based learning medical curriculum.
Chapter Three: Research Design and Phase One

This chapter serves two distinct purposes: it presents the mixed-methods, multiphase design of the entire study; and it reports on and discusses the methods and results of the first phase in the four-phase design.

The overall research design involved a mixed-methods, multiphase approach, with each of the study's four phases of investigation informing the next. This chapter draws upon educational-research literature to explain the rationale for the study design, and presents an overview of the design of each phase. Individual chapters throughout this thesis elaborate further on each phase, starting with Phase One in this chapter.

3.1 Research design

This study addresses the need for evidence-based research in the design and delivery of high-quality education. Curriculum development that is not supported by educational theory and research can result in uninformed and ineffective educational practice. The current study sought to address this by designing a program informed by relevant literature and an investigation of the learning context. Learner engagement and program outcomes were tested through an intervention study. The results of this study contribute to the knowledge of self-regulated learning in problem-based learning, specifically in higher education. These results include empirical evidence to guide and inform curriculum practice. Due to its problem-based learning curriculum, a graduate medical school in which self-regulated learning was deemed an important attribute of successful learners was chosen as the context for this study.

Design of research methods for investigating medical education is a topic of debate. As medicine is a science-based discipline, there is often a belief that strict, randomised controlled trials are the most effective way to conduct research in this area. Specific to investigations of educational interventions in medical education, it has been stated that “in the hierarchy of study designs, the randomized, controlled trial remains the gold standard” (Reed et al., 2005, p. 1082). However due to the non-clinical nature of learning environments, randomised controlled trials are not ideal for evaluating educational interventions, as variables are difficult to control and randomisation is not always feasible (Harden, Grant, Buckley & Hart, 2000; Prideaux,
This suggests the need for researchers in medical education to look for alternatives to clinical forms of investigation. This study considered a range of educational-research literature, so that its findings might be generalised to many areas of higher education.

### 3.1.1 Mixed-methods research

Historically, research methodologies used to investigate educational environments have been based on a choice between quantitative and qualitative approaches. Mixed-methods research has emerged as the “third methodological movement” (Teddlie & Tashakkori, 2003, p. 5). Incorporating both quantitative and qualitative methods, mixed-methods research has significantly increased in popularity among researchers in the social, behavioural and related sciences in recent years (Bergman, 2008), as it offers an alternative to the historic dichotomy between qualitative and quantitative methods.

Mixed-methods approaches allow researchers to collect diverse types of data. Mixed-methodologists work within a pragmatist paradigm and place value on both narrative and numeric data to inform their research (Teddlie & Tashakkori, 2009). A mixed-methods research design is based on the premise that “the combination of quantitative and qualitative approaches provides a better understanding of research problems than either approach alone” (Creswell & Plano-Clark, 2007, p.9). Researchers gain a deeper understanding of the area of investigation through combining theoretical testing and participant feedback (Hanson, Creswell, Plano-Clark, Petska & Creswell, D., 2005). In deciding to use a mixed-methods approach, the researcher must be explicit about the grounds for doing so.

Combining research methods is a complex task and requires justification. There is concern that mixed-methods research has become fashionable, and that its selection is at times, insufficiently rationalised by the researchers who use it (Bryman, 2008). When considering a mixed-methods research design, investigators must be clear in their purpose. Table 3.1 is a detailed list of justified reasons for using a mixed-methods approach, based on researchers’ practices from a review of 232 social-science articles (Bryman, 2006).
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<th>Table 3.1 Reasons for using a mixed-methods approach (Bryman, 2006, p. 105-107)</th>
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<tr>
<td>• <strong>Triangulation or greater validity</strong> – refers to the traditional view that quantitative and qualitative research might be combined to triangulate findings in order that they may be mutually corroborated.</td>
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<td>• <strong>Offset</strong> – refers to the suggestion that the research methods associated with both quantitative and qualitative research have their own strengths and weaknesses so that combining them allows the researcher to offset their weaknesses and draw on the strengths of both.</td>
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<td>• <strong>Completeness</strong> – refers to the notion that the researcher can bring together a more comprehensive account of the area of enquiry in which he or she is interested if both quantitative and qualitative research are employed.</td>
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<td>• <strong>Process</strong> – quantitative research provides an account of structures of social life but qualitative research provides a sense of process.</td>
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<td>• <strong>Different research questions</strong> – this is the argument that quantitative and qualitative research can each answer different research questions.</td>
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<td>• <strong>Explanation</strong> – one is used to help explain findings generated by the other.</td>
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<td>• <strong>Unexpected results</strong> – refers to the suggestion that quantitative and qualitative research can be fruitfully combined when one generates surprising results that can be understood by employing the other.</td>
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<td>• <strong>Instrument development</strong> – refers to contexts in which qualitative research is employed to develop questionnaire and scale items – for example, so that better wording or more comprehensive closed answers can be generated.</td>
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<td>• <strong>Sampling</strong> – refers to situations in which one approach is used to facilitate the sampling of respondents or cases.</td>
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<td>• <strong>Credibility</strong> – refers to suggestions that employing both approaches enhances the integrity of findings.</td>
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<td>• <strong>Context</strong> – refers to cases in which the combination is rationalized in terms of qualitative research providing contextual understanding coupled with either generalizable, externally valid findings or broad relationships among variables uncovered through a survey.</td>
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<tr>
<td>• <strong>Illustration</strong> – refers to the use of qualitative data to illustrate quantitative findings, often referred to as ‘putting meat on the bones’ of ‘dry’ quantitative findings</td>
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<td>• <strong>Utility or improving the usefulness of findings</strong> – refers to a suggestion that combining the two approaches will be more useful to practitioners and others.</td>
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<tr>
<td>• <strong>Confirm and discover</strong> – this entails using qualitative data to generate hypotheses and using quantitative research to test them with a single project.</td>
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Table 3.1 Reasons for using a mixed-methods approach (Bryman, 2006, p. 105-107)

- **Diversity of views** – this includes two slightly different rationales – namely, combining researchers’ and participants’ perspectives through quantitative and qualitative research respectively, and uncovering relationships between variables through quantitative research while also revealing meanings among research participants through qualitative research.

- **Enhancement or building upon quantitative and qualitative findings** – this entails a reference to making more of or augmenting either quantitative or qualitative findings by gathering data using a quantitative or qualitative research approach.

In the review of the literature that informed Table 3.1, it was noted that researchers often had multiple reasons for using mixed methods, and that new reasons emerged throughout the process of the study (Bryman, 2006). It is important that researchers have at least one clear reason when making the initial choice to use a mixed-methods approach (Creswell & Plano-Clark, 2011).

The researcher in this study adopted a mixed-methods approach for several reasons. First among these were *completeness* and the use of *different research questions*. A mixed-methods approach was justified, as the researcher sought a more comprehensive account of the development of self-regulated learning in a problem-based learning curriculum than could be achieved from using a quantitative or qualitative approach alone. Different questions were asked to understand the context of the study, which then informed the development and investigation of a contextually bound program for the support of self-regulated learning. A mixed-methods approach was used as it provided the researcher the platform to ask questions to investigate both engagement with the program and its impact. Mixed methods provided a pragmatic framework to assess the program. Such an approach is valued among those seeking to evaluate the merit and worth of social programs in a way that offers integrity and rigorous research (Rallis & Rossman, 2003). Therefore a mixed-methods approach also offered *credibility* to the findings. To be able to achieve its goals, this study required more than one phase of inquiry.

Mixed-methods research can be conducted in varying designs. Six major mixed-methods designs have been identified: convergent, explanatory, exploratory, embedded, transformative and multiphase (Creswell & Plano-Clark, 2011). A
multiphase, mixed-methods research design combines the collection of quantitative and qualitative data over multiple phases within a study, making it well suited to investigations of program development and evaluation (Creswell & Plano-Clark, 2011). A multiphase design was chosen for this study as it provided a framework in which a needs assessment informed program development prior to program evaluation, refinement and testing; the research design let each phase build on what had been learned from the one before.

The multiphase, mixed-methods research design was used to address a set of incremental research questions that each informed the next phase within the study. Figure 3.1 provides an overview of the four phases of the study. (This figure is repeated in each chapter, with highlighting to indicate which phase the chapter discusses).
Figure 3.1 Overview of the research design

Qualitative methods were adopted to respond to research questions in Phases One and Two. Phases Three and Four combined qualitative and quantitative methods for data collection and analysis. Methods for each phase are discussed in detail in the relevant chapters relating to each phase. Phase One is presented here.
3.2 Phase One

The purpose of Phase One was to gain a contextual understanding of the experience of novice learners in the transition to a problem-based learning medical curriculum. This investigation sought to understand how students chose which learning strategies to use to direct their own learning, and how they felt other students could be supported in this transition. The research questions specific to Phase One were:

- How do first-year medical students experience problem-based learning?
- What strategies do students use to support their learning in a problem-based-learning medical curriculum?
- What strategies do students think could support learners entering a problem-based-learning medical curriculum?

Phase One was designed to investigate the student experience upon transition to a problem-based learning environment. In this phase the researcher sought to understand the student experience, and how current students thought future students might be supported in this transition. Research designed to develop and test context-specific programs commonly seek knowledge of the context prior to program development (Creswell & Plano-Clark, 2007). The findings of Phase One were used to inform program development and evaluation in the subsequent phases.

3.2.1 Method for Phase One

Phase One was designed to collect data relating to the context. Figure 3.2 shows the components of this phase and how it relates to the remainder of the study.
Figure 3.2 shows the overarching design of this multiphase, mixed-methods study highlighting Phase One. Focus groups were the selected strategy for data collection in Phase One. Focus groups are a qualitative research method that can be used to explore human thoughts and experiences. Frequently used in marketing research throughout the 1970s, focus group methods have become more prevalent in other discipline areas.
(Fern, 2001). In the area of sociology, focus groups are defined as “a research technique that collects data through group interaction on a topic determined by the researcher” (Morgan, 1996, p.132). Through this definition, focus groups are acknowledged to be interactions and discussion in a group setting, actively led by a researcher for the purpose of data collection.

Focus groups have inherent features that make them highly suitable for exploratory purposes. The following strengths of the focus-group method are among those identified by Johnson and Turner (2003, p. 310):

- Useful for exploring ideas
- Allow good interpretive validity
- Can obtain in-depth information about exactly how people think about an issue
- Allow probing
- Allow most content to be tapped
- Allow quick turnaround

However, when considering the strengths of an approach, the limitations must also be realised and addressed where possible. Table 3.2 shows the weakness of the focus-group method as also identified by Johnson and Turner (2003) and reports on the strategies used by the researcher to overcome the limitations.
Based on the strengths, and with strategies in place to overcome the limitations, focus groups were determined to be an effective way to investigate the student perspective of the transition experience to problem-based learning.

### 3.2.2 Research participants

Participants were recruited from a graduate-entry medical school in an Australian university (this context has been discussed in greater detail in Chapter One, Section 1.5). Participants were recruited on a voluntary basis from the Year One cohort of students at the medical school in 2008. These participants were chosen due to their recent transition to a problem-based learning curriculum. Participants who had just

<table>
<thead>
<tr>
<th>Limitation (Johnson &amp; Turner, 2003, p. 310)</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sometimes expensive</td>
<td>No costs associated</td>
</tr>
<tr>
<td>Possible reactive and investigator effects if participants feel that they are being watched</td>
<td>Researcher builds rapport with participants before interview. Conversational, low-stakes environment created.</td>
</tr>
<tr>
<td>May be dominated by one or two participants</td>
<td>Researcher moderates discussion to tactfully resolve any power struggles and to ensure all participants are provided with opportunities to respond.</td>
</tr>
<tr>
<td>Very difficult to generalize if small unrepresentative samples are used</td>
<td>Small sample size appropriate for the purpose of contextual analysis in this setting.</td>
</tr>
<tr>
<td>Focus group moderator possibly biased</td>
<td>Semi-structured questions developed to elicit the student perspective of the learning context free from moderator opinion or bias.</td>
</tr>
<tr>
<td>Might have low drop rate</td>
<td>Focus group schedule kept succinct, and discussion facilitated by the researcher to keep the discussion moving to maintain participant attention.</td>
</tr>
<tr>
<td>Measurement validity possibly low</td>
<td>Not applicable to this study</td>
</tr>
<tr>
<td>Usually should not be the only data collection method used in a study</td>
<td>Other data collection methods used in this mixed-method study.</td>
</tr>
<tr>
<td>Data analysis sometimes time consuming</td>
<td>Focus groups were seen to be less time consuming than the alternative of individual interviews.</td>
</tr>
</tbody>
</table>
completed the first semester of their transition were considered to be most appropriate, as the experience was still current.

The recruitment process occurred through a lecture presentation and email system. The researcher presented the study via PowerPoint presentation during a clinical skills lecture where all students were expected to be in attendance. Students were offered four different times allocated to focus group sessions. Interested students were invited to email the researcher to indicate their willingness to participate and the focus group session that was most suitable for them to attend. Based on this voluntary response, students were allocated to the focus group session of their choice. While four focus group sessions were initially planned, one session did not receive any response from interested students.

A total of 12 students participated in one of three focus-group sessions held in September, 2008. The groups included eight females and four males. The participant group included representatives from a range of undergraduate discipline areas including the arts, mathematics and health sciences.

3.2.3 Ethics
Potential ethical issues were considered to ensure that this study was not compromised, nor would it compromise participants in any way. Ethics approval was sought from and granted by the institutional Human Research Ethics Committee (Appendix 3.1 contains the approval letter).

Participation in this study was voluntary, and potential participants were assured that the choice not to participate had no impact on their academic relationship with the university. The researcher had no relationship with the medical school beyond it being the context of study. Potential participants were provided with information about their role in the study, and those who took part provided written consent (Appendix 3.2 contains the information sheet, and Appendix 3.3 the consent form). Participants were informed that they could withdraw from the study at any time.

All data was securely stored in a locked filing cabinet and on a password-protected computer. Identifiable data was only accessible to the researcher and was not made
available to those involved in teaching or assessing participants. All data was de-
identified prior to publication of study findings.

3.2.4 Data collection and analysis

Data collection

Participants attended one of three focus-group sessions. A semi-structured question
guide was used to direct the focus-group discussion (Appendix 3.4). The question
guide included questions about the learner experience in problem-based learning and
the learning strategies that participants used. Qualitative, or semi-structured,
interviewing is a strategy that facilitates “conversations with a purpose” (Burgess,
1984, p. 102). This approach promotes an interactional and informal exchange of
dialogue with a flexible structure to allow the emergence of unexpected themes
(Mason, 2002). Semi-structured questioning was used in this phase of the study to
allow the researcher to generate a meaningful and contextually bound understanding
of the research questions.

In the design of a semi-structured interview guide, the researcher listed the three
overarching research questions for Phase One, then subdivided these into smaller,
more conversational questions. This approach ensured that important topics were
covered, while still allowing participants to express their views; this gave the
interviewer flexibility to move with the group’s direction (Mertens, 2005).

Research question 1 was related to the student experience upon transition to problem-
based learning. Participants were asked to share their experiences in the first semester
of medical school. They were presented with a scenario in which they were asked to
tell a newly enrolled student about what to expect when they commenced study. The
researcher engaged in the conversation by seeking clarification where necessary.

Research question 2 sought to investigate learning strategies that students new to
problem-based learning used. Participants were asked to discuss each type of learning
activity in which they took part during their fortnightly learning cycle; this gave
participants the opportunity to elaborate on the different strategies they used. The
researcher prompted participants to consider each of the learning activities by asking
them about each one individually.
Research question 3 was written to understand how students who were new to problem-based learning could best be supported. Participants were asked to consider what information or support they would have found to be helpful when they entered the context. Once again, the researcher only engaged in conversation by prompting for elaboration where clarification was required. The focus group was audio-recorded and transcribed verbatim for analysis.

Data analysis
A coding process provided a systematic approach for the analysis of textual data (Creswell, 2009). The research questions provided the primary codes into which the focus-group data could be grouped for further analysis. These primary categories included experiences, strategies and thoughts on supporting effective learning. A fourth category was added to include other items of interest. These codes provided the framework for a second level of analysis. The transcripts were read and emerging themes within each primary category were added as they became apparent in the data.

Consequently, the following coding scheme was developed:

Focus-group data-analysis codes relevant to the first research question for Phase One included:

<table>
<thead>
<tr>
<th>1.0 Experiences: responses relating to the student experience in problem-based learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Time – references to perceived course workload requirements, amount of content to learn, and time spent studying</td>
</tr>
<tr>
<td>1.2 Knowledge – references to perceived prior knowledge requirements of students</td>
</tr>
<tr>
<td>1.3 Group – references to the experience of the groups learning environment</td>
</tr>
<tr>
<td>1.4 Curriculum structure – opinions relating the PBL curriculum structure and the student experience within it</td>
</tr>
</tbody>
</table>
Data codes used to investigate the second research question for Phase One included:

<table>
<thead>
<tr>
<th>2.0 Strategies: responses relating to the learning strategies that students were using in the PBL context</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Preparation – references to how they prepared for learning before they actually engaged in learning</td>
</tr>
<tr>
<td>2.2 In Class – references to specific learning strategies employed in various face-to-face learning sessions</td>
</tr>
<tr>
<td>2.2.1 CBL/PBL sessions</td>
</tr>
<tr>
<td>2.2.2 Lectures/Labs</td>
</tr>
<tr>
<td>2.3 Individual study time – references to specific learning strategies employed during self-guided study time</td>
</tr>
<tr>
<td>2.3.1 Resources– references to learning resources used during self-guided study time</td>
</tr>
<tr>
<td>2.4 Self-assessment – references to how students assessed their own learning progress</td>
</tr>
<tr>
<td>2.5 Collaborative/group learning – references to specific strategies to initiate and guide group learning interactions</td>
</tr>
</tbody>
</table>

Codes used to guide analysis of the third research question for Phase One included:

<table>
<thead>
<tr>
<th>3.0 Thoughts on supporting effective learning: responses relating to how future students could be supported to understanding effective learning strategies upon entry to PBL</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Curriculum – strategies that could be curriculum based</td>
</tr>
<tr>
<td>3.2 Non-curriculum – strategies that could stand outside of the curriculum</td>
</tr>
</tbody>
</table>

A fourth code allowed the researcher to include items that did not relate directly to the questions:

| 4.0 Other items of interest |

Each focus-group transcript was reread, and sections were allocated to relevant coding categories accordingly. The researcher interpreted the data in each code to create meaningful explanations of the findings in relation to the research questions. Given the interpretive, open-ended and contextualised nature of this phase of the
research, data was used to provide thick, rich descriptions as a procedure for establishing the credibility of the study (Creswell & Miller, 2000). As such, participant responses are reported verbatim in the ‘Results’ section to enable the reader to consider their own interpretations of the findings (Hays & Singh, 2011).

3.3 Results
The research questions for Phase One provided the over-arching themes for reporting the analysis of the focus-group data: experiences, strategies and thoughts on supporting learners.

3.3.1 Experiences
The experiences theme reported on data that addressed the question, How do first-year medical students experience problem-based learning?

*Time*
Most participants in all three focus groups indicated that finding enough time to complete their studies was a common problem. Their discussion focussed on the amount of content that was delivered and a lack of clarity as to the depth of information they needed to learn. One participant expressed this in his response:

> With the learning objectives it’s hard to know when you first get into the course how much information you need to know, because you have an objective and it seems so huge. You could spend two weeks on one objective (Participant, Focus Group 1).

*Prior knowledge*
A consistent concern shared by at least half of the participants was the amount of prior knowledge they felt they were expected to have for participation in learning experiences. One participant said, “I still find that a little bit frustrating now. We kind of need to know a lot of background to the presenting complaint to be able to know questions to ask” (Participant, Focus Group 1).

Participants whose backgrounds were in discipline areas other than science described their lack of basic science to be a major challenge. This was discussed by one
participant: “Not coming from a medical-science background, I feel so far behind the eight-ball. I feel like I’m playing catchup the whole time” (Participant, Focus Group 1).

Group learning
Group learning was a positive experience for some, yet a negative for others. One participant reported, “I hate group learning and that’s why I don’t like the (problem-based learning) stuff. I’d rather be given a chapter in a textbook and I’ll go and read it and I’ll understand it” (Participant, Focus Group 3). This same participant also said that having to discuss knowledge in a group situation often made him feel as though he had not learnt enough, or had not studied the correct things. Others reported that fellow students in their group were a source of frustration when they talked too much or presented as being overly confident with their grasp on the knowledge. This participant reported, “Some people just feel as though it’s their duty to take over the group and show everyone how much they know. It can be pretty intimidating” (Participant, Focus Group 1).

Not all participants reported frustration with the group learning experience. Those who found themselves in a highly functional group reported enjoyment with the experience and said that it helped them to learn. While only four of the 12 participants reported being part of a well-functioning group, the importance of commitment to the group process was recognised, as “It only works because everyone in the group wants it to work” (Participant, Focus Group 2). Some of the strategies these participants used to promote effective group functioning are discussed in Section 3.3.2.

Curriculum structure
The problem-based learning curriculum structure was initially difficult to understand for a majority of the participants. Most participants felt as though the problem-based learning process was not clearly communicated to students in the beginning of the course. This caused a lot of unnecessary stress.

To get thrown into a whole new degree with a new way of thinking and a new way of learning, it’s pretty tough. By the time you get six months into it, I feel like I’ve lost that whole six months. That’s pretty heavy. I could’ve learnt this
All of the participants agreed on this as an early frustration, though some found that it began to dissipate with time as they experimented with strategies to cope.

To begin with, I had no idea where the objectives were coming from so I stuck to the lectures to guide my learning. Now I’ve got more knowledge, I’m able to break those down and I know where to look for those objectives (Participant, Focus Group 1).

Others clearly did not like the structure, even after the settling period: “It’s just not structured enough for me” (Participant, Focus Group 3).

3.3.2 Strategies
Problem-based learning requires the use of different learning strategies than those applied in traditional classrooms. This was confirmed by a participant who stated, “In my other degree, I didn’t do anything before the exams and then I just crammed the night before and forgot it all afterwards. Now I’m trying to change my strategies” (Participant, Focus Group 2). The strategies theme was used to analyse data relating to the question, What strategies do students use to support their learning in a problem-based learning medical education curriculum? The strategies were categorised according to what students did to prepare for learning, what they did in formal learning sessions and how they structured individual study time, selected resources, assessed their own learning and organised their groups to function in a collaborative manner.

Preparation
Participants discussed how they prepared for learning at the beginning of each fortnight. Participants discussed two strategies that they used to gather a basic understanding of the content matter prior to attending class.

One strategy, popular amongst the participants, was to read the faculty-provided online resources prior to lectures and clinical-skills classes. One participant reported,
“I have read the pre-reading available online and they help me to understand the lecture material” (Participant, Focus Group 2).

Another strategy used by two of the participants was to read the timetabled lecture topics in advance and access their own resources on the topics. For example, one participant said, “I like to look at [the] timetable to see what the lecture content is and read up on it in...one of my favourite textbooks before class” (Participant, Focus Group 2).

Not all participants liked to prepare before class. One student preferred to “go in completely unprepared to keep an open mind” (Participant, Focus Group 2). This was supported by another participant from another focus group, who reported this as a method to cope with the large workload of medical school. She described a strategy that she had developed to avoid spending large amounts of time researching a topic, often to find that most of it was covered in class later in the fortnight. She said:

> When we get the (problem-based learning) objectives, I go through the timetable and tick off lectures that relate to the objective and I do not do my own research. I will just wait for the lecture and then if I think there is anything more I need to know after the lecture, then I will do more research (Participant, Focus Group 1).

**In class**

In the problem-based learning introduction sessions (during which a patient was present), one strategy was for participants to use a framework for taking a patient history. This strategy use was used by each of the four participants who had previously worked in the field of nursing. They would use a history-taking system that was already familiar to them from their previous hospital experience, as this participant quote demonstrates: “I try to group information into presenting complaint, history, medical history, family history, social history etc. I have a nursing background and this comes from my work experience” (Participant, Focus Group 1).

For many others, there was a realisation that they could develop a greater understanding from watching the presentation, and not focus on note-taking. About
half of the participants in the focus groups indicated that they preferred not to take notes. For example, this participant said:

At the start I used to write it all down but now, as I’ve gone through, I write less and less. Just because we get a lot of the information back anyway, so I only tend to write the things that are most relevant. I get more out of sitting there watching and listening to the patient (Participant, Focus Group 1).

*Individual study time*

Participants discussed the different strategies they applied to their individual study time.

One strategy was to use the course learning objectives to structure individual study time. Three participants discussed their creation of an *objective book* in which they would dedicate one full page to each of the learning objectives that were established in the first problem-based learning session of each fortnight. They would work throughout the fortnight to address each learning objective and write up a one-page summary for each objective to demonstrate an understanding of the topic for the fortnight. The record also acted as a reference for further reading. One participant voiced the importance of keeping the entries succinct with reference to the source: “One page per objective. It has to be something that can be read at a glance. I also keep record of the text where information came from in case I need to refer to it later” (Participant, Focus Group 2).

Other participants talked of a bank of possible exam questions made available to them by the medical school in an online environment. Five participants discussed how they would use these questions to structure their individual study time by creating summarised responses. They found that by categorising the questions into topic areas, they could create succinct study notes and file them in individual folders, specific to the different topic areas. One participant shared how she did this by “[p]utting specific questions into topic ‘buckets’ and summarising into succinct study notes in topic folders” (Participant, Focus Group 3).
For most, addressing gaps in knowledge as they appeared was important. This was illustrated when one participant stated:

You never get the time to go back. Now with anything that comes up, like if I don’t understand something, I used to go, "Oh, I’ll look it up later", but now I don’t, I say "No, I’ll look it up right now" because I know I’ll never make the time to come back to it later (Participant, Focus Group 3).

The need to address gaps in knowledge often led participants away from the focus content. Most participants found themselves being distracted by other interesting information. Participants agreed that it was important to be specific about study intentions so as to maintain focus on the current topic. This participant reminded himself of his goals to help direct his learning:

I try to stick to the core of things and not go off on tangents. I’m trying to balance between the fact that when I finish I want to be able to practice independently and well, but I also want to get through the exams (Participant, Focus Group 3).

Though individual study time was mostly reserved for working alone, some participants had found that they learnt more effectively when they were able to talk about content with their peers. Four of the participants used a group learning strategy in their individual study time by finding other students who were willing to study together. One participant shared his approach to working with another student when not in a formal group learning situation:

The biggest thing I’ve changed to is that I do a lot more talking. I’ve found the best way to learn is to sit with someone and just quiz each other back and forth. See how much we can recall before we need to get a book (Participant, Focus Group 2).

Resources
Participants discussed their strategies for selecting and using resources. All of the participants agreed on the need for information that was easy to comprehend. For most, this meant selecting resources that provided an overview of the topic prior to
using a more detailed resource to gain deeper understanding. Participants found that when using text books that provided detailed information, it was useful to skim over the major points first before deciding which ones to read in greater detail.

I use one [book] because I find that it explains things in terms that I understand. It is quite detailed in some sections but I don’t ever go into the huge details. Sometimes I just skip over and just find the important bits (Participant, Focus Group 3).

During the focus-group sessions participants also discussed specific textbooks and websites that they used to access information. This involved sharing with each other the resources that they had purchased, borrowed or accessed to find the information relevant to what they were to learn. While these discussions were taking place, participants were observed to be taking down notes of the various resources that were spoken about. Participants reported great value in talking to their peers and discovering new resources in the focus group, as stated by this participant: “Just talking in this group today has given me new ideas of different ways I could study and other resources to look at” (Participant, Focus Group 2).

Self-assessment
During the focus-group sessions participants discussed strategies that they had developed to self-assess learning progress. This was agreed to be a very important activity, as there was no formal feedback until the end-of-year exam. Most of the participants talked of how they would access the online self-assessment questions to rate their current understanding, and determine areas where they needed to revise. For example, this participant said, “You can sit there and think that you know things, but when you test yourself it gives you a better idea of where you’re at” (Participant, Focus Group 1).

Collaborative group learning
Beyond the formal problem-based small-group tutorials, some participants chose to meet more often than once a fortnight in a group. For some this was an extra meeting with students from their existing small group. For others, new groups were formed when they felt their assigned small group did not work well together. In total, four of
the 12 participants in the focus-group sessions reported that they had become a member of a well-functioning study group.

Regardless of how the group formed, participants discussed some important guidelines that they believed enhanced their group interactions. All participants agreed that at the beginning of the course, time should be taken to plan together how the group would function so that all team members had a part in creating the plan for group cohesion. One participant clarified this by stating, “The group needs to set an agenda, you know, outlining what it is you want to get done as a group, that way everybody’s on the same page. That’s huge” (Participant, Focus Group 2).

Each group had a unique approach. In a group that was self-formed (not directed by a tutor), strategies were found to evolve as learners discovered more-effective learning techniques.

With everyone involved it’s a lot better than a didactic process of one person doing one objective and talking to it through PowerPoint slides, which is the way we started. It wasn’t very educational. It’s now a lot better. It’s become a group discussion (Participant, Focus Group 3).

Another self-formed group used a similar approach that also ensured that the group members had to focus on all of the learning objectives:

Everybody does all of the objectives, and... you pull out of the hat which one each group member will be talking about. The chosen person is expected to stimulate group discussion. This makes everyone study each objective and then learn them by talking them out and leading the group (Participant, Focus Group 2).

One problem-based small group made the most of their resources in an extra group meeting throughout the fortnight. They arranged their meeting topics based on the presence of their tutor, or otherwise: “My group has an extra session on the Thursday of week one and we make that our science day, and we make Monday our clinical day
because we have a GP (general practitioner) as a tutor [that day]” (Participant, Focus Group 2).

Participants in well-functioning groups were able to benefit from the social structures they formed. Each of the participants who participated in group learning beyond problem-based small-group tutorials indicated that they shared resources through an email system with their groups.

Not all participants were fortunate enough to be part of a well-functioning group. Of these focus groups, only four of the 12 participants reported extracurricular group activity. One participant noted a desire to work in this way, though did not know how to initiate it:

Apparently those groups that learn in group sessions, such as this, where you talk about things, is that you learn a lot more, you know, it becomes cemented. So I keep thinking, "Oh, I should be doing that". Even if it’s not with my own CBL group, but forming another one – but it’s just finding the people and the time (Participant, Focus Group 1).

3.3.3 Thoughts on supporting learners
This theme reported on data that asked the question, What strategies do students think could support learners entering a problem-based learning medical education curriculum? Participants were asked this question directly, and their responses were coded into curriculum and non-curriculum categories.

**Curriculum**
A majority of the participants felt that greater guidance was needed to help students understand the problem-based learning process upon transition to medical school. One participant stated, “The first session wasted a lot of time trying to get the students to work out what they wanted. It needed to be better guided” (Participant, Focus Group 1). A participant in another focus group supported this by saying, “The very first session could have been less PBL and a little more ‘walked through’ or explicit in what students were required to do” (Participant, Focus Group 3).
Participants discussed the idea of integrated support to help learners understand the processes. For example, one participant suggested, “Give a bit of scaffolding. That might work. Then take it away” (Participant, Focus Group 3). While they were unclear about how this might be achieved, all participants agreed that any addition to the curriculum should be integrated into the existing timetable. If it were to be introduced as an extra activity it would make further demands on their already limited time.

Non-curriculum

From their experience of sharing in the focus-group sessions, participants indicated the value they found in speaking with each other about learning strategies. From this experience, one participant suggested the invaluable resource of more-experienced learners.

Having somebody who has done the (problem-based learning) thing before and getting advice on how they did it, but not just from one person because everybody learns in different ways, but learning different strategies that they’ve used and what worked for them (Participant, Focus Group 1).

There was a high level of agreement among the other participants in the focus groups in terms of the value of discussion with others; however, consensus was divided about the best way to achieve this. One participant suggested “setting up a forum saying ‘ok guys, this is what’s working for me’. We’re all so attached to our computers anyway. We’re all on there and we’re all chatting anyway and that’s a good way to access everyone” (Participant, Focus Group 1). However, another participant disagreed with this method: “That wouldn’t work for me. Because of my background, I don’t use the (Internet) café. Last time I studied, there was no Internet” (Participant, Focus Group 1).

3.4 Discussion

Phase One was conducted to investigate the student experience in the first year of study in a problem-based learning medical curriculum. It aimed to identify the learning strategies that learners developed within this context, and collect ideas for how new students could be supported in this environment. The findings of Phase One
offered unique insight into the student experience within the context, and confirmed reports in the literature about the student experience upon transition to problem-based learning.

### 3.4.1 How do first-year medical students experience problem-based learning?

Students selected for postgraduate programs in medical education are often assumed to be skilled and confident learners. The findings of Phase One illustrate that this assumption can lead to learning environments in which novice learners feel overwhelmed and unsure of how to approach learning. Participants in this phase shared their experiences of transition to the problem-based learning context and commonly reported challenges within both individual and group learning situations.

Learners new to problem-based learning reported feeling as though they did not have a foundational knowledge on which to build new knowledge. This was of particular concern for students who did not have a medical-science background. For these students, this created frustration as they felt as though they had to learn a lot more than some of their peers to be able to understand the content in detail. While these students attributed this to their non-medical-science background, further findings showed that understanding what and when to learn was a common problem for many.

For most learners in their first year of problem-based learning, trying to understand how much they should learn on any particular topic was of major concern. The increase in the volume of information associated with medical school meant that participants in this study were overwhelmed with the amount of content and did not know how to gauge when they had studied sufficiently. As a result, learners reported that they were spending a great amount of time attending to their studies, and were still left unsure as to whether or not they had learnt enough. These findings are not unique to this study. A study that explored transition issues, strategy use and self-regulated learning practices of 36 medical students in a Canadian medical school reported that an increased volume of information was the most common transition issue identified (Reaume & Ropp, 2005). Other transition issues that were reported included increased time pressures and more stress. In the current study, focus-group
participants attributed workload stresses to the volume of information, and also to the structure (apparent lack of it) of the problem-based learning curriculum.

Learners found the new curriculum structure to be confusing at first. Participants discussed the time spent on trying to adapt their learning strategies, agreeing that the time could have been better allocated to learning content. Most participants indicated that they were able to develop some effective learning strategies that helped them to feel more comfortable with their approach. However, toward the end of the first year of study, there were still some participants who remained uncomfortable with the lack of structure in the curriculum.

Research has reported on experiences among learners in other problem-based learning medical-education contexts. Evensen et al. (2001) found from observations of learners in their first semester of problem-based learning that equally capable students can have very different experiences and levels of success with the development of skills for this context. The authors reported on the case studies of six learners in their first semester of problem-based learning. These learners presented many of the same issues cited in the findings of Phase One of the current study, including limited prior knowledge, feelings of being overwhelmed by content, a need to know everything, a desire for greater guidance and structure within the curriculum and dissatisfaction with a group approach. The authors reported that some students were able to discover effective self-regulatory skills, while other retreated to strategies from previous learning environments that were less effective for problem-based learning.

A group learning approach aims to provide learners with opportunities to observe learning processes within problem-based learning. For some participants in Phase One, the group scenario was found to exacerbate their own insecurities and issues with the problem-based learning approach. They felt that group discussions merely reminded them of how much they did not know. Research published on group dynamics in problem-based learning has reported learner frustration with other students dominating discussion and group sessions (Duek, 2000). Through observation of and interviews with learners in this context, the author identified the different roles and behaviours that emerged in the small-group sessions. As roles were not assigned to students, there were members within each group who self-selected
their position, resulting in much angst among group members. These findings reflected the experience of some students in Phase One of this study.

For others in Phase One, the group experience was positive learning environment. It was apparent that for these participants, well-functioning groups set strategies in place to structure and manage the group interactions. Researchers who have observed the functioning of effective groups in problem-based learning have also reported that collaborative learning does not result from simply meeting in a group; guidelines for collaboration are required (Faidley, Evensen, Salisbury-Glennon, & Hmelo, 2000). This suggests the benefits of greater structure for learners when organising their learning in group activities.

Phase One of this research has demonstrated that the student experience of transition to problem-based learning often involves complication and self-doubt. This can be magnified as a result of unstructured individual and group activity within the curriculum. These findings were not isolated to the context of this study, but were also identified in literature reporting on the learner experience in similar contexts around the world.

3.4.2 What strategies do students use to support their learning in a problem-based learning medical curriculum?

For success in problem-based learning, learners must realise the need for appropriate learning strategies. The findings of Phase One demonstrated a range of strategies of which learners had become aware towards the end of their first year of study in this context. Participants in this phase discussed the strategies they had developed for learning in both individual and group learning situations.

Learners used a range of different strategies to attend to individual learning in this context. These included the use of pre-readings and lecture topics to guide preparation for class. Many allocated their individual study time guided by the course learning objectives. Others used an online bank of exam questions as an indicator of what to study. Dolmans and Schmidt (2000) found that reliance on faculty-provided resources such as course objectives, lectures and tests is common among students in their first year of problem-based learning, but those who successfully progressed through to
their fourth year were more likely to identify and set study goals according to their own needs and interests. While such research suggests that learners in problem-based learning are likely to develop skills in self-regulated learning, it does not report on the students who were unsuccessful in completing their studies in this context.

Goal setting is an important strategy used by effective self-regulated learners. A majority of the participants in this study reported difficulty in maintaining learning focus and knowing how much they should learn. Only one participant discussed the use of goal-setting techniques to guide his learning, sharing how he used goals to help him to maintain a learning focus. This example provides further evidence for claims that while some students realise effective self-regulated learning skills, this is not the case for all (Evensen et al., 2001). This was also found to be true of groups and effective group-work strategies.

Successful group functioning was found to relate to clear and established guidelines of effective group practice. Participants who reported being a member of a well-functioning group each discussed a number of different approaches to group work. What was common to all was an underpinning of agreed methods for group interactions. The problem-based learning context requires learner responsibility for the development of effective group strategies (Duek, 2000). Literature on group interactions in problem-based learning supports the need for a structured approach to promote effective group functioning (Faidley et al., 2000). In Phase One of this research, only four of the 12 participants reported being members of a well-functioning group. This meant that for the majority, group learning experiences did not often support learning or the development of learning skills.

Phase One of this study sought to understand how learners could best be supported in the development of effective learning skills in a problem-based learning context. To gain knowledge from participants' personal experience, the researcher asked those in Phase One how they thought novice learners might best be supported in this context.
3.4.3 What strategies do students think could support learners entering a problem-based learning medical curriculum?

The transition to a new learning context can be a challenge for any learner. Participants in this study suggested the need for assistance in the first year of the problem-based learning medical curriculum to support the development of effective learning strategies. It was felt that this would reduce the pressure on students to adapt to the context at the same time as learning substantial amounts of information.

Participants in this study believed that curriculum-based guidance was needed to support learners' skill development. While participants were unsure as to exactly how such support could be achieved, there was consensus that it should be focussed on helping students understand the processes within problem-based learning. Furthermore, it should allow learners to understand effective strategies for operating within the context. Overwhelmingly, all participants agreed that a program aimed at supporting learner transition should be embedded within the curriculum and not place extra demands on learners’ time.

Participants also suggested non-curriculum methods for learning-strategy development. Such suggestions involved the sharing of learning strategies between current and more-experienced learners. While all participants agreed that this would be valuable, they could not agree as to whether this should take place in face-to-face meetings or in an online forum.

Participants in Phase One all agreed on the need for support in the development of effective learning strategies for success in problem-based learning. Furthermore, research also suggests the need to make the processes in self-regulated learning more salient for student success (Evensen, 2000). There is support for training learners when engaging with a new instructional technique to reduce extraneous cognitive load, which places pressure on learning (Schmidt et al., 2007). Phase One investigations confirmed this belief and identified the need for support for the development of self-regulated learning skills to be embedded into the curriculum.
3.5 Conclusion

Phase One of this study was undertaken to investigate the student experience in transition to problem-based learning. Furthermore, it aimed to determine how learners could best be supported when entering this context. This research was designed using a multiphase, mixed-methods approach. This methodology allowed the researcher to combine both quantitative and qualitative methods to investigate the problem by responding to different research questions over four phases of enquiry. A multiphase, mixed-methods investigation is well suited to research that aims to develop and evaluate a social program (Creswell & Plano-Clark, 2011). For this reason, this approach was chosen for the current research study.

Successful students in problem-based learning are those who demonstrate skills in self-regulated learning (Blumberg, 2000; Evensen, 2000; Zimmerman & Lebeau, 2000). These learners are able to determine for themselves any gaps in their knowledge, and plan for learning to address these gaps. However, not all students are able to realise such skills without guidance (Evensen et al., 2001; Lloyd-Jones & Hak, 2004). Research suggests that merely creating an environment in which self-regulated learning is required does not necessarily foster effective strategy development (Evensen et al., 2001). This study sought to investigate the experience of learners new to problem-based learning to understand how they could be supported in the development of self-regulated learning skills.

The findings of Phase One showed that learners new to the problem-based learning context were often overwhelmed by the experience. They were under pressure from the amount of content and unsure of effective strategy use for this context. Participants felt that scaffolding was required to help learners understand the learning processes required for success in this context. It was recommended that a program be designed to integrate such support into the existing curriculum structure.
Chapter Four: Phase Two

This chapter reports on Phase Two of the study. The purpose of this phase was to develop a learning-skills program to support self-regulated learning in a problem-based learning medical curriculum. Design principles in this phase were informed by social-cognitivist theory as it applies to self-regulated learning, and by the findings of Phase One. This chapter reports on the development and initial evaluation of the learning-skills program. It also describes the final design of the program that was tested in Phase Three of this study.

4.1 Design underpinnings

Self-regulated learners are characterised by guiding their own learning. They are aware of a variety of cognitive strategies and know how to select the most appropriate one for a particular task. The choice of the most effective cognitive strategy is context- and task-dependant. In a problem-based learning medical curriculum, learners are required to process and critically consider large amounts of information to develop knowledge and understanding in a self-regulated manner. In the development of this learning-skills program, the researcher considered both self-regulated learning processes and cognitive strategies that have been demonstrated to be effective in problem-based learning. This program was designed to support learners in processes within the self-regulated learning cycle, and to introduce an effective cognitive strategy for the problem-based learning environment.

Based on the findings of Phase One, and relevant research literature, an initial design for the program was developed according to the following principles:

- scaffolding the development of self-regulated learning skills, and
- introducing and supporting the use of concept mapping as an effective cognitive strategy.

4.1.1 Scaffolding self-regulated learning

In problem-based learning students are expected to be responsible for their own learning. It is suggested that, beyond content knowledge, self-regulated learning skills are an important outcome of problem-based learning, as they are necessary for ongoing professional development after medical school (Barrows, 1986). There is
evidence to support that problem-based learning does promote the development of self-regulated learning skills for many learners (Blumberg, 2000). However, further research demonstrates that not all learners develop effective self-regulated skills, and those who do, do not always develop skills without some level of affective stress (Evensen, 2000). The learner experience can benefit from guidance for understanding the salient processes within self-regulated learning.

Participants in Phase One of this study reported a need for curriculum-based guidance to support learning skill development in problem-based learning. Participants presented aspects of the ideal model in the form of embedded supports that were relevant, and allowed learners to understand effective strategies for the given learning context. Ideally, supports should not place extra demands on learners’ time. These guidelines were considered when reviewing models for support in the development of self-regulated learning strategies.

Designs to scaffold self-regulated learning in hypermedia environments offer insightful ideas for supporting students in problem-based learning. These environments are similar in that both require a high degree of learner control. Bannert, Hildebrand and Mengelkamp (2009) developed a metacognitive support program based on three principles: integrated instruction; explanation of the application and usefulness of supported strategies; and training time to allow participants to implement the strategy once it is learnt. They designed an integrated program in which experimental group participants were informed about metacognitive strategy use, and scaffolded through the processes with paper-based metacognitive prompts. As a result of participation in the program, students from the experimental group demonstrated a higher level of metacognitive activity and cognitive organisation strategies than their peers in the control group. Further to this, significant development in transfer performance was noted in the experimental group, indicating that students increased in their skill in applying new knowledge in other contexts.

Another model of support for self-regulated learning in hypermedia environments also offered design principles that aligned with the contextual social cognitivist perspective (Azevedo, Cromley & Seibert, 2004). While this model presented an ideal placement of in-situ support at the time of need (as determined by the computer
programming), this was not able to be replicated in the face-to-face, non-hypermedia context. The design principles implemented by Bannert et al. (2009) met the criteria for a program as recommended by participants in Phase One and was adaptable to the non-hypermedia context. Therefore, the design of the learning-skills program in Phase Two of this study incorporated these principles. Section 4.2 presents the methods used in this study to integrate instruction, explain the application and usefulness of the support strategies and provide training time to allow participants to implement the strategies.

4.1.2 Concept mapping as a cognitive strategy in problem-based learning

Concept mapping was chosen as the cognitive strategy to be introduced to learners in the learning-skills program. Concept mapping is one of many effective learning strategies however the researcher offered only one to allow for comparison between participant’s work samples in this study. Further investigations could consider the introduction of a range of effective cognitive strategies. For the purpose of this study, concept mapping was chosen as a strategy that would enable participants to realise gaps in their learning and use this to inform their goal setting.

Concept maps promote engagement in learning through elaboration and organisation of information. Concept maps, commonly used to represent scientific knowledge, are a graphical arrangement of key concepts with connecting lines to demonstrate meaningful relationships between the chosen concepts (Novak & Gowin, 1984). They offer an information-organisation strategy derived from theoretical developments in education, and are a powerful learning tool to promote meaningful learning (Van Zele, Lenaerts & Wieme, 2004). While constructing a map, learners are engaging with knowledge and creating a representation of their personal understanding as they identify the meanings and relationships between central ideas (Heinz-Fry & Novak, 1990).

Research has shown the efficacy of concept mapping in promoting learning. Empirical testing of the effectiveness of concept mapping has been reported in a meta-analysis of 19 studies (Horton et al., 1993); this analysis found concept mapping to have positive effects on both academic achievement and student attitude to
learning. Furthermore, in a study of 14 participants in one tutorial group in a problem-based learning pathophysiology course, students were paired and given the task of completing an incomplete concept map (Rendas, Fonseca & Pinto, 2006). Participants were asked to complete a questionnaire to ascertain the efficacy of concept mapping in helping them to identifying main concepts, establish the order of the concepts and establish relationships between concepts using key words. The findings of this study reported that the use of concept maps in a problem-based learning course stimulated meaningful learning and the development of effective learning strategies for both individuals and groups. Concept mapping is therefore seen as an important cognitive strategy for learners in problem-based learning.

Beyond learning and academic achievement, concept mapping can also support the development of self-regulated learning. Chularut and DeBaker (2004) investigated the effectiveness of concept mapping as a learning strategy for students with English as a second language, and reported that concept mapping had a positive impact on student achievement, self-regulation and self-efficacy for learning. Specifically, they found that concept mapping fostered the development of self-regulated learning, as it provided visual evidence of goal achievement, and consequently fostered positive self-reaction in the finishing phases of learning. This evidence indicates the efficacy of concept mapping as not only an information-organisation strategy but as a support for the development of self-regulated learning skills. For learners in a problem-based learning curriculum, understanding how to create concept maps can prove valuable to their learning.

Concept-mapping strategies vary in approach, and can be seen in any number of forms. These can include use as a learning strategy (student-generated) and as a teaching strategy (teacher-generated), and also somewhere in between (fill in the blanks). A study of 124 undergraduate students that investigated the effect of different approaches to concept mapping demonstrated that completely learner-generated concept mapping strategies were more effective for knowledge acquisition than maps that were partially learner-generated or entirely expert-generated (Lim, Lee & Grabowski, 2009). These findings indicate that learners in a problem-based learning curriculum benefit mostly from an understanding of how to create concept maps as a
completely learner-generated activity. Therefore, concept mapping was introduced in the design of the learning-skills program in Phase Two as a learner-generated activity.

4.2 Program design
A program to support self-regulated learning in problem-based learning was designed in this phase of the study. To best communicate the design, a visual model was created to represent the activities and supporting resources within the program. The concept of a Learning Design Visual Sequence has previously been used as a way to communicate pedagogical designs to teachers (Agostinho, 2009). This concept is used in Figure 4.1 to present the design of the final learning-skills program developed in Phase Two of this study.
Figure 4.1 Phase Two/Three learning-skills program design

Figure 4.1 illustrates the tasks that participants engaged with in the learning-skills program. It also shows the supports and resources that were designed for the program.

The learning-skills program was designed to support the processes within the self-regulated learning model as presented in Chapter Two (Section 2.3). Following the scaffolding design principle of integrated instruction (Bannert et al., 2009) the planning for learning activities (as shown in Figure 4.1) were created to take place at the beginning of the fortnightly problem-based learning cycle. Learners were
supported to orientate themselves and plan towards learning through activities that guided them to ascertain their current level of understanding and set goals for learning within the current cycle. The *monitoring learning* activities were scheduled for two iterations within the performing phase of learning throughout the middle of the cycle. Learners were supported to monitor and adjust their learning with activities aimed at guiding them through these processes. The *reflecting on learning* activities were designed for the finishing phase of learning at the end of the cycle. Learners were supported to consolidate and reflect on their learning efforts and strategies.

A preliminary training session to introduce the program and the activities to the participants was held in the week before the commencement of the learning-skills program. The 20-minute session included a forum to introduce the program and to gather ethics consent from the participants. This session was designed to address the design principle of explanation of the application and usefulness of supported strategies (Bannert et al., 2009). The session began with an explanation of the learning-skills program and highlighted the importance of self-regulated learning in problem-based learning. Participants were then guided through an example of the self-regulated learning activities associated with the learning-skills program. They were also guided through the schedule to understand how the self-regulated learning activities aligned with the phases within the problem-based learning cycle. Participants were shown how the activities were designed to be integrated within their existing problem-based learning structure (as described in Section 1.5.1). This design promoted the design principle of allowing training time to allow the participants to implement the strategy once learnt (Bannert et al., 2009). As there was no problem-based learning activity at the end of the first week of the cycle, the first iteration of the monitoring learning activities was not embedded into the existing schedule. Instead, learners were reminded of the activity during lecture time so that they could complete it on that day in their own time. Table 4.1 shows the learning-skills activity schedule and where it was to be integrated within the existing problem-based learning cycle.
Table 4.1 Learning-skills program activity schedule

<table>
<thead>
<tr>
<th>Day of PBL cycle</th>
<th>Normal timetabled activity</th>
<th>Integrated learning-skills program activity</th>
<th>Time allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1 Monday</td>
<td>Large-group introduction</td>
<td>Planning for learning</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Day 4 Thursday</td>
<td>Lecture presentation</td>
<td>Monitoring learning</td>
<td>In own time</td>
</tr>
<tr>
<td>Days 8 and 9</td>
<td>Small-group tutorial</td>
<td>Monitoring learning (reminder only)</td>
<td>15 minutes</td>
</tr>
<tr>
<td>Monday or Tuesday</td>
<td>The Wrap-up</td>
<td>Reflecting on learning</td>
<td>20 minutes</td>
</tr>
</tbody>
</table>

The integrated timetable aimed to embed the activities into the participants’ current context to reduce the burden of extra work. The researcher attended the timetabled sessions to prompt interaction with the learning-skills program activities and respond to any questions. A resource book was also provided to guide participants through the program. The first part of the book contained information about the program and to provide a basic overview of self-regulated learning and concept mapping for participants interested to know more about the underpinning of the program design.

The second part of the book provided instruction and prompts for the learning activities and a space to complete them (Appendix 4.1 contains the final version developed in Phase Two). The self-regulated learning activities were each designed to be completed at a particular stage of the problem-based learning cycle (as shown in Table 4.1). Therefore each activity began on a new page and followed on from the previous activity in the cycle. Activities of the first fortnightly cycle were repeated for a second fortnightly problem-based learning cycle. This was designed to be representative of the cyclical processes within self-regulated learning. Table 4.2 describes each section of the resource book in greater detail.
Table 4.2 Contents of the Resource Book

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your part in improving education</td>
<td>This page briefly explains the background to the study in a bulleted format. It also provides a timetable to outline when and where learning-skills program activities are integrated into the existing timetable.</td>
</tr>
<tr>
<td>Self-regulated learning</td>
<td>This section explains the application and usefulness of self-regulated learning to problem-based learning. It also shows a visual representation illustrating the processes involved in self-regulated learning in a problem-based learning curriculum.</td>
</tr>
<tr>
<td>Learning strategy</td>
<td>This part explains the application and usefulness of concept maps as an information organisation strategy. It also provides examples of health related concept maps that were added as a result of the Phase Two evaluation workshop.</td>
</tr>
<tr>
<td>Training resources</td>
<td>This section of the resource book provides a place for participants to implement the preliminary training session activities.</td>
</tr>
<tr>
<td>Fortnight (CBL/PBL) resources</td>
<td>This area of the resource book provides prompting and scaffolding of self-regulated learning processes and concept mapping skills. This section provides instruction on the activities and an area for learners to complete them so that they are supported to implement the strategies that they have learnt.</td>
</tr>
</tbody>
</table>

4.3 Evaluation of the learning-skills program

An evaluation of the draft program was conducted to ensure that the learning-skills program design was suited to the context. Participants from Phase One were asked to meet with the researcher to provide feedback on the draft, which was modified on the basis of this feedback. The result of Phase Two was a final version of the learning-skills program, which was tested in Phase Three.

4.3.1 Method for Phase Two evaluation

Phase Two of this study involved the development and review of the learning-skills program. Figure 4.2 shows where Phase Two is positioned within the four-phase study.
After the design process, the draft program was evaluated in a workshop situation. Participants were presented with a copy of the draft resource book, and told of the preliminary session and timetabled activities. They were then asked to discuss their opinion of the design of the program and resources.
Data was collected during the workshop in a group-discussion format. Group discussions are used to stimulate discussion with the intention that the developing conversation produces the central sources of knowledge (Flick, 2006). This strategy can be applied where the researcher seeks group opinion refined through the processes of discussion. Group discussion was therefore seen as an effective method for collecting data about the student feedback on the draft learning-skills program.

4.3.2 Evaluation context and participants
The evaluation process in Phase Two of the study was conducted within the medical school. Participants were sought from those who had participated in Phase One. By Phase Two of this study these participants had progressed into their second year of study in the MBBS course. This population was selected based on convenience, as they were readily accessible and already had an interest in the research area from their earlier input. Participants were invited to participate via email. Five students agreed to participate.

4.3.3 Data collection and analysis
Ethics approval for this data collection had already been obtained in Phase One (Appendix 3.1). Before the data-collection session in Phase Two, participants were provided with information regarding their role in the study and asked to give written consent (Appendix 4.2 contains the information sheet, and Appendix 4.3 the consent form). Data relating to the design of the draft learning-skills program was then obtained in a group discussion. The collection and analysis of data is discussed here.

Data collection
At the workshop participants were each given a copy of the program resources. The researcher explained the design of the learning-skills program and resources. The participants then engaged in a semi-structured group discussion, which began with the researcher asking the group:

1. Do you feel it would be a useful resource to support learners entering a problem-based learning environment?
The researcher engaged in the conversation by seeking clarification of comments where necessary. This provided the researcher with a thorough understanding of what the participants were saying.

A second question planned for the discussion was:
2. Do you think that any modifications to the program would be required before its integration into the problem-based learning curriculum?

However, a natural transition towards this question occurred in the course of discussion; therefore, the researcher was not required to ask it specifically. The group discussion ended when participants commented that they felt they had provided all of their feedback. The researcher invited them to add comments via email if they thought of any other feedback after the discussion session.

Data analysis
The workshop was audio-recorded and transcribed verbatim by the researcher. The transcript data was analysed for data relating to suggested changes to the learning-skills program and any other items of interest. Only two suggested changes became apparent in this data analysis; these are discussed in the next section.

4.4 Results of the evaluation
The only suggested change to the draft learning-skills program was the addition of concept-mapping examples. A participant suggested, “As far as the concept mapping goes, for someone who has never done something like that before you will need to give an example.” (Participants could not be distinguished from one another in the audio recording, so quotes are not assigned to a particular speaker throughout this section.) The other four participants supported this idea, and a conversation developed about the nature of the examples. One participant suggested that health-related concept maps would provide the best examples, saying, “You need a concrete example related to the course.” Other participants agreed with this.

There were no further suggestions for modifying the activities or resources within the draft version of the learning-skills program. However, participants expressed concern about the amount of extra work that would be expected of students to participate in
the program. This topic was discussed for a major part of the time. One participant voiced her worry, saying, “I would be concerned about them [students in the program] saying ‘It’s just too much work and I’m not going to do it.’” Another participant shared his concern by saying “It’s one thing for you to say ‘This will help you’, but all they are seeing is ‘This is extra work.’” One participant suggested that monetary incentives could be offered for participation. All participants agreed and one suggested a raffle system whereby all participants who completed the program would be entered into a competition for a voucher or monetary reward. He suggested that this would encourage participation but not cost a great deal of money.

Participants were otherwise complimentary of the program, with one commenting, “It would have been great if we’d had something like this when we started.” Another confirmed, “Yeah, if it was properly built into our normal activities it would’ve been a great help. I wouldn’t do it, though, if I thought it was going to take extra time.”

4.5 Discussion

Participants felt the design of the learning-skills program was appropriate for its purpose, but offered two suggestions: to attract higher participation rates, and to add further support for learners in the concept-mapping process.

A concern was how the potential participants would react to the extra work burden. Phase Two workshop participants were reminded of the integrated learning timetable that was designed for Phase Three; however, workshop participants felt that students would be more likely to participate in the study if a monetary incentive was offered. This suggestion was actioned by the researcher, who sought research funds to offer three $50 vouchers from the university bookshop.

Participants discussed the need for health-related examples of concept maps to illustrate the requirement of this activity. This suggestion was actioned by the researcher, who searched for appropriate health-related examples to add into the resource book. Research has demonstrated that completely student-generated concept maps are most effective in promoting higher-order thinking skills and knowledge acquisition (Lim et al., 2009). Therefore, the researcher made sure to use examples
that did not cover the same content as students would be addressing in their studies during the intervention period.

Example concept maps were sourced from literature on the use of concept mapping as a strategy in health-related disciplines. Before adding them to the resource book, a medical-school lecturer was consulted to ensure the soundness of the content. Maps that presented appropriate content in a hierarchal structure, with links that showed relationships between concepts, were chosen. These were considered to be high-quality examples of health-related concept maps.

As a result of the workshop and discussion in Phase Two, the draft program was adjusted and the program was finalised.

4.6 Conclusion

This phase of the study was a design and review phase. It was undertaken to develop and evaluate a learning-skills program aimed at supporting self-regulated learning in a problem-based learning medical curriculum. The program was informed by relevant literature and the results of Phase One. The design principles that guided the program development were integrated instruction; explanation of the application and usefulness of supported strategies; and training time to allow participants to implement the strategy once it was learnt (Bannert et al., 2009). The final program design included a resource book, face-to-face training sessions and an integrated timetable that considered each of the design principles.

After the initial drafting of the program, an evaluation process was conducted to ensure that it was suited to the context. The design and evaluation process allowed for the development of a learning-skills program informed by theory and current practice. The evaluation led to the addition of health-related concept-map examples to scaffold learners in this activity. Monetary rewards were also added to the participant-recruitment strategy to encourage participation. This phase of the research resulted in the refinement of learning activities and resources, which were tested in the next phase of the study.
Chapter Five: Phase Three

This chapter reports on Phase Three of the study. The purpose of Phase Three was to test and refine the program that had been developed in Phase Two. This investigation sought to understand how the students participated in the activities and whether they achieved outcomes related to self-regulated learning. The research questions specific to Phase Three were:

- How do students engage in self-regulated learning activities that are integrated into a problem-based learning curriculum?
- What outcomes are achieved by students who participate in self-regulated learning activities that are integrated into a problem-based learning curriculum?

In Phase Three a quasi-experimental methodology was implemented, with both qualitative and quantitative data being collected. This chapter reports on the research method and results of Phase Three, and provides a discussion and conclusion of the results.

5.1 Method for Phase Three

Phase Three was designed to test the learning-skills program that had been developed in the earlier stages of this study. Both qualitative and quantitative research methods were used in this phase of the mixed-methods design. Figure 5.1 illustrates the components of this phase of the research and how it informed, and was informed by, the other phases.
Figure 5.1 shows the overarching design of this multiphase, mixed-methods study highlighting Phase Three. Phases One and Two used qualitative methods to inform an understanding of the context and the development of the program. In Phase Three, both quantitative and qualitative methods provided opportunity for the program to be tested and the research questions to be comprehensively explored from a range of sources.
Phase Three was developed as a quasi-experimental design in which data was collected. Experimental research is a design in which the researcher controls one or more independent variables to investigate their effects on one or more dependant variables (Teddlie & Tashakkori, 2009). In experimental research a control group may be assigned to allow the researcher to isolate outcomes of the treatment (Creswell, 2009). In true experimental conditions the participants are randomly allocated to either control or experimental conditions. In contexts where there is the instance of the group formation that cannot be changed (e.g. classroom) the selection process cannot be random. The researcher must opt for a non-random, convenience sample thus creating a quasi-experimental design (Creswell, 2009). As this research was done with predetermined small-groups of students within the problem-based learning context, the researcher adopted a quasi-experimental design.

Prior to the new students commencing the academic year, the medical school strategically allocated students into problem-based learning small groups. This involved ensuring each group had a heterogeneous representation of gender and previous discipline area. In this quasi-experimental design problem-based learning small-groups were randomly allocated to the learning-skills program or control conditions. The learning-skills program was integrated into the existing timetable, and students in each of the small groups were randomly assigned to either the learning-skills program or comparison conditions.

Experimenting in educational environments differs from the traditional understanding of experimental or quasi-experimental research. When experimenting to support learning, the purpose is to produce findings that inform an understanding of the evolution of the learning environment for learners, based on the specific means of support (Cobb & Gravemeijer, 2008). In this study the intervention was the learning-skills program, and the experiment was designed to understand how learners engaged with a program developed to support self-regulated learning and to investigate the outcomes for learners who did engage with it.

Phase Three data collection took place over a four-week time frame, with the learning-skills program conducted over two consecutive problem-based learning
cycles. Figure 5.2 provides an overview of the specific research design for Phase Three.

During Phase Three of this study Groups 1-5 participated in the learning-skills program as presented in Chapter Four. Groups 6-11 acted as the comparison groups and continued to engage in the normal problem-based learning conditions only. It was the original intent of the research design that a second iteration would occur. A delayed start was to enable groups 6-11 to participate in the learning skills program with the introduction of a cognitive strategy other than concept maps. Groups 1-5 were to become the comparison group for the second iteration. At the completion of the first iteration, students in groups 6-11 were asked to participate in the program. There were no students who agreed to participate. This presented a limitation in the research as it did not allow the researcher to collect the data that was originally intended. Furthermore, it resulted in groups 6-11 not receiving the learning skills program conditions. To ensure that groups 6-11 were able to access the program resources and training were made available to all students at the completion of the phase.
5.1.1 Research participants

Phase Three of the study was conducted within the medical school. Whilst this was the same context as that for Phases One and Two, the participants for this phase were drawn from a different group of students.

Intact problem-based learning small-groups were randomly allocated to the intervention condition or comparison group. Participants were recruited during a lecture presentation. The researcher presented the study via PowerPoint presentation during a clinical skills lecture where all students were expected to be in attendance. The research project and design of the study was explained to students with supporting PowerPoint slides. Students were shown a PowerPoint slide that outlined the allocation of problem-based learning small-groups to either the learning-skills program or comparison conditions for the first iteration of the study. The cohort had 88 students enrolled. A total of 61 students consented to participate in the study. Those who did not offer to participate where still subject to the intervention conditions, though no data was collected from them.

Participants were recruited from students studying in their first year of the postgraduate MBBS degree in 2009. At the beginning of Semester One in the first year of the MBBS course, the curriculum was designed with a six-week learning block called Introduction to Medicine. During this time students were orientated to the course; the focus was on building foundational knowledge prior to commencing the ten-week cardiovascular and respiratory block. To ensure that the processes within the learning-skills program could be supported in the problem-based learning context and not just as a result of their presentation during the orientation phases, students were invited to join the study at the beginning of Semester Two, 2009 in the gastrointestinal/liver block.

5.1.2 Ethics

Ethics approval was sought and granted for this phase of the study (Appendix 5.1 contains the approval letter). Participation in the study was voluntary. Students were offered the right not to participate or to withdraw from the study at any time without repercussion. Those who chose not to participate were still allocated to intervention or comparison conditions, though no data was collected from them. To avoid exclusion
from potential benefits, all students within the context were offered the opportunity to participate. At the completion of the experiment, students were offered access to all training material.

Participants were issued with detailed information about their involvement in the study in an information sheet, and were asked to sign a consent form prior to participation (Appendix 5.2 contains the information, sheets and Appendix 5.3 the consent forms).

Once collected, data was securely stored and made accessible only to the researcher. All data was de-identified and pseudonyms were allocated prior to publication of study findings.

5.1.3 Data collection and analysis

Collecting and analysing data about self-regulated learning is a challenging task. The cognitive operations of learners are mostly inaccessible to the researcher who can often only access the products of the operations (Winne, 2010). As self-regulated learning is contextual in nature, these products have the potential to change in varying circumstances as the learner adapts. Self-report instruments commonly used to collect data about self-regulated learning have certain limitations (Winne & Perry, 2000). Answers to questionnaires and interviews are largely based on the learner’s memory of a particular learning situation and learners may not be able to accurately recall their thought processes (Veenman, 2011). Furthermore, a learner’s perceptions of strategies used may not align with their actual behaviour (Nisbett & Wilson, 1977). These limitations can make it difficult for the researcher to be confident in their findings related to self-regulated learning.

Researchers seek ways to address the limitations of self-report use when investigating self-regulated learning. Current literature presents the notion of collecting trace data from participants in the act of making decisions in learning in computer based learning environments (Veenman, 2011; Winne, 2010). However, this does not address the limitations for off-line methods. Because self-reports have their limitations, a mixed-methods approach is a strategy used in studies of self-regulated learning as it allows the researcher to gather a “broad picture and deep insight into
learners’ learning strategies” (Schellings & Van Hout-Wolters, 2011, p. 85). This method was chosen as it allowed the researcher to use results from one method to elaborate on and clarify those from the other, thus enhancing the quality of the data interpretation (Onwuegbuzie & Teddlie, 2003). During this phase of the study the data collection methods included:

- Motivated Strategies for Learning Questionnaire (MSLQ)
- Feedback questionnaire
- Focus-group discussion
- Work samples (within resource books)

When choosing a mixed-methods approach, the researcher must decide upon the level of interaction between the methodological approaches. Two options have been identified: independent or interactive (Grenne, 2007). Independent levels occur when quantitative and qualitative strands of data are collected and analysed separately, and only synthesised when drawing conclusions at the end of the study. Interactive levels occur when there is interaction between the two strands at any point before the final interpretation. Phase Three involved interaction between quantitative and qualitative data from the point of data collection. Figure 5.3 shows the point at which data was collected, analysed and merged for the purposes of an interactive level of interaction in the analysis.
Figure 5.3 shows the interaction between data at each stage of the research. Some data sources were merged to interpret the findings and produce results for Phase Three. Data found to be complimentary in interpretation of the findings included the feedback questionnaire and the focus group findings, as well as the work samples and the feedback questionnaire. The MSLQ was analysed without being merged. This is discussed in greater detail in the following sections.

5.1.3.1 Motivated Strategies for Learning Questionnaire (MSLQ)
The Motivated Strategies for Learning Questionnaire (MSLQ) was used to collect quantitative data about outcomes for learners who participated in the learning-skills program. Many aspects of self-regulated learning are unobservable due to the mostly internal nature of self-regulation within the individual’s thoughts and beliefs. For this reason, self-report questionnaires are commonly used to measure self-regulated learning by allowing learners to provide data about their own mental processes that researchers cannot observe (Winne & Perry, 2000).

The MSLQ, commonly used in empirical work on self-regulated learning (Zimmerman, 2008), was developed specifically for the purpose of collecting
quantitative data on self-regulated learning. It measures it as an aptitude, focussing on general actions, rather than specific events of learning. With its development informed by cognitive views of motivation and learning, the MSLQ has been revised and tested over time to improve reliability and validity (Pintrich, Smith, Garcia & McKeachie, 1991). It has evolved into an 81-item self-report questionnaire, designed specifically to assess the motivation and use of learning strategies amongst tertiary students. The entire instrument takes 20 to 30 minutes to administer.

The motivation section consists of:
- 31 items to gain insight into students’ goals, beliefs and test anxiety.

The learning-strategy section includes:
- 31 items assessing cognitive and metacognitive strategies, and
- 19 items regarding resource management.

The MSLQ consists of 15 scales that can be used singly or in any combination. As the scales were created as modular components, researchers may select only those that are appropriate to their research to avoid collecting data that is irrelevant to their study. For this study the researcher was interested in the participants’ selection and use of learning strategies. Therefore the Cognitive and Metacognitive Strategies module was selected in this study.

The reliability and validity of the MSLQ have been tested by the questionnaire’s authors; it has been shown to “represent a useful, reliable, and valid means for assessing college students’ motivation and use of learning strategies” (Pintrich, Smith, Garcia & McKeachie, 1993, p. 812). Modification of an instrument may affect the original reliability and validity (Creswell, 2009). For this reason the Cognitive and Metacognitive Strategies module was used verbatim in this study.

The Cognitive and Metacognitive Strategies module was designed to gather data about the participants’ use of learning strategies, including: rehearsal, elaboration, organisation, critical thinking and metacognitive self-regulation. Each of these can be elaborated on in terms of what they measure.
Rehearsal
The MSLQ refers to the rehearsal strategy as including acts of reciting, or creating lists to be learned. It is suggested that these strategies are best used for activating information in the working memory, and are not ideal for attempting to add new information to the long-term memory. This is because these strategies are seen to assist with attention and encoding processes, but do not promote the connecting of information, or allow new knowledge to be integrated with prior knowledge (Pintrich et al., 1991).

Elaboration
When testing for the use of elaboration strategies, the MSLQ identifies activities such as summarising or paraphrasing information in an attempt to relate it to pre-existing knowledge. Such strategies promote the storing of information in long-term memory by creating connections between new and existing knowledge (Pintrich et al., 1991).

Organisation
Organisation strategies, according to the MSLQ, are used when a learner is able to select the main ideas from the information to be learned and outline them in a way that promotes connections to be made. These strategies can include concept mapping, creating tables, clustering information and identifying main concepts. Active organisation of information leads to greater linking and retention of knowledge (Pintrich et al., 1991).

Critical thinking
Critical thinking is tested by the MSLQ as the ability to apply previously learned knowledge to new situations. This stored knowledge is used to help solve problems and make decisions when confronted with a new situation (Pintrich et al., 1991).

Metacognitive self-regulation
Metacognition is referred to in the MSLQ as one’s knowledge and control of the thinking and learning process. Metacognitive self-control, in this case, refers to learners’ self-regulation of their cognitive processes: the ability to plan, monitor and regulate their learning. Planning activities can include strategies to activate prior knowledge as a foundation to integrate new knowledge, and goal-setting to prepare
for the task ahead. Monitoring involves tracking one’s learning progress through self-testing and questioning oneself throughout the learning process. Regulating is the readjustment of goals and strategies to achieve the highest possible learning outcome (Pintrich et al., 1991).

The MSLQ was one instrument of measurement used in this mixed-method study. Table 5.1 demonstrates how the MSLQ scales relate to the model of self-regulated learning used in this study (Figure 2.2), and the design of the learning skills program.
Table 5.1 Aligning the: MSLQ, self-regulated learning model, learning-skills program

<table>
<thead>
<tr>
<th>MSLQ Scale</th>
<th>Self-regulated learning processes</th>
<th>Learning-skills program activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rehearsal</td>
<td>Rehearsal strategies were not identified in this model</td>
<td>Rehearsal strategies were not supported in these activities</td>
</tr>
<tr>
<td>Elaboration</td>
<td>Orientation Monitoring</td>
<td>Concept mapping to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• explore existing knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• create connections to new knowledge</td>
</tr>
<tr>
<td>Organisation</td>
<td>Planning Adjusting</td>
<td>Concept mapping to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• identify gaps in current knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Goal setting to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• address gaps in a manner that promotes creating connections to new knowledge, hence greater retention of knowledge</td>
</tr>
<tr>
<td>Critical Thinking</td>
<td>Orientation Monitoring Planning</td>
<td>Concept mapping to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• apply existing knowledge to current learning situation</td>
</tr>
<tr>
<td></td>
<td>Planning Adjusting Evaluating</td>
<td>Goal setting to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• support decisions to confront current situation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflection to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• consider efficacy of the approach taken and its application in future learning episodes</td>
</tr>
<tr>
<td>Metacognitive Self-Control</td>
<td>Orientation Monitoring Planning Adjusting Evaluating</td>
<td>Concept mapping to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• activate prior knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• identify gaps in knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• monitor knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Goal setting to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• plan for learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• adjust learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflection to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• consider implications of this learning episode on future learning episodes</td>
</tr>
</tbody>
</table>

Table 5.1 shows the connection between the data collected through the MSLQ, the model of self-regulated learning used in this study and the design of the learning skills program. This table demonstrates the intricate interplay between self-regulated learning processes and the activities within the learning-skills program. Each activity
(concept mapping, goal setting and reflection) had more than one purpose in the support of self-regulated learning processes, and are therefore difficult to separate. The MSLQ was used to measure the participants’ use of different learning strategies and self-regulated learning processes. However, the limitations of the use of self-report questionnaires for investigations of self-regulated learning have been acknowledged. For this reason, the MSLQ is used in this mixed-method study and is triangulated with other forms of data collected.

Data collection
In this study, the Cognitive and Metacognitive Strategies module of the MSLQ, consisting of 31 questions (Appendix 5.4), was administered before and after the learning-skills program. Participants responded on a Likert scale, ranging from 1, ‘not at all true of me’, through to 7, ‘very true of me’. Each of the scales in the Cognitive and Metacognitive Strategies module of the MSLQ were used in this study to collect evidence of changes in self-regulated learning skills for participants within the learning-skills program group. This data was collected from both the learning-skills program group and the comparison group, both before and after the intervention period, to explore relationships between the learning-skills program and changes in self-regulated learning skills.

Data analysis
The responses were scored by taking the average of the items within each scale for each participant. For Phase Three of this study participants' individual scale scores were averaged and shown in a bar chart to represent the group as a whole. The same process was undertaken separately with scores of the participants in the comparison group and the learning-skills program group. The MSLQ data was then used to create a comparison between the learning-skills program group and the comparison group, once again shown in a bar chart. This comparison was used to demonstrate the consistency between the groups prior to the intervention conditions, and to compare changes in their approaches to cognitive and metacognitive strategy use at the completion of the learning-skills program.
5.1.3.2 Feedback questionnaire

The feedback questionnaire was used to collect both quantitative and qualitative data. This allowed the researcher to investigate how participants engaged with the program and how it could be improved for a second iteration in Phase Four.

A self-report questionnaire was created. Self-report questionnaires can be purely quantitative, qualitative or a mixture of both (Johnson & Turner, 2003). In a mixed questionnaire, participants respond to both open- and closed-ended items. In closed-ended items participants use Likert-scale responses or rating scales such as agree, neutral or disagree. Open-ended items are unstructured, and allow participants to respond in their own words. The addition of open-ended questions allows for new and important information to be gathered that might otherwise be missed with only closed-ended questions (Johnson & Turner, 2003). By mixing the two methods in Phase Three, the researcher could gain a deeper understanding of participation in the learning-skills program and possible amendments for Phase Four.

Data collection

In Phase Three of this study all participants from the learning-skills program group were asked to complete a feedback questionnaire at the end of the intervention period (Appendix 5.5). The written questionnaire asked participants about how they engaged with the learning-skills program, and their opinion with regard to the program's efficacy in helping them to regulate their learning. Table 5.2 explains the sections of the feedback questionnaire.
<table>
<thead>
<tr>
<th>Section</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completing the activities</td>
<td>This section explores whether the participant completed each of the activities in the resource book. It prompts for more information to explain why particular participants may have chosen not to complete them. Further questions relate to whether participants did the activities in the timetable-allocated sessions or at other times. For those who opted for other times, space is provided for them to indicate when they did activities and why, and also how they felt the timing of the activities could be improved. This question is asked to inform feedback for further iterations of and improvement to the learning-skills program.</td>
</tr>
<tr>
<td>Training session and resources</td>
<td>The <em>training session</em> section asks participants whether they attended the training session. Those who did are asked to elaborate as to their perceptions of the value of the training session in helping them understand the program. Those who did not attend are asked to indicate if they felt this affected their ability to participate in the program. In the <em>resources</em> section participants are asked to indicate if they found the information in the front of the resource book to be useful to their understanding of the program. They are also asked if they found the resource book to be structured in a way that was easy to understand and made it easy to complete activities.</td>
</tr>
<tr>
<td>Learning-design model</td>
<td>The information section of the resource book presents a visual representation of self-regulated learning processes in a problem-based learning curriculum. This section of the questionnaire refers to that visual representation. The visual representation is included as a reminder prompt for reference to the questions. The questions ask participants if they feel the visual representation was helpful for understanding the processes of self-regulated learning. Space is provided for participants to elaborate on their response.</td>
</tr>
</tbody>
</table>
The feedback questionnaire included 30 items that required participants to tick a box (for example, ‘Yes’ or ‘No’, or ‘Very helpful’, ‘Somewhat helpful’, ‘Neutral’ or ‘Not helpful’). Participants were also provided with a space in which they could add text to elaborate on their response. The five-page questionnaire was conducted at the end of the learning-skills program to collect evidence about how participants engaged with the program. It also gathered information that was used in a review of the program to inform changes for the Phase Four iteration.

Data analysis

The feedback questionnaire collected qualitative and quantitative data. In mixed-methods research design, decisions can be fixed or emergent depending on issues that develop during the research process (Creswell & Plano-Clark, 2011). Once the data was collected, it was decided that the feedback questionnaire would be analysed in a qualitative manner due to high attrition rates among the participants. This was achieved through a thematic analysis of the free-text responses with which the

<table>
<thead>
<tr>
<th>Table 5.2 Explanation of feedback questionnaire</th>
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<tbody>
<tr>
<td><strong>Section</strong></td>
</tr>
<tr>
<td><strong>Questions</strong></td>
</tr>
<tr>
<td><strong>Self-regulated learning</strong></td>
</tr>
<tr>
<td>This section includes a diagram showing the cycle of forethought, performance and self-reflection in self-regulated learning. Participants are asked if they found the processes of outlining knowledge, monitoring learning, setting goals and reviewing learning to be helpful in the learning-skills program. Participants are also asked to offer a written response about any of the self-regulated learning processes that they feel they will continue to use after the learning-skills program. Space is provided for further comment about the activities.</td>
</tr>
<tr>
<td><strong>Learning strategy</strong></td>
</tr>
<tr>
<td>Participants are asked whether they used the concept-mapping strategy that was used in the learning-skills program. If the response is ‘No’ participants are asked to clarify why they did not. If their response is ‘Yes’ they are asked to explain what they liked or disliked about the strategy. Participants are also asked to list any other learning strategies they may have used during the program and if they found it helpful to have a learning strategy, such as concept mapping, introduced as a part of the learning-skills program. Space is allocated at the end of the questionnaire for participants to add any further comment.</td>
</tr>
</tbody>
</table>
participants elaborated on their tick-box responses. By analysing the data through qualitative methods, the researcher was able to gain an understanding of individual and overall engagement with the learning-skills program, and reason for completion or non-completion of the activities. This informed changes to be made for the Phase Four program.

The researcher interpreted the data by creating codes for organising the data. The headings of each section in the feedback questionnaire provided the primary codes into which the data was initially grouped for further analysis. These primary categories included completing the activities, training session and resources, learning-design model, self-regulated learning and learning strategy. These codes provided the framework for a second level of analysis. Data in the categories were read and emerging themes were developed as they became apparent in the data. Consequently, the following coding scheme emerged:

Data codes relevant to the topic of engagement with the learning skills program included:

<table>
<thead>
<tr>
<th>1.0 Completing the activities: response relating to engagement (or otherwise) with the learning skills program activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Reason for not completing the activities – references to influences or decisions for not engaging with the learning skills program</td>
</tr>
<tr>
<td>1.2 Completing activities during timetabled sessions – references relating to being able to complete activities during scheduled times</td>
</tr>
<tr>
<td>1.3 Completing activities but not during timetable sessions – references about how, when, where and why activities were completed during non-scheduled times</td>
</tr>
<tr>
<td>2.0 Learning strategy: responses relating to the concept mapping activity</td>
</tr>
<tr>
<td>2.1 Reasons for using the concept mapping strategy – references about the use of concept maps as a learning strategy in PBL</td>
</tr>
<tr>
<td>2.2 Reasons for not using concept mapping strategy – references to influences or decisions not to use the concept mapping strategy</td>
</tr>
<tr>
<td>2.3 Strategies other than concept mapping – references about learning strategies, other than concept mapping, that participants used in PBL</td>
</tr>
</tbody>
</table>
Data codes relevant to a review of the learning skills program included:

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
</table>
| 3.0     | **Timing of activities: references to timing of the scheduled activities**  
| 3.1     | Positive features – what worked in terms of timing  
| 3.2     | Possible improvements – suggested ways the scheduling could be improved  
| 4.0     | **The training session: references relating to the value of the preliminary training session for the learning skills program**  
| 4.1     | Positive features – the aspects participants found to be of value  
| 4.2     | Possible improvements – suggested ways the training session could be improved  
| 5.0     | **Resource design: references about the resource book**  
| 5.1     | Positive features – the aspects participants found to be of value  
| 5.2     | Possible improvements – suggested ways the training session could be improved  
| 6.0     | **Learning design model: references to the learning design model (in the resource book) used to present the learning skills program design to participants**  
| 6.1     | Positive features – the aspects participants found to be of value  
| 6.2     | Possible improvements – suggested ways the training session could be improved  
| 7.0     | **Support for self-regulated learning: references relating to the learning skills program activities within specific phases of self-regulated learning**  
| 7.1     | Perceived benefits of outlining knowledge at beginning of fortnight  
| 7.2     | Perceived benefits of monitoring learning  
| 7.3     | Perceived benefits of setting goals  
| 7.4     | Perceived benefits of reviewing knowledge at end of fortnight  
| 7.5     | Possible improvements to support for self-regulated learning  
| 8.0     | **Possible improvements to learning strategy instruction – open feedback for comments relating to the learning skills program**  
| 9.0     | Other |
Each questionnaire was reread and sections were entered into the relevant coding categories. Feedback-questionnaire data was analysed separately from the other data sources. After the independent analysis of all data sources was complete, the findings of the feedback questionnaires were triangulated with other data to produce the findings of this phase. Triangulation of data allows qualitative and quantitative data to be mutually corroborated to substantiate the findings (Bryman, 2006). In the interpretation of data in Phase One, feedback-questionnaire data was triangulated in one instance with focus-group data, and in another with work-sample data.

5.1.3.3 Focus-group interviews

Focus-group interviews were used once again in this phase of the study, for the reasons established in Chapter Three. The aim of this method was to collect qualitative data on the learners’ engagement with the program. This information informed both the evaluation of the program and changes for retesting in Phase Four.

Data collection

Volunteer participants from the learning-skills program group participated in one of two focus-group interviews at completion of the intervention. As in Phases One and Two, a semi-structured interview protocol was used to guide discussion within the focus groups (Appendix 5.6). The protocol was developed to guide the same questions that were asked in the feedback questionnaire (as described in Table 5.2). However, the focus-group scenario allowed the researcher to prompt for more detail in the responses to elaborate on the feedback-questionnaire data.

Data analysis

The focus-group discussions were audio-recorded and transcribed verbatim for analysis. The transcripts were analysed according to the codes established in the analysis of the feedback questionnaires, and informed a thematic summary of the focus groups. As the data from the focus groups was used to complement the findings of the questionnaires, data from these two sources were drawn together for interpretation of the results. Once data was drawn together, the information in the codes was read, and emerging themes were developed as they became apparent. The final analysis of the feedback questionnaire data and the focus-group data were coded into the following categories:
1. Reasons for non-completion with the program: references relating to influences and decisions relating to non-engagement with the learning skills program

1.1. Time – references relating to the perceived amount of time required to engage with learning skills program activities

1.2. Timing – references relating to the timing of activities within the existing class schedule

1.3. Value – references relating to the perceived value (or lack of) of engagement with the learning skills program

1.4. Support/Instruction – references relating to issues with how learners are supported to understand the requirements of the activities within the learning skills program

1.5. Current study habits – references relating to reasons why participants’ current study habits influenced non-engagement with the learning skills program

2. Reasons for engagement with the program: references relating to influences and decisions relating to engagement with the learning skills program.

2.1. Time – references relating to when and where participants chose to complete learning skills program activities

2.2. Value – references relating to the perceived value of engagement with the learning skills program

2.2.1. Self-regulated learning processes – references specific to the perceived value of the planning, monitoring or evaluating activities

2.2.2. Concept mapping – references specific to the perceived value of the concept mapping activities

3. Other – any other comments of interest

The findings of this data analysis are discussed together in the findings from the feedback questionnaire and focus groups (Section 5.2.2).

5.1.3.4 Work samples
Artefacts in the form of work samples that were produced by the participants further added to the data set. The collection and analysis of documents is a strategy that can
yield deeper insight into the phenomena under investigation (Creswell, 2009). Used as the only source of data, documents may offer only a limited understanding of the area of investigation. However, when analysed along with other data such as interviews or observations, documents can prove a valuable addition to understanding experiences and processes (Flick, 2006). For the purpose of adding to the investigation of how participants engaged with the learning-skills program, and outcomes of their engagement, resource books were collected at the completion of the intervention. The researcher used these documents in an analysis of the work samples that participants had produced.

Data collection
For the purpose of this study, documents were collected in the form of work samples: the artefacts produced by learners as they participated in learning-skills program activities. Individual resource books (as described in Chapter Four and available in Appendix 4.1) were collected to obtain work samples from participants. Participants were asked to submit their resource books at the completion of the learning-skills program to allow the researcher to analyse their work samples for an understanding of student engagement with the program.

Data analysis
Participants' resource books were analysed to develop an understanding of how each participant interacted with the activities. This was conducted through a systematic analysis of their concept maps and goal-setting activities.

An analysis of concept maps can be done through quantitative or qualitative methods. Quantitative scoring methods are often designed to count characteristics within the concept map to produce a numerical representation of knowledge. Prominent examples include McClure, Sonak and Suen (1999), Ruiz-Primo and Shavelson (1996) and Novak and Gowin (1984). Qualitative methods are used to produce a descriptive statement of the content and quality of the concept map. Examples of these methods in the literature include Hoz, Tomer and Tamir (1990), Lomask, Baron, Greig and Harrison (1992) and White and Gunstone (1992). In a study of 170 engineering students’ concept maps, each map was analysed quantitatively and qualitatively using these six methods (Van Zele et al., 2004). The researchers reported
that quantitative methods were subject to variation in the results, and that a qualitative analysis offered a more informative analysis and complete picture of students’ understanding.

In Phase Three of this study, a qualitative method was developed to guide analysis of the concept maps. This allowed the researcher to compare changes over the intervention period and to make descriptions of each participant’s engagement with the activities throughout the program. A qualitative analysis system was developed in which concept maps could be coded into one of four categories: no attempt, basic, intermediate or advanced. Table 5.3 clarifies the definitions of these categories.

<table>
<thead>
<tr>
<th>Table 5.3 Concept-map analysis codes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No attempt</strong></td>
</tr>
<tr>
<td><strong>Basic</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Intermediate</strong></td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Advanced</strong></td>
</tr>
</tbody>
</table>

Each concept map was analysed on an individual basis according to the coding system in Table 5.3 to gain an understanding of each participant’s engagement with the learning-skills program. A limitation of this analysis is the absence of an expert review of the concept map coding. The current coding scheme is not sensitive to the conceptual accuracy of the work sample. This coding system focused on analysis of engagement with the learning-skills program. For future research, it would be ideal to create the coding scheme through consultation with a content expert.
Participant engagement was further investigated through the coding and analysis of goal-setting activities in the resource books. Again, a qualitative analysis system was chosen and goals were coded into one of four categories: *no attempt, content focus, learning-strategy focus* or *content and learning-strategy focus*. Table 5.4 explains the coding system that was applied to the goal-setting work samples within the resource books.

<table>
<thead>
<tr>
<th>Table 5.4 Goal-setting analysis codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>No attempt</td>
</tr>
<tr>
<td>Content focus</td>
</tr>
<tr>
<td>Learning-strategy focus</td>
</tr>
<tr>
<td>Content and learning-strategy focus</td>
</tr>
</tbody>
</table>

Each goal-setting activity was analysed on an individual basis to gain further understanding of each participant’s engagement with the learning-skills program. After the independent analysis of the work samples was complete, the results were triangulated with data from the feedback questionnaires on an individual basis.

Through the triangulation of data for further analysis, individual cases were developed. Case-study analysis allows researchers to investigate holistic and contextual characteristics of real-life events (Yin, 2009), providing a means by which they can understand the intricacies of the data and build distinctive explanations of the themes that cannot be explored in cross-sectional data (Mason, 2002). Case study research has been identified as a strategy that offers certain strengths in investigations of self-regulated learning (Butler, 2011). This approach allows the researcher to conduct a fine-grained analysis of the processes in the context in which they occur, hence offering opportunities to explore critical questions related to a social-cognitivist perspective of self-regulated learning. The analysis of the work-sample and feedback-questionnaire data is reported on as *Cases* in the results section of this chapter.
5.2 Results

Initially, a large portion (n=70%) of the entire cohort of students consented to participate in Phase Three of this study. At the end of Phase Three data had been collected from a total of n=35% of the entire cohort. Table 5.5 details the number of participants before and after Phase Three and the types of data collected.

<table>
<thead>
<tr>
<th>Table 5.5 Phase Three participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Before learning-skills program</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Total consenting participants: 61</td>
</tr>
<tr>
<td>Completed MSLQ pre-test</td>
</tr>
<tr>
<td><strong>After learning-skills program</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Total consenting participants: 31</td>
</tr>
<tr>
<td>Completed MSLQ post-test</td>
</tr>
<tr>
<td>Completed feedback questionnaire</td>
</tr>
<tr>
<td>Provided complete resource book</td>
</tr>
<tr>
<td>Provided incomplete resource book</td>
</tr>
<tr>
<td>Participated in focus-group interview</td>
</tr>
</tbody>
</table>

Table 5.5 demonstrates an attrition rate of n=50% from the original consenting participants. At the completion of this phase of the study a total of 14 participants from the learning-skills program group had submitted at least one form of data, as indicated in the table. Each of the 14 participants completed an MSLQ pre-test and post-test. However, only 12 participants completed a feedback questionnaire. Each of these 12 participants demonstrated varying levels of engagement with the learning-skills program. As a result, five incomplete resource books and five complete resource books were collected from this group for further analysis. For the purpose of reporting the results of Phase Three, each participant was allocated a pseudonym. Table 5.6 below indicates the data collected from each participant from the learning-skills program group.
Table 5.6 Data for Phase Three individual cases

<table>
<thead>
<tr>
<th>Participant</th>
<th>MSLQ pre-test and post-test</th>
<th>Feedback questionnaire</th>
<th>Incomplete resource book</th>
<th>Complete resource book</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celia</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Jake</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>John</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Brenda</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Peter</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Karl</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Darren</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Phoebe</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Renae</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Melanie</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Natalie</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sally</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Suki</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Simona</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Results of the data analyses are discussed in the following sections.

5.2.1 MSLQ Results

A total of 61 MSLQ pre-tests were completed at the beginning of the intervention. At the end of the intervention a total of 31 post-tests were collected. The original intent of the research design was to analyse differences between the learning-skills program group and the comparison group. There was an expectation that there would be differences in the results between the two groups. Upon analysis of the MSLQ data it was found that there was very little difference between the two groups after the delivery of the learning-skills program. This led to the researcher conducting a deeper level of analysis of the feedback-questionnaire and focus group data in an attempt to explain the results of the MSLQ data.

5.2.2 Feedback-questionnaire and focus-group results

At the end of the Phase Three experiment a total of 12 completed feedback questionnaires were collected. The participants who completed the feedback questionnaires represented a range of engagement levels from those who did not
attempt the activities of the learning-skills program at all, through to those who completed every activity. From the 12 participants who completed the feedback questionnaires, five offered to elaborate on their responses in a focus-group interview. The researcher conducted two focus-group interviews with five participants in total. Complete versions of the feedback questionnaire and the interview schedule are contained in Appendices 5.5 and 5.6 respectively. From an analysis of the data the reasons for completion and non-completion emerged. (As participants could not be distinguished in the focus-group audio recording, quotes are not assigned to a particular speaker throughout this section).

5.2.2.1 Reasons for non-completion of the learning-skills program
The most commonly cited reason for non-completion of the learning-skills program was lack of time to do the activities. For example, in his feedback questionnaire, Karl reported the learning-skills program to be “an imposition on limited contact hours” (Karl, feedback questionnaire). Brenda supported this with her statement that “the last thing I want to do after a couple of dense hours of lectures and tutorials is sit there and fill out the workbook” (Brenda, feedback questionnaire).

Even those who did do some of the activities reported that the time factor determined how much effort they put into their attempts: “we just wanted to get out and have a break, so that meant the times I did do it, I did it a bit too quickly and didn’t put much thought into it” (Focus Group 1). To address the time issue it was suggested that the learning-skills program be compulsory and embedded in the existing curriculum. As one participant stated:

If it was more regular and routine as part of the timetable it would work, and force you to work on the activity, but sometimes we just wanted to race out and do other types of activities. If it’s not part of the structure, then it’s tempting not to do it, or I might not do it at the proper time (Focus Group 2).

Participants identified the placement of the learning-skills program in the second semester of the course as another factor in their non-completion. Most participants had already developed their preferred learning strategies in the first semester of medical school; for example, “About half way through the year I established my
routine so it was a bit hard to change after that” (Focus Group 1). Some participants said they were unwilling to try new strategies so close to exam time: “I’ve tried different strategies, but coming up to exam time I don’t want to change what I’m doing” (Focus Group 1). Overall, there was agreement that it would have been more effective to schedule the activities earlier in the year when participants were first establishing their routines. One participant shared her thoughts: “At this stage, a lot of us have found a routine already. If we had have done it earlier in the course, we’d be more willing to take time to experiment with it” (Focus Group 2).

The perceived lack of clarity of the educational benefit of the learning-skills program also influenced the participants’ decisions on engaging with the activities. Peter suggested, “If you could easily show that the technique was helpful, I would have been more likely to trial it” (Peter, feedback questionnaire). This is further supported with a quote from a participant in Focus Group 2 when he stated:

It was hard to get it in context. It was more like "this is an experiment" rather than "this is a set of teaching and learning tools you can employ which we will then study the impact of". I felt like that was a very key distinction in people’s minds because your predecessors, as in people who’ve come into the class in the past, have all been, "this is my research paper this is my questionnaire, this is my survey, this is seeking participants in an activity". As opposed to "We want to improve your study and learning mechanisms, here is an example of a way to do it, and we’re going to run it for a period, and I want to teach you how to use those tools first. And in the background, I’m going to study how it goes along" (Focus Group 2).

For those participants who did want to engage with the activities, a lack of support and instruction was found to be an impinging factor on their ability to participate. In his feedback questionnaire John reported, “If all you have to do is flick open the book and instructions are there in front of you, I would be more likely to do it” (John, feedback questionnaire). This concern was specifically related to both concept-mapping and goal-setting activities. This quote demonstrates one participant’s ongoing frustration with understanding how to create a concept map: “I knew about them, but I fail on them every time. I try to do them, but I get confused” (Focus Group
1. Natalie supported this: “I had no idea what I was supposed to include in them – my focus changed every day” (Natalie, feedback questionnaire). Goal-setting activities were also said to require explicit instruction for use as a specific strategy for the purpose of this activity. One participant stated:

I wasn’t sure about what I was supposed to do with the goals. I was thinking, is the goal supposed to be setting a schedule, like "put in time to do certain things", or is it more like learning objectives, like "find out about this, this or this" (Focus Group 2)?

When activities in the learning-skills program were closely aligned with the participants’ existing study habits, the participants were also less likely to engage with the program. Renae reported in her feedback questionnaire, “I found I was already doing these things in my own time and didn’t want to rewrite things” (Renae, feedback questionnaire).

In summary, participants cited a number of reasons for non-completion of the learning-skills program. This feedback predominately came from those participants who did not comply, or only took part in some activities in the program. In contrast, participants who did comply with the learning-skills program provided feedback as to how they engaged with the activities.

5.2.2.2 Reasons for engagement with the learning-skills program

Of the five participants who fully engaged with the learning-skills program, each reported that they did not always use the set time available to them to complete the activities. For some this was because they felt that there was not adequate time made available. In her feedback questionnaire Sally stated, “There was no time to complete the activity at the start of a lecture, between two lectures or in the middle of a tutorial, yet these seemed to be the allocated times” (Sally, feedback questionnaire). For others it was because the resource book was difficult to follow. One participant stated, “I found the format confusing, like I was confused as to what activity I was up to. It’s not the way my mind works, so I back-tracked and did it retrospectively” (Focus Group 1).
Participants who engaged with the learning-skills program reported that they did so because they felt it contributed to their learning in some way. For some, outlining knowledge at the beginning of the fortnight was useful to their learning. One participant with a medical-science background reported that it helped him activate his prior knowledge: “My knowledge was sketchy but this step helped. Because I have a medical-science background, it helped me remember what I know” (Focus Group 2). It was also useful for learners with a non-medical background to help them recognise what they did and didn’t need to learn “I don’t have a medical-science background, so in many ways, trying to keep up with the fires of information has meant that anything I don’t have to learn twice, I don’t. That’s great” (Focus Group 2).

Goal setting was reported by participants to be a helpful strategy. Participants agreed that they normally had an idea of what they wanted to achieve from their learning experiences, though rarely did they record such thoughts. They said the goal-setting activities encouraged them to clarify and document their thoughts. In her feedback questionnaire Natalie reported, “Goal setting was good – never had actually done it with pen and paper before” (Sally, feedback questionnaire).

Some participants also reported that the concept-mapping strategy was useful, as it provided a visual representation of knowledge. This strategy is beneficial to students, as it supports them in evaluating their current understanding and realise gaps in their knowledge. One participant reported the benefit of the concept-mapping activity in providing this clarity: “It lets me see what I don’t know. If there’s an empty bubble, I obviously don’t know something” (Focus Group 1).

In Phase Three some participants reported reasons for non-completion, while others discussed the positive aspects of the learning-skills program. In general the reasons for non-completion related to issues that could be addressed through design changes in the program's resources and delivery. The value of a learning-skills program integrated into the early stages of a problem-based learning curriculum is illustrated in the following quote:

Part of our course outline is to be a self-regulated learner, that you are going to do that long-term. I guess, you don’t want to be spoon-fed because you’re
not going to be spoon-fed forever. You need to be able to have these different learning strategies so you can work out what works for you. It’s not just about passing an exam at the end of the year, it’s about being able to do it forever. So you want to establish some things and be given options of ways to learn so that you can have that ‘toolkit’ forever (Focus Group 1).

The results of these findings offered insight into how participants engaged with the learning-skills program. It also provided and understanding of possible amendments that could be made to the program for retesting in Phase Four of this study.

5.2.3 Case results
At the end of the learning-skills program a total of 10 resource books were collected. Resource books represented a range of engagement levels from those who only completed one or two activities through to those who completed every activity. The concept-mapping and goal-setting activities in the resource books were analysed to investigate the level of engagement of each participant throughout the program. Section 5.1.3.4 details the coding schemes.) Each individual’s level of engagement was entered into a table that represented the fortnightly format of the problem-based learning cycle. Because the learning-skills program was integrated over two problem-based learning cycles (two fortights), these tables report on engagement with the activities in each cycle.

Each individual’s work-sample data was interpreted with their feedback questionnaire to understand how, when and why they engaged with the program. The following sections present a range of cases that each offered insight into the varying degrees of participation in the learning-skills program.

5.2.3.1 Cases of engagement with the learning-skills program
Five participants completed all of the activities in the learning-skills program. Their cases are individually presented here, as each one demonstrates a unique experience.

Melanie
Melanie submitted a complete resource book from the learning-skills program. An overview of her engagement with each activity is shown in Table 5.7.
All of Melanie’s concept maps were categorised as a basic approach. In her first concept map activity she named two of the symptoms experienced by the patient, and created a short list of possible reasons as to why each of these issues could be occurring (Figure 5.4).

Later in the fortnight Melanie created a diagram of the body’s digestive system as her concept map (Figure 5.5).
This concept map is illustrative of Melanie’s diagrammatic approach, in which she focussed on schematic representations of body systems and diseases. This continued to be her approach to concept mapping throughout the remainder of the learning-skills program. As a result her diagrams showed the structure and function of various parts of anatomy and illnesses relating to the cases. This provided evidence of her tendency to use the concept-mapping strategy as a method of rehearsing the content knowledge rather than identifying links between related concepts.

Melanie’s goal-setting approach was mostly content-focussed. For example a goal would be written as “Learn digestion and absorption” (Melanie, resource book, goal-setting prompt 3, fortnight 1). Each goal was brief and did not detail a plan to show how she would attempt to achieve it. In fortnight 2, activity 2, Melanie did apply a content and learning-strategy focus to her goal setting. For example, a goal was written as “Structure of anatomical relations of liver and gall bladder: pre-readings and anatomy. Draw diagrams” (Melanie, resource book, goal-setting prompt 2, fortnight 2). After this, though, her goal setting returned to a content-focus-only strategy.
In her feedback questionnaire Melanie ticked a box to indicate that she *sometimes* did the activities during the allotted timetable, though would often do them “in free time to break the monotony of study a little” (Melanie, feedback questionnaire). She also wrote that she “was a little confused as to the progression of the activities” and also found that “reassessing my goals constantly was frustrating” (Melanie, feedback questionnaire). Melanie indicated that beyond the learning-skills program she thought she would attempt to continue “outlining what I know/have learnt in flow diagrams” (Melanie, feedback questionnaire). While she would use the strategy for some of her study, she noted, “My mind doesn’t always work this way. I find that in complicated topics, concept mapping becomes counter-productive and I end up getting frustrated with the map” (Melanie, feedback questionnaire).

**Natalie**

Natalie submitted a complete resource book from the learning-skills program. An overview of her engagement with each activity is shown in Table 5.8.

<table>
<thead>
<tr>
<th>Concept map</th>
<th>Activity 1</th>
<th>Activity 2</th>
<th>Activity 3</th>
<th>Activity 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fortnight 1</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>Basic</td>
<td>Basic</td>
</tr>
<tr>
<td>Fortnight 2</td>
<td>Intermediate</td>
<td>Basic</td>
<td>Basic</td>
<td>Basic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Goal setting</th>
<th>Activity 1</th>
<th>Activity 2</th>
<th>Activity 3</th>
<th>Activity 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fortnight 1</td>
<td>Learning-strategy focus</td>
<td>Content focus</td>
<td>Content focus</td>
<td>N/A</td>
</tr>
<tr>
<td>Fortnight 2</td>
<td>Content focus</td>
<td>Content and learning-strategy focus</td>
<td>Content focus</td>
<td>N/A</td>
</tr>
</tbody>
</table>

In her resource book, Natalie’s first concept map showed evidence of concepts and their relationships through the inclusion of some linking words between concepts (Figure 5.6).
Although she used these links in her first attempt at concept mapping, Natalie did not follow this through in subsequent mapping activities. For example, Figure 5.7 shows that in her second concept map of the fortnight Natalie made connections between different issues arising in the patient’s case by drawing arrows in multiple directions.
Natalie created a similar map to Figure 5.7 in her first attempt in the second fortnight. However, all of her other attempts at concept mapping followed a diagrammatic approach that represented a description of the patient case and results of medical investigation, as shown in Figure 5.8.
While each of these concept maps was detailed in terms of its content, none included links between concepts related to the topic. Instead, they provided an illustrated overview of the patient case and its components.

In her goal-setting activities Natalie had mostly a content focus. At times she did create some content and learning-strategy-focussed goals, though she did not detail how she would go about achieving them; for example, “Link lectures to CBL case and
GOAL (Guided Online Assessable Learning)” (Natalie, resource book, goal-setting prompt 1, fortnight 1). Towards the end of fortnight 2 her goals had become more content-focused, but were still very brief and lacking detail as to how she would achieve them; for example, “Look at prognosis and/or treatment for all types of Hepatitis” (Natalie, resource book, goal-setting prompt 3, fortnight 2).

In her feedback questionnaire, Natalie indicated that she never completed the activities during the allocated timetabled sessions. Her preference was to do the activities “at night rather than other more intense study” (Natalie, feedback questionnaire). She said she also found that the initial training session did not convince her that these activities would be beneficial to her learning, as it was “still not clear whether it has been proven that these methods are useful” (Natalie, feedback questionnaire). She felt that greater instruction in how to concept map and goal set was necessary to help participants to develop their skills. She wrote that the training session “gave us a lot of freedom to choose what we wrote about, but I’d rather more specific directions on how to use this; i.e., what to put in my concept maps” (Natalie, feedback questionnaire).

Like Melanie, Natalie found the program hard to follow, and suggested that dates or page numbers on each activity would have been helpful. While her goal setting was brief and not so detailed, Natalie reported that she did find this to be a useful activity and one that she had never formally engaged with before.
Suki submitted a complete resource book from the learning-skills program. An overview of her engagement with each activity is shown in Table 5.9.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Activity 2</th>
<th>Activity 3</th>
<th>Activity 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept map</td>
<td>Fortnight 1</td>
<td>Basic</td>
<td>Basic</td>
</tr>
<tr>
<td></td>
<td>Fortnight 2</td>
<td>Basic</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Goal setting</td>
<td>Fortnight 1</td>
<td>Content and learning-strategy focus</td>
<td>Content and learning-strategy focus</td>
</tr>
<tr>
<td></td>
<td>Fortnight 2</td>
<td>Content and learning-strategy focus</td>
<td>Content focus</td>
</tr>
</tbody>
</table>

In her resource book, Suki’s concept-map activity pages were often filled with many maps or diagrams on one page. While they were all on the one page, they were separated from each other, with no obvious links being made between them. Mostly the basic concept maps were content-based and focussed on the structure and function of different body systems, or the cause and effect of different diseases (Figure 5.9).

Figure 5.9 Suki – concept-map example 1
Suki’s more elaborate and connected concept maps were shown in her attempts to map out the patient case. In these examples she used multiple arrows in various directions to illustrate the patient problem and possible causes (Figure 5.10).

![Figure 5.10 Suki – concept-map example 2](image-url)
These examples suggest that Suki was able to consider both the concepts as well as content knowledge in the creation of her concept map. There was no evidence of her ability to move beyond this strategy to begin using linking words to further specify the relationships between the concepts – in other words, to produce concept maps at an advanced level.

In her goal-setting activities Suki focussed on content and learning-strategy goals; for example “Develop good anatomy summary sheets on major GI organs” (Suki, resource book, goal-setting prompt 3, fortnight 1). In fortnight 2, she added a timing focus to her goals, though in this instance did not outline her learning strategy; for example, “Embryology – Monday afternoon” (Suki, resource book, goal-setting prompt 2, fortnight 2).

Suki’s feedback questionnaire indicated that she did not always find enough time to complete the activities in the allocated time, and thus would often complete them at home after class. She found it very helpful to her learning to set goals and review her knowledge at the end of each fortnight. As a result of the learning-skills program she indicated that she would continue to add to a large flow chart each fortnight to keep track of the ideas and concepts being learnt. Suki also intended to commit herself to “writing down key questions on areas I want to find time to learn more about so I can come back to them and look for answers that might come up during class” (Suki, feedback questionnaire).
Sally

Sally submitted an almost complete resource book from the learning-skills program. While she did create an entry for most pages in her resource book, she did not always respond to the set activity. An overview of her engagement with each activity is shown in Table 5.10.

<table>
<thead>
<tr>
<th>Activity 1</th>
<th>Activity 2</th>
<th>Activity 3</th>
<th>Activity 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concept map</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fortnight 1</td>
<td>Intermediate</td>
<td>Basic</td>
<td>Basic</td>
</tr>
<tr>
<td>Fortnight 2</td>
<td>Basic</td>
<td>Intermediate</td>
<td>Basic</td>
</tr>
<tr>
<td><strong>Goal setting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fortnight 1</td>
<td>Content focus</td>
<td>Content focus</td>
<td>No attempt</td>
</tr>
<tr>
<td>Fortnight 2</td>
<td>Content and learning-strategy focus</td>
<td>Learning-strategy focus</td>
<td>No attempt</td>
</tr>
</tbody>
</table>

In her resource book, Sally’s engagement with the concept-mapping activities was inconsistent. As shown in Table 5.10, she moved between basic and intermediate levels of concept-map creation throughout the two fortnightly cycles. Figure 5.11 is an example of one of her basic concept maps.

![Figure 5.11 Sally – concept-map example 1](image-url)
Figure 5.11 presents a concept map that was created in activity 3, fortnight 1. The concept map created only four days later (Figure 5.12) is evidence of a higher level of understanding.
Figure 5.12 shows that Sally was able to create an elaborate map with a detailed description of the patient case, related symptoms, diagnosis and ideas for treatment. This map offered some links and multi-directional arrows.

During fortnight 1, Sally also created a map that did not relate to content or the case (Figure 5.13).

Figure 5.13 Sally – concept-map example 3
In this concept map Sally focussed on her personal status rather than the case or course content. In this she communicated her frustration and sleep loss as a result of studying medicine and participating in the learning-skills program. In the feedback questionnaire Sally indicated that the timetabling did not fit well and that there were too many activities throughout the fortnight. Overall she found the activities to be “time-consuming and frustrating” (Sally, feedback questionnaire). Sally felt very strongly about the need to eliminate the extra-curricular structure of the learning-skills program:

There is not enough time in a course like this to try and follow a learning program like this. It’s a waste of time because each time you try to change something, you’re wasting time that should be [spent] learning new information. (Sally, feedback questionnaire)

In her goal-setting activities in fortnight 1, Sally focussed her goal setting on content knowledge acquisition, though did not elaborate a plan as to how she would attempt to achieve her goals. For example, a goal would be stated as “find out causes and consequences of diarrhoea (chronic) in infants” (Sally, resource book, goal-setting prompt 1, fortnight 1). In her second fortnight, in Sally’s first attempt at goal setting she broke her page down into two parts: Goals and Plan. For her goals, she set out content-focussed goals with the aim of relating them to the patient case. In her plan, she outlined some ways to achieve this; for example, “Read about questions in relevant textbooks, ask peers when I don’t understand something, answer CBL objectives” (Sally, resource book, goal-setting prompt 1, fortnight 2). After this point, for subsequent goal-setting activities throughout the fortnight Sally only created some very brief points (e.g. “Review lecture notes”) or nothing at all.

Overall, Sally’s approach to the activities was inconsistent. At times throughout the fortnight she was able to set well-thought-out goals with plans on how to achieve them. She also created some more-elaborate concept maps that identified links between concepts for the fortnight. At other times Sally’s entries focussed on her low motivation and negative feedback towards the time taken to do the learning-skills program activities. Because Sally continued to complete the activities throughout the
fortnight, it can be assumed that she did recognise some value in completing the program.

**Simona**

Data collected from Simona included a resource book in which she filled each of the activity pages. However, the activities were completed out of order; for example, she had some fortnight 2 activities completed on fortnight 1 pages and vice versa. There was no way to determine in which order she had done the activities, so following the progress of her development was not viable.

Simona did not offer much detail in her feedback questionnaire. She did indicate that she didn’t always engage with the activities, as they “seem[ed] to be repetitive” (Simona, feedback questionnaire). The limitations in the organisation of the data made further analysis unachievable.

**Summary**

Each of the five cases illustrated different experiences of engagement with the learning-skills program. Each participant demonstrated a commitment to engagement with the program through completion of all of the activities. There was, however, little evidence of growth and development in their approaches to concept mapping and goal setting. Furthermore, some participants showed frustration with the program and a lack of direction in knowing how and when to complete the activities. Overall, the cases demonstrated that learners may require greater assistance throughout the program if it is to be effective in supporting them in enhancing their skills in self-regulated learning.

**5.2.3.2 Cases of non-engagement with the learning-skills program**

An analysis of participants who did not complete their resource-book activities was also conducted. Of the five incomplete resource books, two cases offered additional insight to the feedback-questionnaire and focus-group findings. Both Renae and Karl reported non-engagement with the learning-skills activities, as the activities were already closely aligned to their existing study habits. In both cases, the participants began to complete the activities in the resource book, but stopped upon realisation
that the strategies were similar to their own practice. Karl’s case is presented here to illustrate these findings.

*Karl*

Data collected from Karl included a resource book in which he completed some of the activities. An overview of his engagement with each activity is shown in Table 5.11.

<table>
<thead>
<tr>
<th>Table 5.11 Karl – work-sample overview</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>Concept map</td>
</tr>
<tr>
<td>Fortnight 1</td>
</tr>
<tr>
<td>Intermediate</td>
</tr>
<tr>
<td>Basic</td>
</tr>
<tr>
<td>Basic</td>
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<tr>
<td>No attempt</td>
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<tr>
<td>Fortnight 2</td>
</tr>
<tr>
<td>Basic</td>
</tr>
<tr>
<td>Intermediate</td>
</tr>
<tr>
<td>No attempt</td>
</tr>
<tr>
<td>No attempt</td>
</tr>
<tr>
<td>Goal setting</td>
</tr>
<tr>
<td>Fortnight 1</td>
</tr>
<tr>
<td>Learning-strategy focus</td>
</tr>
<tr>
<td>Learning-strategy focus</td>
</tr>
<tr>
<td>Content and learning-strategy focus</td>
</tr>
<tr>
<td>N/A</td>
</tr>
<tr>
<td>Fortnight 2</td>
</tr>
<tr>
<td>Learning-strategy focus</td>
</tr>
<tr>
<td>Content and learning-strategy focus</td>
</tr>
<tr>
<td>No attempt</td>
</tr>
<tr>
<td>N/A</td>
</tr>
</tbody>
</table>

In his resource book in fortnight 1, Karl completed three of the four activities. From the beginning he was able to create concept maps that illustrated relationships between concepts (Figure 5.14).
Karl’s ability to show relationships between concepts was a strategy that he consciously employed. This was illustrated in one of his early goal-setting activities, when he planned to “revisit Learning Objectives as many overlap” (Karl, resource book, goal-setting prompt 2, fortnight 1). Following his initial concept map, however, Karl only continued to make basic attempts at this activity. By the end of the fortnight he was no longer completing them.

In his feedback questionnaire, Karl indicated that he found the learning-skills program to be “an imposition on limited contact hours” (Karl, feedback questionnaire). He added, “It also doubled up fortnight planning I already do” (Karl, feedback questionnaire). Karl’s early work samples indicated that he had already adopted some effective learning strategies prior to participating in this program. His early attempts at concept mapping and use of learning strategy-focussed goals suggested this.

Renae’s case was also analysed, though not reported in full here. An analysis of Renae’s data illustrated that she too had already developed some effective skills in concept mapping and goal setting prior to the learning-skills program intervention. Renae reported that the skills being taught in the learning-skills program were similar.
to those she was already using in her current study strategies. Work samples in her resource book confirmed her reports.

**Summary**

Renae and Karl each independently chose to discontinue their engagement with the program beyond the first iteration. This choice was made by both on the opinion that their existing study strategies were already closely aligned with those being taught in the learning-skills program. These two cases contributed to a greater understanding of reasons for non-completion of the program, adding to those already discussed in Section 5.2.2.1.

**5.3 Discussion**

Phase Three was conducted to investigate participant engagement with, and outcomes of, a program to support self-regulated learning in a problem-based learning curriculum. Three key findings emerged from this phase of the study:

- Learners engage with a program to support self-regulated learning when they believe it to be relevant to their learning.
- Supports for self-regulated learning require clear guidance and instruction for engagement beyond the face-to-face environment.
- The development of self-regulated learning skills is an individual experience, and investigation requires an individual approach.

The findings of Phase Three offered scope for further investigation, and were used to inform changes to the program design and evaluation in Phase Four.

**5.3.1 Learners engage with a program to support self-regulated learning when they believe it to be relevant to their learning**

Ensuring that learners engage with additional learning-support devices in a student-directed learning environment can be a challenging task. Learners can make a conscious decision not to engage with certain aspects of the curriculum if they do not feel it will contribute to their development. Self-regulated learners are those who take control of metacognitive, motivational and behavioural aspects of their learning (Zimmerman, 1989). Their self-generated thoughts and actions are orientated toward
the attainment of learning goals. The results of Phase Three support this notion, with the results indicating that learners who felt that the program was of benefit to their learning were more likely to engage with the activities.

Learners in this phase of the study cited a number of reasons for non-completion of the learning-skills program. These included a perceived impingement on their time, inappropriate timing of the program, lack of guidance in the activities and lack of clarity as to the program's educational benefit to them. Participants who did engage with the learning-skills program commonly reported that they did so because they felt it contributed to their learning in some way. While some reported the concept-mapping activities to be more beneficial to them, others stated that the goal-setting activities aided their learning. The results of this phase indicated that learners who found aspects of the program to be relevant to their learning were more likely to engage with it.

The need to inform learners of the benefits of the learning-skills program had already received consideration during the initial design of Phase Two. This resulted in the inclusion of a preliminary training session where learners were offered an explanation of the learning-skills program; moreover, the importance of self-regulated learning in problem-based learning was highlighted. This was designed to meet the design principle in which an explanation of the application and usefulness of supported strategies was deemed to encourage participation (Bannert et al., 2009). The results of this phase indicate that this preliminary training session was ineffective in aiding a majority of learners to see the educational benefit of the program to their own learning situations. For Phase Four, this required reconsideration.

To investigate how learners could be better supported to understand the benefits of the learning-skills program, research literature was revisited. While relevant research in face-to-face learning environments is limited, the researcher looked towards other student-directed environments. A literature review of research on tools to support learning processes in hypermedia learning environments revealed that such tools are seldom used by students, or are used in ways not intended in the original design (Clarebout & Elen, 2006). In their review the authors sought to uncover if certain characteristics of the learner, the learning task or the tool itself influenced learners’
uptake of the support. Their findings were inconclusive. They did, however, assert the positive effect of explicit encouragement for tool use and strategy training, reporting that learners who were exposed to these events were more likely to use tools than those who were not. The authors generalise their findings to all open-learning environments, in which learners autonomously decide upon their use of learning-support tools.

The learning-skills program was redesigned to offer learners explicit encouragement for engagement with the program. This was achieved through a variety of methods.

**Learning-skills program upon transition to problem-based learning**

In Phase Three the learning-skills program was integrated into the second semester of the first year of the course. In the design of Phase Three the researcher had avoided placing the program at the beginning of the first semester so as to allow learners to focus on the development of foundational knowledge associated with their course. The findings of this phase indicated that this placement was a factor in non-completion, as many students now had other priorities or felt that they had already developed learning strategies that would suffice.

The placement of the learning-skills program was reconsidered in Phase Four. When learners enter a new learning environment they can experience difficulty in adapting their learning skills to suit the contextual requirements (Ennis, 1990). Even for experienced learners, a lack of contextual understanding may mean that they will need to develop an entirely new set of learning skills, hence rendering them in effect a novice learner once again (Boekaerts, 1997). To better support learners at a time when they were beginning to consider and trial learning strategies for the new learning environment, the program was redesigned to take place in the first semester of the first year of the course. Through discussion with the curriculum developers in the medical school, the learning-skills program was integrated into a content block at the beginning of the semester called Introduction to Medicine. The aim of placing it at the earliest point of the degree was to allow learners to develop effective learning strategies for the context at the same time they built their foundational knowledge for the program. By the nature of this content block, learners were encouraged to develop skills and knowledge that would support them to succeed in medical school. With the
integration of the learning-skills program at the first point of transition into the problem-based curriculum, learners were encouraged to participate in the activities as they sought to understand the nature of the learning environment.

**Preliminary training session with second-year student presentations**

A preliminary session was once again designed as an introduction to the learning-skills program. As the program was to be placed in the Introduction to Medicine block, the preliminary session was embedded into the timetable as a component of this content area. A lecture was designed in which students were informed of the curriculum structure of a problem-based approach to learning. By promoting a greater understanding of the curriculum structure, it was hoped that learners would better understand the value of knowing effective strategies that have been shown to enhance learning in this context.

To further encourage learners to participate in the learning-skills program, a group of more-experienced learners were asked to share their experiences with the new cohort. Four students from the second year of the course presented and discussed the challenges they experienced in their transition to the problem-based learning context. This strategy aimed to provide the new learners with a first-hand account of the value of support for the development of effective learning strategies.

**Tutor support**

More explicit in the Phase Four design was support from the tutors of the problem-based learning small groups. For Phase Four only groups of students whose tutors supported the program were asked to participate. Tutors were invited to support the program via contact from the medical school Dean. Those who were in favour were supported to integrate the activities into small-group tutorial time.

Tutors were provided with support to understand the program and implement some of its activities into small-group tutorial time. Research on the profiles of effective tutors in problem-based learning indicates that faculty development is required to develop skills for supporting student learning of both the content and the learning processes required for the problem-based learning environment (De Grave et al., 1999). As tutors were not available for training in relation to the learning-skills program, support
was offered in the form of written instruction and email conversations. Small groups' tutors collaborating with the delivery of the learning-skills program encouraged learners to engage with the activities in a range of learning contexts within the problem-based learning environment.

*Fewer activities and more reminders in the form of lecture slides throughout intervention allowed students to do the activities in their own time.*

To further encourage engagement with the learning-skills program, the number of activities throughout the fortnightly cycle was reduced in Phase Four. The activities were restructured to include only one instance of monitoring throughout the fortnightly cycle to reduce workload on students, while still incorporating each of the phases of the self-regulation cycle. To reduce the number of face-to-face encounters, learners were prompted to complete some of the activities in their own time, with a reminder slide being shown at the end of lectures.

The results of Phase Three indicated that learners were more likely to engage with the learning-skills program when they felt it was beneficial to their learning. Strategies to encourage engagement were given a greater level of consideration for the Phase Four design. More opportunities for the researcher, and explicit encouragement from the faculty for students to participate, came in the form of activities built into small-group tutorials, with tutor training on how to deliver them, as well as regular prompts for learners as reminder slides in the lecture material. More-implicit methods to encourage participation came in the form of the placement of the program in the earliest point of the learning experience, and also the reduction of the number of activities from the Phase Three version. These became a feature of the Phase Four design.

### 5.3.2 Supports for self-regulated learning require clear guidance and instruction for engagement beyond the face-to-face environment

Learners should be supported to develop effective skills for successful self-regulated learning. A well-designed learning program explicitly supports students to acquire these skills (Boekaerts, 1997; Dabbagh & Kitsantas, 2005). In Phase Three, the results indicate that this support must be available to learners beyond the scheduled learning episodes.
In student-directed learning environments, learners may not always attend to learning tasks at a set or given time. This prompts consideration of how a learning-support program can be designed to support learners both within and beyond the face-to-face environment. The intended design for the learning-skills program in Phase Three included activities for learners to engage in at scheduled times throughout the fortnightly learning cycle. The results of this phase showed that all students who completed the learning-skills program activities did so mostly in their own time and not during these scheduled times. An analysis of their engagement with the program highlighted that the instruction within the resource book was not enough to guide or support for students to fully understand the task requirements. This resulted in students losing direction in the activities and gaining little or no improvement in their self-regulated learning skills.

These findings in Phase Three are not unique to this study. A literature review of the use of tools to support learning processes in hypermedia learning environments found that such learning tools are commonly not used as intended in the original design (Clarebout & Elen, 2006). This literature review reported inconclusive evidence relating to learner, task and tool characteristics that may influence how learners use the support. However, the authors did conclude that students who received explicit strategy training were more likely to use the tools in the intended manner. The results of Phase Three of this research, as well as the literature review discussed here, informed the need for explicit strategy training to be reconsidered for the Phase Four design.

The lack of guidance and instruction within the resource book was a factor that caused some participants to choose not to comply with the activities. For this reason it was realised that additional integrated guidance and instruction was required in the program design for Phase Four. This would promote flexibility for learners to choose the best time for them to engage with the activities while still achieving improvements in self-regulated learning skills.

Changes were made to the resource book for Phase Four so that it provided greater integrated instruction. This would allow participants to understand the requirements
and complete the activity in their own time if required. To address this, the resource book was edited with the removal of information and instruction that the Phase Three participants deemed unnecessary. With the removal of the additional information, participants would be able to focus on the necessary components of the resource to guide them through the activities.

Further to this, the researcher introduced a scaffold to guide participants through the process of effective goal setting in Phase Four. The acronym SMART indicates goals that are specific, measurable, attainable, relevant and timely. This structure was reflected in the activity pages, which were redeveloped to promote participant understanding of effective goal-setting practices. A complete description of these changes is found in the next chapter.

5.3.3 The development of self-regulated learning skills is an individual experience, and investigation requires an individual approach

In Phase Three, data was collected and analysed through for both individuals and groups. Data for individuals was collected through feedback questionnaires and work samples. Other data, including the MSLQ and focus-group interviews, were collected and analysed to report on the group as a whole. The results of the data analysis in Phase Three only allowed a limited understanding of how learners engaged with the learning-skills program, and even less about the outcomes of their engagement. The results of Phase Three of this investigation suggested the need for all data to be collected and analysed on an individual basis to better respond to the research questions. The results of Phase Three prompted the researcher to reconsider protocol for measuring self-regulated learning: specifically, what data might best inform how individual learners engage with self-regulated learning supports and the outcomes they achieve through this engagement.

There are many unobservable processes within self-regulated learning. This has led to the development of different measurement strategies aimed at collecting data about the unseen. Common approaches to measuring self-regulated learning include questionnaires and structured interviews (Zimmerman & Martinez-Pons, 1988). As different measures generate slightly different data on self-regulated learning, it is suggested that using multiple measurement protocols and triangulating the data will
allow a deeper understanding (Winne & Perry, 2000). This principle was applied to the methodological design of Phase Four of this study.

Data collection and analysis was reconsidered in the Phase Four design. As with Phase Three, the intent of Phase Four was to test the impact of the intervention; therefore a quasi-experimental design was used once again. Phase Three demonstrated that there is a great deal of variance in how each participant engages with activities in the learning-skills program. This finding suggests the need to collect and analyse data on an individual basis rather than as a group. For this reason each of the data types was collected and analysed on an individual basis in a case-study approach in Phase Four.

The significant change in Phase Four was the collection of individual interview data instead of the focus-group data collected in Phase Three. Interviews were chosen as they are good for measuring attitudes and allow the researcher to prompt participants for more information (Johnson & Turner, 2003). Interviews were deemed to be important to allow the researcher to gain deeper insight into the engagement of and outcomes for each participant in the learning-skills program group.

In Phase Four individual interviews were designed to gain more information about individuals' experiences of the learning-skills program. To further support this, the MSLQ data was analysed on an individual basis. The MSLQ has been demonstrated to be a reliable measure to investigate individual approaches to self-regulated learning (Garcia-Duncan & McKeachie, 2005). Each of these changes to data collection and analysis were made to gain a more elaborate insight in to how students engage with a program aimed at supporting self-regulated learning in a problem-based learning curriculum, and also the outcomes of their participation.

5.4 Conclusion

Phase Three was designed to test the learning-skills program that was developed in the earlier stages of this study. Specifically, it was concerned with the investigation of how learners engaged with the program and the outcomes of their engagement.
The results of Phase Three revealed that learners engaged with the program to support self-regulated learning when they believed it to be relevant to their learning. Participants who did not engage with the program cited reasons including a lack of time, the timing of the program being later in the first year, a lack of perceived value in the program and minimal instruction in completing the activities. Those who did engage suggested that they found some benefit to their learning through participation in the program. These findings prompted consideration as to how Phase Four could be redesigned to further promote the value of the learning-skills program among learners in the medical-school context. Revisions to the Phase Four design included a shift in timing of the program to occur upon transition to the curriculum, a preliminary information session involving discussion with more-experienced learners in the context, a greater level of tutor support and a reduction in the number of activities in the program.

The results of Phase Three also suggest that supports for self-regulated learning require clear guidance and instruction for engagement beyond the face-to-face environment. Participants who engaged with the learning-skills program mostly completed activities in their own time rather than within the scheduled times. The analysis of the data illustrated that participants found it difficult to understand the task requirements, and little or no development was shown in their approaches to self-regulated learning. The results led to suggested changes for Phase Four, including greater integrated instruction into the resource book, the removal of information from the resource book that Phase Three participants had deemed unnecessary or not useful and the addition of a SMART goal scaffold into the goal-setting activities.

Lastly, the findings of Phase Three highlighted that the development of self-regulated learning skills is an individual experience, the investigation of which requires an individual approach. The design and methods of data collection in Phase Three did not allow the researcher to completely investigate the research questions; therefore this was reconsidered for Phase Four. Changes to Phase Four involved an individual approach to data collection and analysis, whereby a case-study approach allowed for the individual analysis of an interview, feedback questionnaire, MSLQ and resource book.
The findings of Phase Three informed changes to the design of both the learning-skills program and the research design in Phase Four. Once again, the program was delivered and investigated to understand how learners engaged with a program to support self-regulated learning, and to determine the outcomes of their engagement.
Chapter Six: Phase Four

The findings of Phase Three informed changes to the learning-skills program and the methodology for investigation in Phase Four. This chapter reports on Phase Four of the study. The purpose of Phase Four was to further test the learning skills program that had been developed and adapted in the earlier phases of this research. Once again, this investigation sought to understand how the students participated in the activities and whether they achieved outcomes related to self-regulated learning. The research questions specific to Phase Four were:

- How do students engage in self-regulated learning activities that are integrated into a problem-based learning curriculum?
- What outcomes are achieved by students who participate in self-regulated learning activities that are integrated into a problem-based learning curriculum?

This chapter reports on the changes to the program and methodology for Phase Four, and discusses the results and presents the conclusions from this phase.

6.1 Method for Phase Four

Phase Four, the final phase in the multiphase investigation, was designed to test the learning-skills program that was developed and refined throughout the earlier phases of this study. Figure 6.1 illustrates the components of this phase of the research, as informed by the other phases.
Figure 6.1 Overview of the research design highlighting Phase Four

A quasi-experimental design similar to the one in Phase Three was once again planned for Phase Four. Figure 6.2 provides an overview of the specific research design for this phase.
The learning-skills program was conducted over two consecutive problem-based learning sessions. Data was collected both before and after the intervention period.

In Phase Four the activity of the comparison group varied from that of the comparison group in Phase Three. In Phase Three the comparison group continued to engage in the problem-based learning curriculum only while the learning-skills program group participated in the intervention program. As a result, the activities were only integrated into the timetable for the learning-skills program group, offering free time to the comparison group. The findings of Phase Three suggested a need for greater embedding of the program into the curriculum. Therefore in Phase Four, study-skills activities were designed for the participants who were allocated to the comparison group so that the entire program could be embedded to promote engagement and participation.

The comparison-group activities were designed so that they would not affect the participant’s self-regulated learning skills. These study skills included activities focussed on note-taking, group work and exam preparation. Table 6.1 highlights the differences between the learning-skills program group and the comparison group treatments.
Table 6.1 Learning-skills program comparison

<table>
<thead>
<tr>
<th>Session</th>
<th>Learning-skills program group</th>
<th>Comparison group</th>
</tr>
</thead>
</table>
| Learning skills workshop 1 | The introductory workshop was attended by both groups. Topics included:  
  - Orientation to problem-based learning  
  - Rationale for the curriculum design  
  - Importance of effective learning skills (discussion with 2nd year students)  
  - The learning-skills and study-skills program  
The workshop was facilitated by the researcher and research supervisors  
The session went for 90 minutes of scheduled lecture time |  |
| Learning skills workshop 2 | Focus on: Planning for learning  
Facilitated by: Small group tutors with support from the researcher  
Timing: 1 hour on Day 1 of the PBL fortnightly cycle (Iteration 1) | Focus on: Note-taking – using the Cornell method  
Facilitated by: Research supervisors  
Timing: 1 hour on Day 1 of the PBL fortnightly cycle (Iteration 1) |
| Learning skills workshop 3 | Focus on: Reflecting on learning  
Facilitated by: Small group tutors with support from the researcher  
Timing: 1 hour on the final day of PBL fortnightly cycle (Iteration 1) | Focus on: Working in groups  
Facilitated by: Research supervisors  
Timing: 1 hour on the final day of PBL fortnightly cycle (Iteration 1) |
| Learning skills workshop 4 | Focus on: Planning for learning  
Facilitated by: Small group tutors with support from the researcher  
Timing: 1 hour on Day 1 of the PBL fortnightly cycle (Iteration 2) | Focus on: Exam preparation  
Facilitated by: Research supervisors  
Timing: 1 hour on Day 1 of the PBL fortnightly cycle (Iteration 2) |
| Learning skills workshop 5 | Focus on: Reflecting on learning  
Facilitated by: Small group tutors with support from the researcher  
Timing: 1 hour on the final day of PBL fortnightly cycle (Iteration 1) | Focus on: Reviewing the previous workshops  
Facilitated by: Research supervisors  
Timing: 1 hour on the final day of PBL fortnightly cycle (Iteration 2) |

Table 6.1 overviews the conditions for both groups in this study. The specific activities for each group are presented in greater detail in the following section. At the completion of the phase, resources and training were made available to all students to ensure fairness and equity between both groups in terms of access to resources and supports for learning.
6.1.1 Program design for Phase Four

In response to the findings from Phase Three, this phase was conducted in the first semester of study. Participants were recruited from the 2010 Phase One, First Year student body of the MBBS degree. Through negotiation with the timetabling administration staff at the medical school, Phase Four was integrated into the Introduction to Medicine content block at the beginning of the semester. Separate programs were created for the learning-skills program groups and comparison group. The following sections describe the treatment for each group to demonstrate the differences between their conditions in the study.

6.1.1.1 Learning-skills program group treatment

Figure 6.3 shows the Learning Design Visual Sequence of the learning-skills program.
Figure 6.3 illustrates the program design for Phase Four, including the tasks, resources and supports. To achieve the iterative process of the design, the learning skills program was delivered two times over a four week period. This allowed for the process to be repeated over two problem-based learning cycles.

The Phase Four learning-skills program differed to the one in Phase Three, as the Phase Three investigation had revealed a number of flaws in the design. The following paragraphs describe the identified problems with the Phase Three design, and how they were addressed in Phase Four.

Students needed to understand the usefulness of the program to themselves in their context. In Phase Three the preliminary session had focussed solely on instruction in how to complete the activities. This had resulted in the participants feeling uncertain regarding the value of the program to their learning. To address this in Phase Four, an introductory workshop was held to inform participants about problem-based learning, its use in the context and the importance of effective learning skills. An overview of self-regulated learning was also provided in the resource book to communicate the main points. The amount of information was greatly reduced from the Phase Three resource book, as participants had suggested that too much information in the resource book made it difficult to ascertain what was most important for them to focus on. Reference to further reading was provided in the Phase Four resource book for those who were interested in seeking more detail.

Students also required greater guidance through integrated support in the program. To provide more guidance for participants than was offered in Phase Three, SMART (specific, measureable, attainable, relevant, timely) goals were used to support goal setting in Phase Four. Whilst the exact origins of SMART goals is unknown, their use as effective guidelines for goal setting has been documented in empirical literature for many discipline areas including health sciences, business management and psychology (for example, Barclay, 2002; Monaghan, Channell, McDowell & Sharma, 2005; Shahin & Mahbod, 2007). Integrated support was also provided through further instruction of the activities in Workshops 2 through 5. These are described more fully later in this section.
The program design needed to provide training time for implementation of the strategies being supported. As in Phase Three, the activities were embedded into the existing timetable in Phase Four, but the number of activities per fortnight was reduced from four to three.

In Phase Three many participants did not engage with the activities due to a confusing layout of the resource book. This was addressed in Phase Four by offering a clearer structure in the resource book. This involved adding a simple colour-coded diagram and colour-coding the pages accordingly. Page numbers were also added to further support guidance.

In this phase the learning-skills program group participated in learning-skills workshops and completed activities aimed at supporting self-regulated learning skills in a revised resource book. The participants were encouraged to attend five workshops over a four-week period.

*Learning-skills workshop 1*

An introductory workshop was held for all participants, consisting of:

- A lecture in which students were provided with an orientation to problem-based learning, the rationale for the curriculum design in the medical school and the importance of effective learning skills in this context.
- A discussion in which second-year students were recruited to speak to the study participants. They covered topics such as the challenges of studying in medical school, and shared some of the strategies they discovered to help them overcome learning issues.
- A presentation of the learning-skills program and study-skills activities to demonstrate their design, and their role in promoting effective learning-strategy development.

All participants from both the learning-skills program group and the comparison group attended this session. At the end of the session students were provided with information relating to which group they had been assigned to as well as the timetable.
and room allocations for learning-skills workshops 2 to 5. Students were also asked to consent to data being collected from them to inform an analysis of the program. If consent was provided, participants were asked to complete the MSLQ.

For learning-skills workshops 2 to 5, learning-skills program groups and comparison groups were divided into separate sessions. The researcher supported the small-group tutors to work through the learning skills program activities with the learning-skills program group and her supervisors led the sessions with the comparison group.

*Learning skills workshops 2 to 5*

The learning-skills program group participated in self-regulated learning activities for learning-skills workshops 2 through 5. These workshops were integrated into the problem-based learning small-group tutorial time in an attempt to further embed the program and encourage participation. Ideally, tutors would be available for training on how to deliver the activities, but as this was not the case, tutors were provided with guidance on the activities so that they could address them in their small-group tutorial time. This guidance came in the form of a tutor support sheet (Appendix 6.1) that briefly outlined the activities and offered points as to how the tutor could support the activities in the tutorial. The researcher had also discussed the activities with each of the tutors prior to the tutorial by phone and email to answer any questions they may have had regarding the program.

In learning-skills workshop 5 participants completed the final *Reflecting on learning* activities and were thanked for their involvement with the program. They were asked to complete the MSLQ post-test and a learning-skills workshop feedback form. Participants were also asked to consider offering to meet with the researcher in an individual interview so that they could elaborate on their engagement with and feedback of the learning-skills program. For those who agreed there was a space at the bottom of the feedback form for them to add their contact details.

*Resource book*

The resource book was redeveloped based on the findings of Phase Three (Appendix 6.2 contains the adapted resource book). Table 6.2 describes each section of the resource book.
Table 6.2 Phase Four resource-book contents

<table>
<thead>
<tr>
<th>Heading</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>So you want to know how to learn at medical school?</td>
<td>This page provides a brief overview of the research into self-regulated learning. It also provides a short reference list of the related literature for those who wish to know more about it.</td>
</tr>
<tr>
<td>Becoming a self-regulated learner in medical school</td>
<td>This page presents a simple diagram of the self-regulated learning cycle to demonstrate the basis of the learning-skills program activities. The diagram is colour-coded. Each activity throughout the resource book is printed on coloured paper to match the diagram.</td>
</tr>
<tr>
<td>Resources for learning-skills workshops</td>
<td>This section provides prompts and scaffolding of the self-regulated learning and concept-mapping skills. This involves support planning for learning, monitoring learning and evaluating their learning throughout each fortnight. These are designed to be completed in Workshops 2 through 5, but are also explained in a way that lets participants complete them in their own time if they prefer.</td>
</tr>
<tr>
<td>Concept maps</td>
<td>This section offers a brief description of concept mapping. Health-related examples are provided to help participants gain an understanding, and a short reference list is made available for participants interested in reading more about the strategy.</td>
</tr>
</tbody>
</table>

6.1.1.2 Comparison-group treatment

The comparison group participated in learning-skills workshop 1 with the learning-skills program group, as previously described. The study-skills activities for the comparison group were then delivered separately for learning-skills workshops 2 through 5. These were delivered over a four-week period to align with the timing of the learning-skills program group activities. They were teacher-led discussion in format and covered the following topics:

- Learning-skills workshop 3: Working in groups.
- Learning-skills workshop 4: Exam preparation.
- Learning-skills workshop 5: This time was used to review the previous learning-skills sessions and collect the MSLQ post-test.

The intention was to provide the comparison group with strategies that were helpful to their studies as medical students but were not likely to affect their self-regulated
learning skills, as this was the attribute under investigation. Appendix 6.3 contains the lecture notes for learning-skills workshops 2, 3 and 4 for the comparison group.

6.1.2 Research participants
In Phase Four a problem-based learning small-group tutorial activity was added to the design of the program. To successfully integrate the program into the small-group sessions, tutor support was required. As not all tutors were supportive of the program, the random assignment of intact groups was unachievable. Tutors of the problem-based learning small groups were asked if they would be willing to participate. Tutors who were willing to participate were possibly more motivated to ensure student success. This was a potential limitation of the study; however, it was deemed necessary here for successful integration of the learning-skills program.

Groups who were volunteered by their tutors were allocated to the intervention conditions, while the others served as comparison groups. A total of five groups consisting of a total of 37 students were assigned to the intervention conditions, while six groups totalling 47 students were assigned to the comparison conditions. Demographic data was not sought from participants in this study therefore descriptive information of their ages, gender and academic backgrounds is unavailable.

6.1.3 Ethics
Changes to the research methodology for Phase Four required approval from the Human Research Ethics committee. Approval for the changes was sought and granted (Appendix 6.4 contains the approval letter).

As in Phase Three, participation in Phase Four was voluntary, and participants had the right not to participate, or to withdraw from the study at any time without repercussion. All students were still allocated to intervention or comparison conditions though no data was collected from students who did not provide consent. Participants were informed about the study and asked to sign a consent form if they agreed (Appendix 6.5 contains the information sheet, and Appendix 6.6 the consent form).
In Phase Four, the comparison group engaged in learning-skills activities that were not related to self-regulated learning. To avoid exclusion from potential benefits and to ensure fairness and equity for all students, all of the resources from both the intervention and comparison groups were made available to all students after the data had been collected. This was done through their online learning system.

Once collected, data was once again securely stored and made accessible only to the researcher. All data was de-identified and pseudonyms allocated prior to publication of study findings.

6.1.4 Data collection and analysis
In Phase Four, MSLQ data was collected for both the comparison and learning-skills program groups before and after the intervention period. This data was used to compare the two groups for different purposes throughout this phase of the study. No further data was collected from the comparison group.

Case studies of participants in the learning-skills program group were undertaken to inform the findings of Phase Four. The learning-skills program group participants were asked to complete the MSLQ pre- and post-test and also offer a feedback questionnaire, individual interview and a copy of their work samples from the program activities. While the use of case studies was a method that emerged in Phase Three, it was a deliberate feature of the methodology in Phase Four. In mixed-methods research, case studies can support the researcher's investigation of conditions within the entities under examination (Yin, 2009). The researcher chose to use this approach in Phase Four to provide an in-depth description in response to the research questions. Figure 6.4 shows the interactive level of interaction between data in Phase Four.
Figure 6.4 Phase Four data interaction

Figure 6.4 shows that in Phase Four the cases were informed by all data sources. The richness of a case study depends on collection from a range of data sources. To achieve this it is essential that the researcher obtain multiple data sources, and that this data can be triangulated (Yin, 2009). To inform each case, data was collected in the form of feedback questionnaires and work samples. Some participants also volunteered to participate in a semi-structured interview. Individual MSLQ results were also analysed with other data in each case. The collection of multiple sources of data allowed for triangulation to occur, enhancing the validity of the findings.

An analysis of the data was conducted to respond to the research questions. To be able to completely ascertain the outcomes of engagement with the learning-skills program, the learning-skills program group was separated between those who showed a commitment to the program and those who did not. An analysis of the data sources was used to determine whether or not a participant from the learning-skills program group was engaged or non-engaged with the learning-skills program. This was determined based on data from the feedback questionnaire, resource book and individual interview. Specific methods are discussed in the following sections.
6.1.4.1 Motivated Strategies for Learning Questionnaire (MSLQ)

The Motivated Strategies for Learning Questionnaire was used to collect evidence of changes in self-regulated learning skills in Phase Four. For this phase the Cognitive and Metacognitive Strategies module was recreated verbatim, as in Phase Three. (The MSLQ, previously described in Section 5.1.3.1 of this thesis, appears in Appendix 5.4.) This data was collected from both the learning-skills program and comparison groups to allow analysis between the groups, along with analysis of the relationships between the intervention activities and changes in self-regulated learning skills.

Data collection

In Phase Four of this study the Cognitive and Metacognitive Strategies module of the MSLQ was administered to all consenting participants both before and after the learning-skills workshops. Participants from both the learning-skills program and comparison groups responded to 31 questions that were designed to gather data about their use of contextual learning strategies, including rehearsal, elaboration, organisation, critical thinking and metacognitive self-regulation. Each of these scales is explained in Table 5.1.

Data analysis

Scales in the MSLQ were scored individually by taking the average of the items in each scale. The scores of the MSLQ pre-test were averaged and presented in a bar chart to show the differences between the comparison group and the learning-skills program group prior to the intervention. This was done to demonstrate the consistency between the two groups prior to the intervention conditions. The scores of the MSLQ post-test were also averaged and presented in a bar chart to compare the two groups after the intervention period. Furthermore, the MSLQ results of the learning-skills program group were analysed to compare the results of the non-engaged participants and the engaged participants to gain a greater understanding of the outcomes of engagement with the learning-skills program.

MSLQ data was also used to inform the individual cases for the purposes of analysing individual outcomes of participation in the learning-skills program. For each case the data was analysed on an individual basis alongside data from other sources, including
the feedback forms, work samples and interviews, to examine changes to self-regulated learning for each participant in the learning-skills program group.

**6.1.4.2 Feedback questionnaire**

Feedback questionnaires were collected from learning-skills program participants at the completion of the learning-skills program. The combination of questionnaires and in-depth interviews leads to a more complete understanding of the differences across participants (Teddle & Tashakkori, 2003). As individual interviews were an addition to the data set in Phase Four, the length of the feedback questionnaire was reduced in length from that used in Phase Three.

Each questionnaire included eight questions. Participants responded on a Likert scale, ranging from 1, ‘not at all true of me’, through to 7, ‘very true of me’. Participants were provided with a space in which they could add text to elaborate on their feedback. They were also asked to provide contact details if they were willing to participate in an interview.

Data collection

A one-page feedback questionnaire (Appendix 6.7) was given to all learning-skills program group participants at the completion of the learning-skills program. It asked the participants about:

- their use of concept-mapping and goal-setting strategies before the learning-skills workshops
- the value of concept-mapping and goal-setting activities in the learning-skills workshops
- their intentions as to whether they would continue to use concept-mapping and goal-setting strategies after the learning-skills workshops
- the value of the group discussion activities
- the most helpful aspect of the learning-skills program
- other comments
- willingness to participate in an interview

Feedback questionnaires were distributed and collected at the completion of learning-skills workshop 5.
Data analysis

The feedback questionnaire was analysed on an individual basis within the case-study format. The Likert-scale response method allowed participants to indicate engagement with the learning-skills program activities and changes in learning strategies, but it did not prompt for responses to reasons for completion or non-completion of the activities. For this reason the feedback forms were analysed on an individual basis and were triangulated with work samples, individual interviews and MSLQ data where available.

The feedback forms were analysed to gain an understanding of individual participant engagement with the learning-skills program. Due to the Likert-scale design of the questionnaire, the level of engagement was rated from the participants’ responses to questions about whether they found it helpful to practice concept mapping and goal setting as activities in the learning-skills program. As participants responded to questions on a scale of 1 to 7, those who rated the program a 3 or lower were categorised as non-engaged with the learning-skills program.

6.1.4.3 Work samples

The resource books in which the learning-skills program group completed the learning-skills program activities were collected for analysis. Participants were asked to submit their resource book so that their work samples could provide further evidence of their engagement with the program.

Data collection

The resource book has been described in Table 6.1 of this chapter and is contained in Appendix 6.2. The learning-skills program was designed to have participants completing activities in their resource book. Resource books were collected to obtain work samples for analysis.

Data analysis

Resource books were analysed to develop an understanding of how each participant interacted with the activities. This was conducted through an analysis of the concept
maps and goal-setting activities using the qualitative analysis system used in Phase Three.

Participants who submitted their resource book allowed for the analysis of the work samples to be triangulated with their other individual data. From this analysis, overarching themes relating to participant engagement with and outcomes of the learning-skills program were identified:

1. Learners who engaged with the program: describes data from those participants who were deemed to be *engaged* with the learning skills program
   1.1. Adaptations to the program – references relating to the changes participants made to the activities in the learning skills program in relation to how, when and where they completed them
   1.2. Outcomes of engagement – references relating to changes participants’ self-regulated learning that occurred within the duration of the learning skills program
      1.2.1. Changes in cognitive and metacognitive strategy use – references relating to changes in participants’ cognitive and metacognitive strategy use
2. Learners who did not engage with the program: describes data from those participants who were deemed to be *non-engaged* with the learning skills program

Concept-map and goal-setting coding schemes were used to help determine the level of engagement of each participant. Participants who demonstrated that at least half of their activities were a *No attempt* came under consideration for being categorised as *non-engaged* with the learning-skills program, depending on the analysis of their other data sources.

### 6.1.4.4 Semi-structured interviews

Participants from the learning-skills program group were invited to participate in an individual interview. The purpose of the interview was to further ascertain participant engagement with and outcomes of participation with the learning-skills program.
Data collection

Semi-structured interviews were conducted face-to-face and audio-recorded for transcription. (Appendix 6.8 contains the interview schedule.) During the interview, the participant’s resource book was shown to them to guide discussion and prompt comments on the specific activities undertaken throughout the program. This was an extension of the data collected through the feedback forms, as the interview allowed for elaboration on the questions asked on the form, and allowed participants to discuss specific activities in their activity books. The interviews helped to gain an understanding of how the participants adapted to and engaged with the activities in the learning-skills program.

Data analysis

Audio recordings of the interviews were transcribed verbatim. Each interview was analysed individually and was triangulated with the corresponding work sample, feedback questionnaire and MSLQ data. The individual interviews provided further understanding of participant engagement with and outcomes of the learning-skills program. The interview data was analysed on a similar coding scheme to that of the work samples. However, as only engaged students participated in an interview, the coding did not include consideration for non-engaged students:

1. Learners who engaged with the program: describes data from those participants who were deemed to be engaged with the learning skills program
   1.1. Adaptations to the program – references relating to the changes participants made to the activities in the learning skills program in relation to how, when and where they completed them
   1.2. Outcomes of engagement – references relating to changes participants’ self-regulated learning that occurred within the duration of the learning skills program
      1.2.1. Changes in cognitive and metacognitive strategy use – references relating to changes in learners’ cognitive and metacognitive strategy use
      1.2.2. Changes in self-efficacy toward learning – references relating to changes in participants’ feelings of control over learning
2. Other
6.2 Results

At the commencement of the learning-skills program, a large proportion (n=92% of the entire student cohort consented to participate in Phase Four of this study. At the end of Phase Four a total of n=48% of the entire cohort remained in the study. Table 6.3 details the numbers of participants in each group before and after Phase Four.

<table>
<thead>
<tr>
<th>Table 6.3 Phase Four participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before learning-skills program</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Learning-skills program group</td>
</tr>
<tr>
<td>Total consenting participants: 77</td>
</tr>
<tr>
<td>Completed MSLQ pre-test</td>
</tr>
<tr>
<td>After learning-skills program</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Learning-skills program group</td>
</tr>
<tr>
<td>Total consenting participants: 40</td>
</tr>
<tr>
<td>Completed MSLQ post-test</td>
</tr>
<tr>
<td>Completed feedback questionnaire</td>
</tr>
<tr>
<td>Provided complete resource book</td>
</tr>
<tr>
<td>Provided incomplete resource book</td>
</tr>
<tr>
<td>Participated in interview</td>
</tr>
</tbody>
</table>

Table 6.3 demonstrates an attrition rate of n=52% from the original consenting participants. Overall the learning-skills program group attrition rate was n=57%, while the comparison group was n=48%. The high attrition rate offers opportunities for an analysis of what factors influenced participants to withdraw from the program. This was not explored in greater detail in this study. This is a consideration that should be taken into account in future research studies. Not only is it useful to analyse what worked well in this program, but also to elicit what did not work so well. This would provide valuable insight to support effective design of learning skills programs.

At the completion of this phase of the study, a total of 20 participants from the learning-skills program group had submitted at least one form of data, as indicated in the table. Each of the 20 participants completed the MSLQ before and after the learning-skills workshops. They also all completed a feedback questionnaire. Each of these 20 participants demonstrated varying levels of engagement with the learning-
skills program. As a result, 14 resource books with varying levels of completion were collected from this group for further analysis. A total of eight participants agreed to be involved in an individual interview. For the purpose of reporting the results of Phase Three, each participant was allocated a pseudonym. Table 6.4 below indicates the data available for each participant.

<table>
<thead>
<tr>
<th>Participant</th>
<th>MSLQ pre-test and post-test</th>
<th>Feedback questionnaire</th>
<th>Incomplete resource book</th>
<th>Individual interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tom</td>
<td>√</td>
<td>√</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Maree</td>
<td>√</td>
<td>√</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lyn</td>
<td>√</td>
<td>√</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Andre</td>
<td>√</td>
<td>√</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Chris</td>
<td>√</td>
<td>√</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wendy</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>Richard</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>Paul</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>Jane</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>Heidi</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>Eve</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>Aaron</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>Naomi</td>
<td>√</td>
<td>√</td>
<td>-</td>
<td>√</td>
</tr>
<tr>
<td>Therese</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Alex</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Emily</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Anna</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Cassie</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Alina</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Sharon</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>

The data shown in Table 6.4 was analysed as described in Section 6.1.4 of this chapter. Results are discussed in the following sections.
6.2.1 MSLQ results

A total of 40 participants completed the MSLQ pre- and post-tests, the results of which were analysed to assist in determining outcomes for participants who engaged with the learning-skills program. The following figures illustrate the differences in the average MSLQ scores for each group identified in this phase of the study. The standard deviation is also shown on each chart. Figure 6.5 charts the results for the comparison group.

As shown in Figure 6.5, most scores for the comparison group generally remained the same or increased only slightly. This indicates that there were no considerable changes in relation to participant’s reported use of most of the learning strategies measured by the MSLQ. These results illustrate the minimal effect of the alternative learning-skills program on self-regulated learning skills for participants in the comparison group.

Figure 6.6 gives the results for the learning-skills program group.
Figure 6.6 MSLQ pre/post-test comparison – Learning-skills program group (n=20)

Figure 6.6 illustrates only slight increases in the results from the pre-test to the post-test for the learning-skills program group. These changes were very similar to those for the comparison group. From these results it could be assumed that self-regulated learning skills were not enhanced as a result of allocation to the intervention conditions. Further analysis was undertaken to ascertain differences in the MSLQ results within the learning-skills program group between those who were engaged and those who were non-engaged with the learning-skills program.

Figure 6.7 shows the changes in the MSLQ pre- and post-test for the participants in the learning-skills program group who were deemed to be non-engaged with the learning-skills program.
In Figure 6.7 it can be seen that for the non-engaged group the elaboration and organisation scores declined slightly. There was a small increase in the scores for rehearsal, critical thinking and metacognitive self-regulation for this group. Overall, there were no great differences between the pre- and post-test results. These results are consistent with those for the comparison group.

Figure 6.8 demonstrates changes in the MSLQ pre- and post-test for the participants in the learning-skills program group who were deemed to be engaged with the learning-skills program.
The engaged group demonstrated an increase in scores on each of the scales. Overall, there is a much more obvious change in the results for the engaged group than any other group in this phase of the study. The increase in rehearsal is small, which is appropriate given that the learning-skills program aimed to have learners move away from ineffective rehearsal strategies as they developed more-effective learning skills.

The results of the MSLQ data analysis illustrate self-reported increases in self-regulated learning strategy use among the participants who engaged with the program. This data is further considered with the findings of the individual cases in the discussion section of this chapter.

### 6.2.2 Cases

At the end of the learning-skills program a total of 14 resource books were collected. Resource books represented a range of engagement levels from those who only completed one or two activities through to those who completed almost every activity. Concept-mapping and goal-setting activities in the resource books were analysed to determine the level of engagement demonstrated by each participant throughout the learning-skills program. Cases were created through the analysis of the individual’s data sources. These cases were then examined to inform the research questions. As a
result of the analysis of the cases there emerged an obvious divide between participants who did and did not engage with the learning-skills program activities.

The following paragraphs detail the findings in relation to how engagement was ascertained and the outcomes for those who did engage.

6.2.2.1 Participants who did not engage with the learning-skills program activities

Analysis of the data (feedback questionnaires, resources books and individual interviews) from the 20 participants in the learning-skills program group revealed varying levels of engagement with the learning-skills program.

The feedback forms were analysed to determine the level of engagement of the five participants who offered neither a resource book nor an individual interview. As indicated in Section 6.1.4.2, engagement was rated based on responses to questions about whether participants found it helpful to practice concept mapping and goal setting as activities in the learning-skills program. Those who rated the program 3 or lower were categorised as non-engaged with the learning-skills program. Every one of the five participants who offered only a feedback questionnaire for analysis rated the program 3 or lower. This resulted in classifying Tom, Maree, Lyn, Andre and Chris as non-engaged.

The design of the feedback questionnaire did not prompt for responses to reasons for completion or non-completion of the activities. However, in the section allocated for additional comments, Tom provided an explanation for not participating in the intervention activities: “it wasn’t time especially well spent because I need to focus on the things I am not familiar with e.g. biochemistry” (Tom, feedback questionnaire). The other four participants did not offer responses to explain their lack of engagement.

Where available, the resource books were examined alongside the feedback questionnaires to determine the level of engagement of the seven participants who did not participate in an individual interview. Through analysis of the data it was
determined that five of the seven participants were to be categorised as non-engaged, as they had either:

- completed less than half of the activities throughout the program or
- completed more than half of the activities, though further analysis based on results of the feedback questionnaire identified them as non-engaged

The following cases illustrate an example of each of the above.

Jane

In her resource book Jane completed the first concept-mapping and goal-setting activities at the beginning of the second fortnight. No activities were attempted in the first fortnight. Apart from the initial activity in fortnight 2, no other attempts at the activities were evident. In the concept-mapping and goal-setting activities that Jane did complete, the work appeared hurried and did not follow the guidelines of the set activity. In her responses to the feedback questionnaire Jane indicated that she did not find it helpful to practice concept mapping and goal setting as activities in the learning-skills program, nor did she intend to continue using such strategies. Jane’s limited completion of the activities and her feedback responses led to her being categorised as non-engaged with the learning-skills program.

Paul

The level of engagement applied by Paul in his resource book is outlined in Table 6.5.

<table>
<thead>
<tr>
<th>Table 6.5 Paul – work-sample overview</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Concept map</td>
</tr>
<tr>
<td>Fortnight 1</td>
</tr>
<tr>
<td>Fortnight 2</td>
</tr>
<tr>
<td>Goal setting</td>
</tr>
<tr>
<td>Fortnight 1</td>
</tr>
<tr>
<td>Fortnight 2</td>
</tr>
</tbody>
</table>

Paul completed each of the concept-map activities throughout both fortnights. For each attempt his concept maps were coded as intermediate according to the concept-map scoring rubric.
In his goal-setting attempts Paul created brief goals that were inconsistent with the SMART goal approach; for example, “Be cognizant of various causes of chest pain to assist with differential diagnoses” (Paul, resource book, page 11). At no point in the goal-setting activity did Paul attempt to create a description of a goal that was specific, measurable, attainable, relevant and timely.

In his feedback questionnaire Paul responded with a 3 or lower to questions about whether he found it helpful to practice concept mapping and goal setting as activities in the learning-skills program. This indicated that he did not find the activities to be useful. He also indicated that he had already adopted a concept-mapping strategy prior to the workshops, which would explain why he was able to produce them at an intermediate level throughout the program.

Paul did not offer further elaboration regarding his engagement in comments or by agreeing to an interview. From the information that he provided in his feedback form and through an analysis of his resource-book activity attempts, it is evident that beyond completing the concept-map activities, he was non-engaged with the program, and his learning practice did not change as a result of the learning-skills program.

These cases provide examples of how non-engagement was determined for participants who offered only a resource book and feedback questionnaire for analysis. Other similar examples resulted in classifying Paul, Jane, Heidi, Eve and Aaron as non-engaged in the learning-skills program.

The greatest detail was provided by the eight participants who took part in an individual interview about their engagement with the learning-skills program. Through analysis of the data it was determined that only one of these participants was to be categorised as non-engaged. Her case explains how this was demonstrated.

Anna

The level of engagement applied by Anna in her resource book is outlined in Table 6.6.
<table>
<thead>
<tr>
<th>Table 6.6 Anna – work-sample overview</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Concept map</td>
</tr>
<tr>
<td>Fortnight 1  Intermediate</td>
</tr>
<tr>
<td>Fortnight 2  Basic</td>
</tr>
<tr>
<td>Fortnight 1  Intermediate</td>
</tr>
<tr>
<td>Goal setting</td>
</tr>
<tr>
<td>Fortnight 1  Content and learning-</td>
</tr>
<tr>
<td>strategy focus</td>
</tr>
<tr>
<td>Fortnight 2  Content and learning-</td>
</tr>
<tr>
<td>strategy focus</td>
</tr>
<tr>
<td>No attempt</td>
</tr>
</tbody>
</table>

Anna completed each of the concept-map activities throughout both fortnights. For most attempts her concept maps were coded as intermediate according to the concept-map scoring rubric.

In her goal-setting attempts at the beginning of each fortnight Anna followed the SMART goal system to create content and learning-strategy focussed goals that were specific, measurable, attainable, relevant and timely. She did not reset her goals throughout the fortnight in activity 2.

In her feedback questionnaire Anna responded with a 3 or lower to questions about whether she found it helpful to practice concept mapping and goal setting as activities in the learning-skills program. To further indicate that she did not find the activities to be useful, she commented on her feedback questionnaire: “I would have preferred to be in the other group (comparison group). I think I would have found it more beneficial” (Anna, feedback questionnaire).

In an individual interview Anna elaborated on the resource-book and feedback-questionnaire data. She explained that while she did complete the resource book activities during the learning-skills workshop sessions, she did not consider them in great detail. When asked whether her approach to concept mapping changed over the intervention period, she replied, “No, it was pretty much the same. Just more information added” (Anna, interview). While Anna did complete the initial goal-setting activities in the learning-skills workshops, she did not use them to direct her learning throughout the fortnight. She explained, “I wrote the goals but I did not refer back to them. I used my normal strategy of writing lists of things to do and ticking them off when they are done” (Anna, interview).
Anna’s overall data indicates that she did not engage with the learning-skills program activities. An analysis of Anna’s data demonstrated that while she did complete most of the activities in the resource book, her feedback questionnaire and interview suggest that she was non-engaged with the learning-skills program.

**Summary**

An analysis of the data shows that of the 20 participants in the learning-skills program group, 11 were deemed to be non-engaged with the learning-skills program. Non-engagement was evident most commonly in those participants who simply ceased attempting to do the activities early on in the program. Paul and Anna, however, continued to participate in most of the activities, though they were still determined to be non-engaged. For these participants non-engagement was determined as a result of their comments and work samples, which demonstrated a minimal effort towards thinking about and completing the activities.

Participants who were deemed to be non-engaged reported a common theme in their feedback of the program. An analysis of the non-engaged cases shows many comments relating to feelings that the program was not helpful, or useful, or time well spent. Overall, the cases demonstrated that not all learners can be encouraged to see the value in programs aimed at supporting their learning needs.

**6.2.2.2 Participants who did engage with the learning-skills program activities**

This phase of the study was concerned with exploring the outcomes for students who engaged with the activities aimed at supporting self-regulated learning. To ascertain this, an analysis of engagement and outcomes was performed on the remaining nine participants.

Of the nine participants who were categorised as engaged in the learning-skills program, seven took part in an interview. For the two who did not offer an interview (Wendy and Richard), their resource books were examined alongside the feedback questionnaires to determine their level of engagement. Wendy’s case is shown here to provide an example of how engagement was determined through an analysis of the available data.
Wendy

The level of engagement applied by Wendy in her resource book is outlined in Table 6.7.

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<thead>
<tr>
<th>Table 6.7 Wendy – work-sample overview</th>
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<tr>
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<tr>
<td><strong>Activity 1</strong></td>
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<tr>
<td><strong>Concept map</strong></td>
</tr>
<tr>
<td>Fortnight 1</td>
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<tr>
<td>Fortnight 2</td>
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<tr>
<td><strong>Goal setting</strong></td>
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<tr>
<td>Fortnight 1</td>
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<tr>
<td>Fortnight 2</td>
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Wendy completed each of the concept-map activities throughout both fortnights. Figure 6.9 shows her initial attempt, which was categorised as basic as it included only a small number of connected concepts.

Figure 6.9 Wendy – concept-map example 1
From Wendy’s initial attempt to create a basic map, her further attempts demonstrated an improvement. Her concept maps were coded as intermediate, as they depicted multiple concepts with some linking phrases to show the relationships between concepts, as shown in Figure 6.10.

In her goal-setting attempts at the beginning of each fortnight Wendy followed the SMART goal system to create content and learning-strategy focussed goals that were Specific, Measurable, Attainable, Relevant and Timely. She did not reset her goals throughout the fortnight in activity 2.

In her feedback questionnaire Wendy responded with a 4 or higher to questions about whether she found it helpful to practice concept mapping and goal setting as activities in the learning-skills program. When asked what she found to be most helpful about the learning-skills workshops, she replied “Concept maps” (Wendy, feedback questionnaire).

Wendy demonstrated engagement with the learning-skills program. This was evident through her commitment to the concept-mapping activities and her responses to the feedback questionnaire. As she was not available for an interview, Wendy’s
engagement with the program was ascertained through an analysis of her work samples, feedback form and MSLQ results.

Wendy’s work samples showed improvement in her approach to concept mapping. Through the program she developed from a basic to an intermediate approach. By following the SMART goal system she was also able to set content and learning-strategy focussed goals. In her feedback questionnaire she used the Likert scale to indicate that she had not used concept maps or a formal goal-setting strategy prior to the learning-skills program. She also responded that she would very likely continue to use the strategies beyond the learning-skills program, thus demonstrating that as a result of the learning-skills program, Wendy developed some effective learning strategies that she intends to apply to the learning context. This was further supported in a comparison of her MSLQ pre- and post-test results (Figure 6.11).

![Figure 6.11 Wendy – MSLQ pre/post-test comparison](image)

From the MSLQ pre-test to the post-test, Wendy's scores for elaboration and organisation increased greatly, and her score for rehearsal declined. Such changes could be explained by the use of concept maps to aid meaningful retention of knowledge and lessening the need to attempt to learn through rote and repetition (as is a common strategy in rehearsal). The MSLQ comparison results support the findings from the resource-book and feedback-questionnaire analysis. This demonstrates
positive outcomes for Wendy in the development of effective learning strategies through engagement with the learning-skills program.

Wendy’s case provides an example of how engagement was determined for participants who offered only a resource book and feedback questionnaire for analysis. Richard’s case tells a similar story, and resulted in classifying Wendy and Richard as engaged in the learning-skills program.

Those who participated in an individual interview about their participation with the learning-skills program provided insight into engagement with and outcomes of the learning-skills program. Seven participants were classified as engaged and participated in an interview. Cassie’s case provides an example of engagement with and outcomes of the learning-skills program described through an analysis of all data sources.

**Cassie**

The level of engagement applied by Cassie in her resource book is outlined in Table 6.8.

<table>
<thead>
<tr>
<th>Table 6.8 Cassie – work-sample overview</th>
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<tbody>
<tr>
<td>Concept map</td>
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<tr>
<td>Fortnight 1</td>
</tr>
<tr>
<td>Fortnight 2</td>
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<tr>
<td>Goal setting</td>
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<tr>
<td>Fortnight 1</td>
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<tr>
<td>Fortnight 2</td>
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</table>

Cassie completed three of the four concept-map activities throughout the learning-skills program. Her attempts at concept mapping are all very similar and demonstrate relationships between a large number of concepts. Figure 6.12 shows an example of her approach to concept mapping.
In her goal-setting attempts at the beginning of the first fortnight Cassie followed the SMART goal system to create a content and learning-strategy focussed goal that were specific, measurable, attainable, relevant and timely. She did not reset her goals throughout the fortnight in activity 2. At the beginning of the second fortnight Cassie adapted the SMART goal system to set goals that were only attainable and specific.

In her feedback questionnaire Wendy responded with a 6 or higher to questions about whether she found it helpful to practice concept mapping and goal setting as activities in the learning-skills program. When asked what she found to be most helpful about the learning-skills workshops, she replied “Concept maps” (Cassie, feedback questionnaire).

In her interview Cassie discussed her learning strategy prior to the learning-skills workshops as being one that already incorporated the use of concept maps. She indicated that as a result of the learning-skills program she had changed the way in which she used concept maps. Prior to the program she would create a separate concept map at the end of each lecture, mapping what she had learnt. At the completion of the program she reported that she now tried to fit multiple concepts into the one map, though she had to do this on large sheets of poster paper that she would
then stick to her bedroom walls. For her, keeping the maps in her resource book did not suit her need to look at them often.

I like drawing lots, like posters. And so I have a more, maybe, photographic memory so I remember specific things, where they are on the map, rather than just reading a whole bunch of text. If you were to come to my house I've got posters everywhere all around the walls because that's how I learn (Cassie, interview).

Cassie used her maps to see connections between concepts and to identify gaps in her knowledge. “I think I looked more into that, and [it] definitely helped me. It definitely helped identify where the gaps were. So, it was good” (Cassie, interview).

Cassie also indicated in her interview that she found great value in learning about the SMART goal system. Prior to the learning-skills program she had been setting goals that she felt were unattainable in the timeframe she had. This caused her to feel like she was constantly behind in her work and unproductive. Having realised this in the learning-skills workshops, she stated, “Now I make goals I know I can achieve in a day, and if I achieve them and have spare time, it's great, I go on and do extra things. But if I just get those done, it's good” (Cassie, interview). While Cassie indicated that she did not use the SMART goal structure exactly, she did use a similar system that ensured that her goals were attainable and specific.

In her parting statement Cassie said:

I liked the SMART goal. Like the attainable part of it made me realise that I was setting goals that were not realistic, and I was just getting really stressed. It was like a cycle of stress. It was horrible. But now I've rung home and told my mum about the workshops and how I've changed my goals and I'm not as tired anymore. Especially, I can concentrate in lectures and I'm getting most of my work done that should be getting done (Cassie, interview).

Cassie’s interview responses demonstrate how she engaged with the learning-skills program by adapting the activities to align with her personal learning preferences. She
recreated the concept-mapping activity to one that resulted in large posters that she could display in her room to help her to understand the content. She used only the elements of the SMART goal-setting system that she felt helped her to feel as though she was making progress in her studies. In her feedback questionnaire she used the Likert scale to indicate that she would very likely continue to use the strategies of concept mapping and goal setting beyond the learning-skills program. Cassie demonstrated that as a result of the learning-skills program she felt more in control over her learning, and felt as though her levels of stress had decreased. She also developed some effective learning strategies and adapted them to suit her needs. This was further supported in a comparison of her MSLQ pre- and post-test results (Figure 6.13).

**Figure 6.13 Cassie – MSLQ pre/post-test comparison**

From the MSLQ pre-test to the post-test an increase was evident in each of scores for elaboration, organisation critical thinking and metacognition/self-regulated learning. There was a decrease in the score for rehearsal. The MSLQ comparison results support the findings from the interview and the resource-book and feedback-questionnaire analysis.

The aim of the learning-skills workshops was to support students in developing self-regulated learning skills in a problem-based learning environment. Cassie’s data demonstrated that by adapting the program to suit her learning style she not only
developed a more effective approach to learning but also experienced great benefits to her self-efficacy and beliefs about her control over learning.

Six other participants who were described as being engaged also participated in an interview. Their cases are summarised in Table 6.9.

<table>
<thead>
<tr>
<th>Name</th>
<th>Engagement</th>
<th>Outcomes</th>
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| Alex  | Feedback questionnaire  
- Found all activities in the program to be useful  
Resource book  
- 2 basic concept maps  
- 2 content and learning-strategy focussed goals  
Interview statements  
- Increased his use of the concept-map strategy  
- Bought a whiteboard for home to create large concept maps  
- Used his concept maps and CBL (PBL) learning objectives to direct learning rather than the SMART goal system. | Increase in (MSLQ scales):  
- Rehearsal  
- Elaboration  
- Organisation  
- Critical thinking  
- Metacognition/SRL  
Also reported:  
- More confidence in approaches to learning  
- Awareness of more efficient learning strategies |
| Emily | Feedback questionnaire  
- Found all activities in the program to be useful  
Resource book  
- 2 intermediate concept maps  
- 2 content and learning-strategy focussed goals  
Interview statements  
- Used large pieces of poster paper for concept maps  
- Included entire fortnight's CBL (PBL) learning objectives in one map  
- Found the SMART goal system useful though internalised the process rather than writing goals | Increase in (MSLQ scales):  
- Rehearsal  
- Elaboration  
- Organisation  
- Critical thinking  
- Metacognition/SRL  
Also reported:  
- Development of strategies to become more efficient with her study time |
<table>
<thead>
<tr>
<th>Name</th>
<th>Engagement</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alina</td>
<td>Feedback questionnaire&lt;br&gt;• Found all activities in the program to be useful&lt;br&gt;Resource book&lt;br&gt;• 1 basic and 3 intermediate and very detailed concept maps&lt;br&gt;• 2 content and learning-strategy focussed goals&lt;br&gt;Interview statements&lt;br&gt;• Demonstrated development in approach to concept mapping&lt;br&gt;• Created extra concept maps as well as completing resource-book activity maps&lt;br&gt;• Introduced concept maps to study group&lt;br&gt;• Used concept maps to guide learning rather than SMART goals</td>
<td>Increase in (MSLQ scales):&lt;br&gt;• Elaboration&lt;br&gt;• Organisation&lt;br&gt;• Critical thinking&lt;br&gt;• Metacognition/SRL&lt;br&gt;Also reported:&lt;br&gt;• Feeling more confident about settling back into study after a five-year break&lt;br&gt;• Awareness of more effective learning strategies</td>
</tr>
<tr>
<td>Sharon</td>
<td>Feedback questionnaire&lt;br&gt;• Found all activities in the program to be useful&lt;br&gt;Resource book&lt;br&gt;• Misplaced book though submitted 2 intermediate concept maps and 1 content and learning-strategy focussed goal on loose paper&lt;br&gt;Interview statements&lt;br&gt;• Used concept maps to see connections between content and gaps in her knowledge&lt;br&gt;• Used concept maps with study group to demonstrate knowledge to each other&lt;br&gt;• Used the SMART goal system with study group to guide their group learning</td>
<td>Increase in (MSLQ scales):&lt;br&gt;• Rehearsal&lt;br&gt;• Critical thinking&lt;br&gt;• Metacognition/SRL&lt;br&gt;Also reported:&lt;br&gt;• Feeling more confident with approaches to learning</td>
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Table 6.9 illustrates how participants engaged with and adapted the learning-skills program. In each of these cases there was no example of a participant who simply
followed the learning-skills program as scripted. The analysis of the data demonstrated adaptations to the activities made by each participant throughout the intervention period.

Table 6.8 also presents the outcomes of participant engagement. These outcomes were demonstrated through changes in MSLQ scores and responses in individual interviews. Outcomes included changes to the use of learning strategies, as well as changes to participants’ feelings towards their approaches to learning.

**Summary**

The cases of the engaged participants show a range of approaches in attending to the activities within the learning-skills program. These participants demonstrated adaptations to the activities to suit their personal learning preferences. In their feedback participants identified the program as being beneficial to their learning, giving them greater understanding and control of effective learning strategies. Participants reported an intention to use some of the strategies beyond the intervention period. Participants also demonstrated growth in their pre- and post-test MSLQ scores. The results of the analysis of data from the engaged participants inform the discussion relating to learner engagement with and outcomes of a program to support self-regulated learning in problem-based learning.

**6.3 Discussion**

In Phase Four, the learning-skills program provided opportunities for learners in this study to engage in activities that reflected the self-regulated cycle, and were relevant to the context of problem-based learning. Of the 35 participants who originally consented to participate in the learning-skills program, only nine continued to engage with the program until its completion. Further investigation is required to understand the reasons behind the large number of participant attrition. This would help to inform the research about the effectiveness of the approach taken in this research. The high level of attrition is a limitation to the generalisability of the findings of this study which could be enhanced through exploration of the perspective of those who didn’t engage with the program.
A further limitation of this study is in the absence of a greater range of data from the comparison group. Ideally, this design of this study would include a deeper level of comparison between the learning-skills program group and the comparison group. A greater understanding of the outcomes and experiences of the comparison group would deepen the findings. Future research in this area should ensure that the perspectives of all participants in the study are considered to provide a more meaningful account of the experience.

Beyond the limitations that arose in the study, three key findings emerged from this phase:

- Learners who engage with a program aimed at supporting self-regulated learning strategies demonstrate increases in cognitive and metacognitive functioning.
- Learners who engage with a program aimed at supporting self-regulated learning strategies demonstrate increased self-efficacy with relation to their approaches to learning.
- Learners who merely participate, but do not engage with the activities, do not demonstrate positive outcomes from a program aimed at supporting self-regulated learning strategies.

The findings of this phase provide an understanding of the importance of supporting self-regulated learning in a problem-based learning environment.

### 6.3.1 Learners who engage with a program aimed at supporting self-regulated learning strategies demonstrate increases in cognitive and metacognitive functioning

Self-regulated learners are active seekers and processors of information who take control of metacognitive, motivational and behavioural aspects of their learning (Zimmerman, 1989). Their self-generated thoughts and actions are orientated toward attaining learning goals. This study investigated the impact of a program aimed at supporting learners to enhance their self-regulated learning skills for engagement in a problem-based learning curriculum. The findings of Phase Four of this study suggest that when learners actively engage with such a program, they report increases in their cognitive and metacognitive functioning.
In Phase Four of this study participants attended to the learning-skills program activities in varying degrees. Their level of engagement with the program was demonstrated through the analysis of various data sources. An analysis of the data revealed that learners who participated with a high level of engagement with the program took control over the activities and adapted them to suit their individual learning needs.

Learner-generated concept mapping was introduced as a cognitive strategy for knowledge acquisition in this study. Completely learner-generated concept-mapping strategies have been shown to be more effective in terms of knowledge acquisition than partially learner-generated or expert-generated concept mapping (Lim et al., 2009). For this reason, greater support for enabling learners to freely construct their concept maps (as advocated by Novak and Gowin, 1984) was chosen for this study, as opposed to a completion strategy whereby learners fill in the blank template of a concept map with the given content material (e.g. Chang, Sung & Chen, 2002). In Phase Four, the improved integrated instruction aided participants in the development of their concept-mapping skills. Analysis of the data showed that concept mapping supported the development of self-regulated learning skills as learners adapted the strategy to their personal learning style.

Participants who engaged with the learning-skills program adapted the concept-mapping strategy to best fit their metacognitive needs. For example, one participant introduced the strategy into group study situations as a way to illustrate and discuss content and connections between concepts related to the topic. Another participant purchased a whiteboard so that he could draw concept maps to help him learn, while another did a similar action on large sheets of poster paper. One participant drew concept maps on poster paper, and stuck them on her bedroom walls for future reference. Another made a task at the end of each fortnight to create a concept map that brought all the learning objectives together. Some participants found value in creating a concept map to activate prior knowledge and recognise gaps in knowledge at the beginning of the learning cycle. Others found it better to create a concept map at the end of the learning cycle to consolidate learning. Many, though, found benefits to their learning through the creation of concept maps at various stages throughout the
learning cycle to assist them with planning, monitoring and reflecting on learning; hence their concept-map actions promoted engagement with the self-regulated learning cycle.

The learner-generated concept-mapping activities provided a metacognitive support for self-regulated learning processes, as they were embedded in the activities for the processes of planning, monitoring and modifying learning. In turn, learners demonstrated greater metacognitive functioning as they adapted the strategy to best suit their learning needs. This suggests that active engagement with concept mapping supports the development of higher metacognitive functioning.

The notion that concept mapping supports the development of self-regulated learning is also reported in other research. In an investigation on strategies to improve English as a Second Language (ESL) students’ learning from English texts, researchers reported that learners demonstrated gains in both cognitive and metacognitive functioning after engaging with the concept-mapping strategy (Chularut & De Backer, 2004). In their study, the researchers conducted an experiment in which 79 learners were randomly allocated to a concept-mapping group or individual study plus discussion group for the purpose of learning from English texts. Pre- and post-testing was designed to investigate both academic achievement and self-regulation of both groups. The researchers reported that students who engaged in the concept-mapping exercises showed greater academic achievements and increases in self-regulatory behaviour. The report claiming that concept mapping provided a visual record of goal achievement and supported learners in monitoring and evaluating their learning.

The findings of Phase Four of this study support the idea that an increase in effective self-regulated learning skills is an outcome of engagement with learner-generated concept maps. The MSLQ scores of the engaged learners showed increases in the scores for elaboration, organisation, critical thinking and metacognitive self-regulation between the pre- and post-test. As suggested by the designers of the MSLQ, such results are evidence of changes to students’ uses of different cognitive and metacognitive strategies (Pintrich et al., 1991). Evidence of participants’ metacognitive control to adapt and use the strategy to suit personal preferences further supports this.
This study has shown that learners who engaged with a program aimed at supporting self-regulated learning strategies exhibit higher cognitive and metacognitive functioning. Research supports this idea that students who plan for, and self-monitor during, learning are found to be more efficient at learning (Van den Hurk, 2006). This was summarised in further research suggesting that “the more that one learns or the more aware one becomes regarding self-direction, the more likely one is to engage in maintaining, revising, or inventing new methods of self-direction” (Evensen, 2000, p. 291).

Phase Four of this study suggests that when novice learners engaged with a program aimed at supporting self-regulated learning, their ability to select and use effective learning strategies appropriate to their studies in a problem-based learning curriculum was enhanced. These findings were made through an analysis of learner work samples and participant interviews, and were confirmed by a comparison of pre- and post-test MSLQ scores.

6.3.2 Learners who engage with a program aimed at supporting self-regulated learning strategies demonstrate increased self-efficacy with relation to their approaches to learning

Upon transition to the problem-based learning context, learners can experience high levels of stress and uncertainty as they attempt to understand the most effective learning strategies for the context. In Phase Four of this study learners reported reduced feelings of stress and greater feelings of confidence in their approaches to learning after engagement with the learning-skills program.

In Phase Four, participants also reported feelings of greater self-efficacy towards their learning after engagement with the learning-skills program. Comments in the individual interviews highlighted participants’ greater feelings of confidence toward their selection of learning approaches. Participants shared thoughts of being more in control of their learning strategies, and the ability to select more effective techniques to maximise learning in a decreased amount of time. As learners became more efficient with their use of study time they began to feel more productive. They also
sought new ways to adapt their learning techniques, and on many occasions, sought out fellow learners with whom to share study sessions.

A student’s beliefs about their success as a learner can greatly affect their ability to plan for and engage in learning. As self-efficacy can change depending on the context, learners who may have been very successful in one environment may see their self-efficacy toward learning falter when entering a new setting. Research has reported that when learners are supported in the development of self-regulated learning skills, they display increases in self-efficacy (Zimmerman & Kitsantas, 1997). In a study of goal setting and self-monitoring for the development of complex motor skills, 90 high-school girls were randomly allocated to one of eight experimental conditions, or a practice-only control group. The experimental conditions comprised of variations of goal-setting and self-monitoring supports. The researchers reported that as participants’ skills in goal setting developed, the processes became internalised as learners’ self-efficacy and skill in self-regulated learning increased. In their study of the development of self-regulated learning, the researchers concluded that:

> when socially validated learning strategies are modeled and adopted as process goals to guide self-directed practice and self-monitoring, students more frequently make attributions to controllable (strategy) personal sources and experience gains in self-perceptions of efficacy and intrinsic motivation to pursue the skill further (Zimmerman & Kitsantas, 1997, p. 35).

Equally, the more self-efficacious a learner is, the more committed they are to leading and directing their own learning (Bandura, 1991). In this study it was shown that as participants began to feel more confident with their approaches to learning, they moved away from the programmed supports and adapted the strategies to suit their own personal learning preferences.

The findings of this study show that when learners are supported to develop learning skills that are effective and deemed appropriate for the context, their confidence and self-efficacy towards learning strategy selection increases.
6.3.3 Learners who merely participate, but do not engage with the activities, do not demonstrate positive outcomes from a program aimed at supporting self-regulated learning strategies

Encouraging all learners to participate in a program to support self-regulated learning skills can be difficult. In Phase Four, access to support and embedded strategies to encourage participation did not necessarily motivate all learners to engage with the activities. In this study many learners chose not to participate at all, and others seemingly went through the steps of the learning-skills program, failing to engage with the activities through only basic attempts to participate. An analysis of the data revealed that these students did not exhibit outcomes as a result of the support being made available.

In Phase Four there were a total of 20 participants in the experiment group. Within this group there was a large range in levels of completion of the learning-skills program. Those who chose not to engage with the program were still willing to provide data, including MSLQ tests and feedback on the activities. Of the total 20 participants only seven engaged thoroughly with the learning-skills program. The outcomes for these seven learners have been discussed in the previous sections of this chapter in terms of the positive outcomes that they experienced through their participation.

The remaining 13 participants showed varying levels of attempts at engagement. There were those who chose not to complete the activities at all, some who attempted parts of the program, and others who did many of the activities, though only with minimal effort. In their feedback, these 13 overwhelmingly reported not recognising the activities in the learning-skills program to be of value to them, or that they did not have the time to attend to consideration of learning strategies. This issue is evident for other researchers investigating how self-regulated learning development can be supported.

Motivation is an important factor for engagement with self-regulated learning processes. Literature in self-regulated learning suggests “learners must be sufficiently motivated to perform self-regulatory actions they deem to be applicable” (Winne & Nesbit, 2009, p. 272). Hypermedia learning environments are a context in which
supports for self-regulated learning activities have been investigated. However, research in this context also presents similar experiences to that of this study, reporting the tendencies of learners not to use the support devices provided (Clarebout, Horz & Elen, 2009). In an investigation of the role of motivation in learners’ attempts to self-regulate their learning more effectively, researchers put forward the need for self-regulated learning interventions to include support for motivational strategies, in order to promote successes in learning for students (Zimmerman & Moylan, 2009). Further research is required in this area to understand how this can be achieved.

6.4 Conclusion
Phase Four was the final phase of this multiphase, mixed-methods investigation that ultimately aimed to understand how self-regulated learning strategies could support students in a problem-based learning curriculum. In Phase Four the researcher investigated learner engagement with a program designed to support the development of self-regulated learning in a problem-based learning context. Furthermore, the researcher sought to understand the outcomes of learner engagement with the program. A limitation of this Phase was the high attrition rate of participants from the study. The findings of this phase focus on an analysis of data from the nine participants who were deemed to be engaged with the program. Future investigation must consider the perspective of the 26 participants who withdrew from the program at various stages of the intervention.

The results of Phase Four suggested that learners who engage with a program aimed at supporting self-regulated learning strategies demonstrate increases in cognitive and metacognitive functioning. Data from participants in the learning-skills program group was analysed to determine the level of engagement with the learning-skills program. Participants who were found to be engaged with the program demonstrated enhanced use of cognitive and metacognitive strategies as they selected, adapted and used appropriate learning strategies to help them achieve their learning goals. Increases in scores for cognitive and metacognitive self-regulation were also evident in the comparison of the pre- and post-test MSLQ scores of the engaged participants. Such an increase in scores was not seen for students in the comparison group, nor for
those in the learning-skills program group who were deemed to be non-engaged. This suggests that an increase in cognitive and metacognitive functioning was an outcome for those participants who engaged with the activities within the learning-skills program.

The results of Phase Four also revealed that learners who engage with a program aimed at supporting self-regulated learning strategies demonstrate increased self-efficacy with relation to their approaches to learning. Participants in this study who engaged with the learning-skills program did so because they felt that it supported their learning in the context. Beyond demonstrated increases in their cognitive and metacognitive functioning, participants reported increases in their satisfaction and confidence in their approaches to learning as a result of engagement with the program. Participants reported feeling as though they had greater control over their learning and had a greater understanding of effective learning strategies and when to use them. This confidence was also demonstrated as participants adapted strategies to suit their personal learning preferences. This supports a finding that increased self-efficacy related to learning is an outcome of engagement with a program designed to support the development of self-regulated learning in problem-based learning.

A third finding of Phase Four was that learners who merely participate, but do not engage with the activities, do not demonstrate positive outcomes from a program aimed at supporting self-regulated learning strategies. Not all participants in the learning-skills program group were motivated to engage with the program. The results indicated that for these learners, there was no evidence of increases in any of the scales of the MSLQ. Furthermore, the feedback provided by these participants reflected beliefs that they did not achieve outcomes related to self-regulated learning as a result of exposure to the learning-skills program. This confirms the notion that outcomes resulting from the learning-skills program were only evident for those learners who actively engaged with the activities.

The findings of Phase Four, along with the findings of the previous phases, informed a response to how self-regulated learning strategies could support students in problem-based learning. This is discussed further in the concluding chapter.
Chapter Seven: Conclusion

This study was conducted to investigate how learners could be supported to develop effective self-regulated learning skills in a problem-based learning environment. The research was guided by a social-cognitivist perspective of self-regulated learning to investigate the contextual nature of support for learning skills. The significance of this study is its contribution to understanding the importance of integrated, contextualised and explicit support of self-regulated learning skills for learners upon entering a student-directed learning environment. This study focussed on the development of self-regulated learning in a problem-based learning curriculum; however, the findings are relevant to other higher-education contexts in which students are required to take control over their own learning.

This study was conducted in a multiphase, mixed-methods design. This ensured a rigorous study in which an investigation of the context informed the development of the learning-skills program prior to its testing. Each phase was designed for the investigation of a series of sub-questions leading to the overarching question that was the focus of the study. Each phase of this research was unique in its design and findings. For this purpose, details of the methodology, results and findings were presented in individual chapters throughout this thesis.

This chapter presents the findings of this study relevant to the overarching question:

- How can self-regulated learning strategies support students in a problem-based learning curriculum?

Following this, the chapter presents a discussion of the implications for research and practice, limitations of the study and suggestions for further research.

7.1 Discussion of the findings

The findings of this study suggest that support strategies for self-regulated learning can be effective in enhancing learning and self-efficacy upon students' transition to a problem-based learning context. However, it is often difficult to encourage learners to engage with new learning strategies in high stakes environments such as medical school. These findings have been determined through a multiphase, mixed-methods inquiry that reports on:
• the investigation of the learner experience of problem-based learning;
• the development of an empirically underpinned and contextually bound learning program to support the development of self-regulated learning;
• the testing and refinement of the program based on initial findings of how learners engage with it; and
• outcomes for learners when they engage with explicit and contextually developed supports for self-regulated learning in problem-based learning.

The findings of this study are timely given the calls in recent literature for further research to understand best practices in supporting the development of self-regulated learning at important transition points in medical education (Brydges & Butler, 2012).

Transition to a new learning environment can be a difficult task. Learners bring with them a range of learning strategies that may or may not be useful for the new context. To be able to effectively participate, the learner is required to adapt and develop strategies appropriate to the new surrounds (Schunk, 2001). The ability to realise such strategies can inevitably affect the student’s success in the chosen course. This investigation was concerned with how students could best be supported in the development of effective learning skills upon transition to a new environment.

For the purpose of investigation, a problem-based learning context was chosen. In problem-based learning, students are required to develop skills to direct their own learning (Barrows, 1986). For many of these students the learning skills developed in primary school, secondary school and university courses are often well suited to a teacher-directed curriculum. When making a transition to a learner-directed context, even the most experienced and successful learners may return to novice status upon entering the new learning environment (Boekaerts, 1997). The challenge for learners is to realise effective learning strategies, and at the same time understand a high volume of content, to meet the demands of the new context. The results of Phase One reported on the challenges that these learners face upon transition to a problem-based learning context.

In Phase One, learners entering a postgraduate medical degree participated in focus-group discussions in which they discussed their experiences in the transition to the
problem-based learning environment, the learning strategies they used and how they thought the transition might be better supported. Participants reported feelings of being overwhelmed and stressed as they adapted to the curriculum. Their workload was increased by the need to develop strategies for learning in their medical degree. Learners found the new curriculum structure to be confusing and sought guidance and structure in faculty-provided resources such as pre-readings, lectures, online assessment and course objectives. While some found that they were becoming more comfortable with the curriculum toward the end of their first year of study, this was not the case for all.

The reports from participants in Phase One were not unique to this study. Other research has reported similar findings when investigating the learner experience of transition to a problem-based learning medical context (Dolmans & Schmidt, 2000; Evensen et al., 2001; Lloyd-Jones & Hak, 2004; Reaume & Ropp, 2005). In each of these studies there was a common theme of affective dissonance for students as they experienced higher volumes of content, ineffective learning-strategy use and greater feelings of self-doubt in the early days of graduate medical school. Participants in Phase One of this study shared their ideas on how they thought the transition could be better supported.

Participants in Phase One agreed that greater assistance was required for students in the early stages of problem-based learning. They felt that support was required to scaffold the development of effective learning skills for new learners to understand the learning processes required. It was recommended that such support be embedded in the existing curriculum structure to avoid putting extra pressure on the already time-poor students.

The Phase One investigation allowed the researcher to gain a contextual understanding of the learning challenges and needs of students in the problem-based learning context. From the findings of Phase One the researcher moved into Phase Two, investigating the associated literature to ascertain how learners might best be supported. The aim of Phase Two was to develop an empirically underpinned, contextually bound program to support learners as they entered a problem-based learning environment.
Problem-based learning is a student-directed pedagogy. Students who are successful in problem-based learning display skills in self-regulated learning (Blumberg, 2000; Evensen, 2000; Sandars & Cleary, 2011; Zimmerman & Lebeau, 2000). This study was concerned with how students could be supported and guided to develop the necessary skills. Through an analysis of empirical literature, Loyens et al. (2008) concluded that self-regulated learning is a developmental process. This suggests that self-regulated learning can be taught (Dignath, Buettner & Langfeldt, 2008). Therefore, the researcher in this study explored literature pertaining to the development of self-regulated learning.

A social-cognitivist perspective of self-regulated learning was chosen to underpin this research. The social-cognitivist perspective views self-regulated learning as a process that is influenced by dynamic interactions between personal, environmental and behavioural factors, and is therefore not a fixed trait (Schunk, 2001). This view supports the notion that self-regulated learning is contextually bound and is a process that can be supported. This perspective was used to inform the design of strategies to support the development of self-regulated learning for learners in problem-based learning.

A learning-skills program was developed in Phase Two based on the review of the literature and the Phase One findings. Activities within the program were designed to emulate the processes involved in self-regulated learning (Zimmerman, 1998). In this learners were encouraged to consider gaps in knowledge and set goals for learning in the forethought stage; monitor their progress toward goal achievement and reset goals where necessary in the performance phase; and reflect on learning in the finishing phase before embarking on the learning cycle again. Furthermore, learners were introduced to concept mapping as a learning strategy that has been demonstrated to promote meaningful learning and self-regulated learning (Chularut & DeBaker, 2004). While these informed the activities of the learning-skills program, consideration of the implementation strategy was further required.

Previous examples of attempts to support self-regulated learning were considered. A learning-skills program was developed based on consideration of the designs of other
studies, and the underpinning beliefs of a social-cognitivist perspective of self-regulated learning. The program followed the design principles of integrated instruction, explanation of the application and usefulness of supported strategies and training time to allow participants to implement the strategy in the context (Bannert et al., 2009). The need for integration of such programs into the existing curriculum was deemed important, as active interactions with the structure and content of the learning domain are critical for the development of self-regulated learning skills (Boekaerts & Cascallar, 2006; Sandars & Cleary, 2011). Phase One participants were once again consulted to ensure that the program aligned with what they felt would be useful to learners in the context. This learning-skills program was delivered, tested and improved upon in the final two phases of the study.

Phase Three was designed to test student engagement with and outcomes of the learning-skills program. Through a quasi-experimental research design the program was evaluated using both quantitative and qualitative methods. The results of Phase Three led to an understanding of how learners engaged with the program and how the program could be improved upon and retested in Phase Four. The findings specific to Phase Three were:

- Learners engage with a program to support self-regulated learning when they believe it to be relevant to their learning.
- Supports for self-regulated learning require clear guidance and instruction for engagement beyond the face-to-face environment.
- The development of self-regulated learning skills is an individual experience, and investigation requires an individual approach.

Encouraging learners to engage with the learning-skills program seemed a challenging task. The findings of Phase Three revealed a number of reasons why some students chose not to participate in the activities. These included a perceived impingement on their time, inappropriate timing of the program, lack of guidance in the activities and a belief that the program did not add value to their learning. Those who did participate each reported that they found some educational benefit from the program. However, evidence also suggested that a lack of guidance and clear instruction made it difficult for learners to attend to each of the activities with the
desired level of engagement. Aspects of the research design made it difficult to ascertain a complete understanding of the outcomes of learner engagement with the program.

Individual and group methods were used to collect and analysis data in Phase Three. As a result, only a limited response to the research questions was elicited. Upon consideration of the findings in Phase Three, changes were applied to the program design and research methodology.

There were significant changes made to promote the value of the learning-skills program to students. First, the learning-skills program was re-integrated at a different point of transition. Where the program in Phase Three was integrated into the initial stages of the second semester, in Phase Four it was moved to the earliest point of transition for the students, at a time when many experience difficulty in adapting to the new context (Boekaerts, 1997; Ennis, 1990). Second, students from the second-year cohort were invited to speak at a preliminary training session. They were asked to share their experiences of transition to problem-based learning and to promote the value of developing of effective learning strategies for the context. A third change was to seek greater support from problem-based learning tutors in the integration of the learning-skills program. Tutors were provided with training so that the activities could be more effectively embedded into the existing curriculum structure. Lastly, the number of activities in the program was reduced so that it was better suited to the learners given the demands of the curriculum.

Further changes were made to allow learners to support effective engagement with the learning-skills program. Greater guidance and instruction were introduced to enhance learners' understanding of the activities and allow them to complete them beyond the face-to-face environment. Changes included greater integrated instruction and scaffolding and the removal of information pages that were deemed to be distracting, according to the feedback in Phase Three. The design of the research was reconsidered to ensure that a greater level of analysis could be conducted.

The findings of Phase Three revealed the limitations of group methods when collecting data about self-regulated learning. The researcher was unable to analyse
the focus-group interview and survey data to a level of granularity required to thoroughly respond to the research questions. For Phase Four, the research design was reconsidered to focus on individual participants rather than the group as a whole.

The findings of Phase Three informed changes to the design of the program and research design. The changes were applied and the program was retested in Phase Four.

With changes made, Phase Four was once again designed to test student engagement with, and outcomes of the learning-skills program. Through a quasi-experimental design in which individual data was collected and analysed, the findings specific to Phase Four were:

- Learners who engage with a program aimed at supporting self-regulated learning strategies demonstrate increases in cognitive and metacognitive functioning.
- Learners who engage with a program aimed at supporting self-regulated learning strategies demonstrate increased self-efficacy with relation to their approaches to learning.
- Learners who merely participate, but do not engage with the activities, do not demonstrate positive outcomes from a program aimed at supporting self-regulated learning strategies.

High attrition rates of participants and non-engagement was once again a problem in Phase Four. Therefore, the findings of the study are limited by the fact that they are based on the analysis of data from a small representation of the cohort. Further investigation is required to understand the features related to attrition and non-engagement with the program.

The individual approach to data collection and analysis allowed a greater understanding of the research questions. Within the group of learners who were exposed to the learning-skills program conditions there remained a difference between those who chose to engage with the activities and those who did not. An analysis of data provided by each participant determined the level of their engagement
with the program. Based on this determination, the results for engaged participants could be compared against those of the non-engaged participants.

Increases in cognitive and metacognitive functioning were an outcome for those who engaged with the learning-skills program. An analysis of the work-sample and interview data suggested that when learners engaged with the activities they became more likely to select and use effective learning strategies and adapt them to suit their personal learning preferences. The triangulation of data sources allowed the researcher to confirm this finding. The engaged participants demonstrated increases in their MSLQ pre- and post-test results where the non-engaged and comparison-group participants did not. Such increases in results are evidence of positive change in students’ use of cognitive and metacognitive strategies (Pintrich et al., 1991).

Increases in self-efficacy pertaining to approaches to learning were an outcome for participants who engaged with the learning-skills program. This finding was highlighted in the interview data in which students who were deemed to be engaged commonly reported on greater levels of confidence and satisfaction with their approaches to learning. Learners communicated greater control over learning-strategy selection and use, and the ability to select more-effective techniques for the productive use of study time as an outcome of engagement with the learning-skills program. Such outcomes were not reported for the non-engaged participants.

This study evolved over four phases on investigation. Each phase responded to research sub-questions, which ultimately informed an overarching question. The findings of this study suggest that support strategies for self-regulated learning can help to enhance student learning and self-efficacy upon transition to the problem-based learning context. The findings of this study lead to implications for research and practice.

### 7.2 Implications for research

A social-cognitive perspective identifies the contextual nature of self-regulated learning. This suggests that the processes involved are specific to the environment in which they are required (Bandura, 1991; Schunk, 2001). Therefore, programs that are
designed to support self-regulated learning should be representative of the specific context in which they will be applied (Bannert et al., 2009). In this research there were ongoing attempts to integrate and contextualise the learning skills program within the existing curriculum. Without the full support of faculty or opportunities for staff development to implement the activities, this proved a difficult task to achieve. For those interested in pursuing research in this area, consideration must be applied to ensuring that support for self-regulated learning can be seamlessly embedded into the curriculum and not seen to be a separate program. This also presents greater challenge in the collection and analysis of data.

Measuring learning strategies in a student’s environment is a difficult task. The most common protocols for measuring self-regulated learning include self-report questionnaire, interviews or think-aloud methods (Schellings, 2011; Winne & Perry, 2000). These methods are mostly dependant on the learner’s memory of events or interpretation of their actions which can limit the validity of the findings (Veenman, 2011). Online traces in the computer-based learning environment offer a way of collecting data about the learner’s self-regulated learning action in real-time and in the context which they occur (Winne, 2010). However, this offers little assistance to those working in a non-computer supported context. In this study a mixed-methods approach allowed the researcher to triangulate data and obtain a deeper insight into learners’ learning strategies than can be achieved through a single-method study (Schellings & Van Hout-Wolters, 2011). This approach led to an understanding of how students engaged with the program, and also the outcomes of their engagement. Though understanding why some learners chose to engage with the activities and why others withdrew from the program was unable to be ascertained through this design. Research in this field should consider designs that allow for an investigation of those students who chose not to engage with self-regulated support programs to further our understanding in this area.

This study has addressed an understanding of how students can engage with support for self-regulated learning and the outcomes of this engagement. There still remains areas to examine to further our understanding. Ongoing investigation in this research can seek to understand why learners may choose not to engage with explicit support for self-regulated learning and also understand integration designs that yield most
effective results for student participation. Further iterations of this study could aim to further modify the program, support the development of other learning strategies and investigate the impact on learning outcomes. Arising from the implications for research are directions that may be considered for further research in this field.

7.2.1 Further research
This study has highlighted the need for further research in the following areas:

- Understanding reasons contributing to attrition of students from the learning skills program

This research project suffered from high attrition rates within each of the learning-skills program phases. The findings of this research were therefore limited to a small group of students who did engage with the activities. Further research is required to investigate the factors that contributed to this attrition and student non-engagement with the program.

- Effectiveness of self-regulated learning-support programs in contexts other than a graduate problem-based medical curriculum.

Self-regulated learning skills are demonstrated by lifelong learners. Universities and employers deem this skill to be an essential attribute of successful students and professionals. Further research may investigate how self-regulated learning skills can be embedded into the early phases of all tertiary courses to support the development of this necessary skill set.

- Involvement of facilitators to problem-based learning in the effective integration of self-regulated learning programs, completely embedded into the curriculum.

As it is the assumption of the problem-based learning approach that students will naturally acquire skills in self-regulated learning, there is little evidence of approaches to explicitly address it in the curriculum. This study found that when attempting to embed the program into the problem-based learning curriculum, its success depended heavily on the involvement of the tutors in the context. As has been discussed throughout this thesis, tutor quality can vary greatly, and faculty development is required to support staff in understanding how self-regulated learning can be supported in their classes. Further research may aim to understand how problem-
based learning tutors can be supported to assist their students in developing self-regulated learning skills in their classrooms.

- Modifications to the program for ongoing improvements

Program and curriculum design can be an ongoing and iterative process, with each phase informing the next. This study demonstrated two iterations of testing and improvement in design from one phase to the next. The final design, while aiding outcomes for some participants, could still benefit from further modification to encourage participation and enhance outcomes. Further research could build on the findings here to continually improve the transition experience for learners in this context.

- Support for the development of other learning strategies

In this study, concept mapping was introduced as a cognitive strategy for organising and elaborating information. This is only one strategy that learners can use to assist in knowledge acquisition. Other strategies include the creation of tables, paraphrasing information and mental imagery, to name a few. There is scope for further research to investigate how other learning strategies can be taught to learners to support them in the development of effective strategies for their context of learning.

- Influence on learning outcomes

This study was limited in its investigation of the outcomes of engagement with supports for self-regulated learning. The data collected in this study allowed an analysis of outcomes for learners in terms of cognitive and metacognitive strategy use, and self-efficacy towards strategy use. Further investigations would be ideal to ascertain outcomes in relation to knowledge acquisition and learning outcomes as a result of increased self-regulated learning skills.

7.3 Implications for practice

Problem-based learning was designed on the premise that self-regulated learning skills would independently develop. This study challenges this view and supports the belief that not all students are able to instinctively become successful independent learners (Dornan, Hadfield, Brown, Boshuizen & Scherpbier, 2005; Winne & Nesbit,
2009). Furthermore, this study supports that adapting to a new learning environment can result in increased stress for the learner (McLean & Gibbs, 2009). Phase One of this study reported on the experience of the learner transition to problem-based learning in the absence of support for acquiring self-regulated learning skills. The findings of Phase One support the call for processes in self-regulated learning to be made explicit and well supported for learners entering a problem-based learning curriculum.

The design of supports for self-regulated learning should be embedded within the existing curriculum. This ensures the development of self-regulated learning skills can be contextually applied by the learner. Learners may not see the relevance or importance of the program to their learning if they are unable to see how it applies to learning in their context. Therefore, the placement of self-regulated learning support activities must align with when and where the skills are required.

The timing of a program to support self-regulated learning should be well considered. The findings of this research suggest that the greatest benefit to learners is when such a program is introduced at the earliest point of transition to the new learning context. In Phase Three the learning-skills program was implemented in the second semester of the first year of learning. In Phase Four it was rescheduled to the beginning of the first semester. The results showed that when the program was introduced at the earlier point of transition, learners who were seen to engage with the program experienced greater benefits.

7.4 Limitations of the study

It is important to acknowledge the study's limitations, as certain characteristics of this research affect the generalisability of the findings. Issues with data and context presented certain limitations to the study.

7.4.1 Limitations within the data

This study aimed to collect and analyse data in a mixed-methods methodology to investigate the research questions. This methodology included the collection and analysis of focus-group interviews, MSLQ pre- and post-tests, feedback
questionnaires, individual interviews and work samples. Despite the large amount of data, unforeseen limitations to the study arose with capturing all of the relevant data.

A mixed-methods design was chosen to provide a deep understanding through theoretical testing, participant feedback and observation of work samples. Often, learners who did engage with the program and demonstrated positive outcomes adapted the program by elaborating concept maps beyond the resource books, or internalising the goal-setting process. Without access to this data, a complete understanding of engagement with and outcomes of the learning-skills program was unavailable. An ability to access and analyse the progressive work samples, completed elsewhere, would have further informed findings. Also, access to those who chose not to participate could help to explain issues surrounding non-completion of the program; however, they did not volunteer to participate in an interview.

The research questions themselves also presented a limitation. Within this study the areas of investigation were focussed on strategy use and development of self-regulated learning processes. The scope of the study did not consider data on learning outcomes relating to increases in knowledge. This is potentially a topic for another investigation.

Limitations relating to data are not unique to this study, as, based on concerns for validity and reliability of current approaches, new designs for assessment instruments in the assessment of cognitive and metacognitive strategy use still continue to develop (Veenman, 2011). The researcher in this study concurs with these concerns, and acknowledges data availability and the exclusion of data on learning outcomes as major limitations to this research.

7.4.2 Limitations within the context

Program completion issues arose in this study partly due to a lack of support from some of the teaching staff in the context of study. While structures were put in place to try and avoid this in Phase Four, ultimately, one is unable to avoid the need for teacher interaction at some point of a fully integrated learning-skills program. For the development of self-regulated learning skills in problem-based learning, students view support from teachers as being an important factor. It has been reported that
students are more likely to plan to achieve their learning needs when their teachers provide support and guidance (Dornan et al., 2005).

Problem-based learning tutors can nurture the development of self-regulated learning skills. Effective tutors stimulate elaboration and integration of knowledge, as well as interaction and individual accountability, while directing the learning process (De Grave et al., 1999). The development of self-regulated learning in problem-based learning can be guided through good teaching. However, medical schools may not always be able to attract tutors with skills in facilitating problem-based learning.

Learning to teach using problem-based learning can be a difficult task. For many, it involves a change in personal philosophy about the role of the teacher. Tutors find problem-based teaching to be challenging as they seek to understand how to plan for, implement and assess learning in a non-traditional pedagogy (Ertmer & Simons, 2005). Researchers in a high-profile medical school in the Netherlands investigated variations among 67 problem-based learning tutors (De Grave et al., 1999). Based on measures of student satisfaction with their tutors, the researchers reported that 24% of their tutors were rated as poor-performing. Students reported that tutors who stressed learning processes were viewed as more effective than those focussing on content.

For students who find themselves in classrooms where tutors focus on content, the development of self-regulated learning skills is left to trial and error. This study sought to empower learners by developing a learning-skills program that aimed to support their development of effective self-regulated learning skills, independent of their problem-based learning tutor.

This study concluded that it is important for a learning-skills program to be embedded into the learning context. Unfortunately, this finding was partly informed by the inability to fully do so due to unaccommodating teachers. The experience of this study, however, is not unique. With the implementation of a problem-based learning curriculum in a medical-education facility, there is often the experience of various reactions from faculty, as issues with regard to the role, and expertise, of the problem-based learning teacher arise. Hence, staff development is seen to be essential in the success of the adoption of new practice. To maximise the success of a new program,
or component of the curriculum, it is imperative that the teachers are actively involved in the curriculum changes (Farmer, 2004; Spronken-Smith & Harland, 2009).

Given this understanding, this study experienced issues with integration and program completion. As it was beyond the scope of this study to involve the problem-based learning teachers in program decision-making, a lack of support was experienced. This disinterest from those who were most involved with the students made the intended integration of the learning-skills program difficult to achieve; therefore, completion issues arose. This is an important understanding for program development at any level of education, and was considered a limitation to the ability to completely embed the program, to support learners in a holistic manner.

7.4.3 Limitations in generalisability

The importance of the context was a feature in the development of effective supports for self-regulated learning. The development of the learning-skills program itself was informed by empirically based design principles and underpinned by the findings of an investigation of the learner experience within the context of study. The design principles were informed by research on a metacognitive support program, and included integrated instruction, explanation of the application and usefulness of supported strategies and training time to allow participants to implement the strategy (Bannert et al., 2009). The findings of this research illustrated the generalisability of these design principles, as they were found to be equally important to participants in this study.

The learning-skills program was design specifically for a postgraduate problem-based learning medical curriculum. The program itself is limited in its generalisability to other contexts. Though, the design of the research itself could be applied in other contexts as the importance of uniqueness of each context was a feature of this study.
7.5 Conclusion
This four-phase, mixed-methods study makes a significant contribution to understanding how effective support for developing self-regulated learning strategies can be achieved, and also the outcomes of this support.

The Phase One investigation provided evidence of the student experience upon transition to a problem-based learning context. The participants reported feeling overwhelmed by the experience and were unsure of what learning strategies to apply. This was supported by similar findings in the related literature. The findings of Phase One informed the need for scaffolding to support student transition to this context. It was deemed important that the support be embedded within the existing curriculum.

In Phase Two of this study a program was developed and evaluated prior to testing in Phase Three. The program was informed by empirically based design principles and the earlier investigation of the context. The program was developed to ensure integration within the existing curriculum, presentation of the importance of the skills within the context and participant interaction with the skills in a contextualised manner. Participants from Phase One examined the program and added suggested changes to enhance its relevance to the context. The program was tested in Phase Three.

Phase Three was designed to test the learning-skills program. The researcher was concerned with how learners engaged with the program, and the outcomes of their engagement. The results of Phase Three indicated that learners engaged with a program to support self-regulated learning when they believed it to be relevant to their learning. Furthermore, such supports required a level of guidance and instruction that allowed learners to engage with activities beyond the face-to-face environment. The findings of Phase Three reported on the need for an individual approach to the investigation of the development of self-regulated learning, and suggested the need for further modification to the program. Based on the findings the program was redeveloped and retested in Phase Four.
In Phase Four the researcher was once again interested in how learners engaged with the program, and the outcomes of their engagement. The findings of Phase Four reported that when learners engaged with the learning-skills program they demonstrated increases in their cognitive and metacognitive functioning as well as self-efficacy related to approaches to learning. Those who did not engage with the program did not demonstrate growth in the use of effective learning strategies.

The four phases of this research led to the overarching finding of this study. Through investigation and empirical testing it is suggest that integrated, explicit and contextualised support for self-regulated learning strategies promote benefits to student learning upon transition to the problem-based learning context. Outcomes for learners who engage with such supports include increases in cognitive and metacognitive functioning and increases in learner self-efficacy.

Further investigations will provide ongoing advances to knowledge in this area.
References


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Appendices
Appendix 1.1 – Medical education program structure
Appendix 1.2 – Fortnightly learning schedule
Appendix 3.1 – Ethics approval – Phase One

INITIAL APPLICATION APPROVAL
In reply please quote: HE08/222
Further Enquiries Phone: 4221 4457

19 August 2008

Ms Lisa Kosta
Faculty of Education
Building 67
University of Wollongong

Dear Ms Kosta,

Thank you for your response of 13 August 2008 to the HREC review comments from the Executive Committee meeting held on the 7th August 2008. I am pleased to advise that the application has been approved.

Ethics Number: HE08/222
Project Title: Using learning designs to scaffold the learning process in a problem-based medical curriculum
Researchers: Ms Lisa Kosta, A/Prof Lori Lockyer, Dr Susan Bennett, A/Prof Elizabeth Farmer
Approval Date: 14 August 2008
Expiry Date: 13 August 2009

The University of Wollongong/SESLIAHS Humanities, Social Science and Behavioural HREC is constituted and functions in accordance with the NHMRC National Statement on Ethical Conduct in Human Research. The HREC has reviewed the research proposal for compliance with the National Statement and approval of this project is conditional upon your continuing compliance with this document. As evidence of continuing compliance, the Human Research Ethics Committee requires that researchers immediately report:

- proposed changes to the protocol including changes to investigators involved
- serious or unexpected adverse effects on participants
- unforeseen events that might affect continued ethical acceptability of the project.

You are also required to complete monitoring reports annually and at the end of your project. These reports are sent out approximately 6 weeks prior to the date your ethics approval expires. The reports must be completed, signed by the appropriate Head of School, and returned to the Research Services Office prior to the expiry date.

Yours sincerely,

A/Professor Steven Rosendrass
Chair, Human Research Ethics Committee

cc A/Professor L. Lockyer, Faculty of Education
Information Sheet

Using Learning Designs to Scaffold the Learning Process in a Problem-Based Medical Curriculum

Researcher: Lisa Kosta (PhD Candidate – Faculty of Education)
Supervisors: Associate Professor Lori Lockyer
Doctor Sue Bennett
Professor Elizabeth Farmer

You are invited to participate in a preliminary study for the project titled “Using Learning Designs to Scaffold the Learning Process in a Problem-Based Medical Curriculum”. This research is being conducted by Lisa Kosta for the purpose of PhD study within the Faculty of Education. This stage of the research seeks to identify learning strategies that are employed by students when engaging in problem-based learning (PBL). Data will be used to inform the development of learning design models intended to communicate learning strategies to students entering the PBL environment.

Participation in this research is completely voluntary. If you choose to participate, you will be asked to participate in one of four focus group sessions, aimed at discussing learning strategies that you employ when engaged in the PBL process. The focus groups, to be conducted by Lisa Kosta, will take approximately 45 minutes and have been scheduled for the following times:

- **Monday the 8th September 2008**
  - Focus Group 1: 12:30pm – 1:30pm
  - Focus Group 2: 1:30pm – 2:30pm

- **Monday the 22nd September 2008**
  - Focus Group 3: 12noon – 1pm
  - Focus Group 4: 1pm – 2pm

As the focus groups will run over lunchtime, food will be supplied at no expense to you.

Focus group discussions will be audio recorded and subsequently transcribed verbatim. In the transcript any real names that may have been used in the discussion will be changed to pseudonyms and data will be analysed and reported as a whole. Audio recordings will be destroyed once transcription and de-identification of the data has occurred. Participants in this research will not be identified. All data shall be stored securely in a locked filing cabinet and/or a password protected computer owned by the researcher. This data will only be accessed by the researcher.

As participation is voluntary, you are free to refuse to participate or withdraw from the research at anytime. Your refusal to participate or withdraw from the study will not affect your relationship with the University of Wollongong or any specific units within the University. If you chose to withdraw from the research after participation in the focus group, data collected from your focus group discussion will continue to inform the research, as participants will not be identifiable.

If you have any enquiries about the research, please contact Lisa Kosta on 42213465 or by email at lkosta@uow.edu.au. Alternatively, you may contact Lisa’s supervisor, Lori Lockyer on 4221 5511 or by email at llockyer@uow.edu.au. If you have any concerns or complaints regarding the way the research is or has been conducted, you may contact the Ethics Officer, Human Research Ethics Committee, Research Services Office, University of Wollongong on 42214457.
Appendix 3.3 – Consent form – Phase One

Using Learning Designs to Scaffold the Learning Process in a Problem-Based Medical Curriculum

Researcher: Lisa Kosta (PhD Candidate – Faculty of Education)
Supervisors: Associate Professor Lori Lockyer
Doctor Sue Bennett
Professor Elizabeth Farmer

I have been given information about the project “Using Learning Designs to Scaffold the Learning Process in a Problem-Based Medical Curriculum” and have had the opportunity to discuss the study with Lisa Kosta who is conducting the research for the purpose of her PhD study within the Faculty of Education at the University of Wollongong.

I understand that, if I consent, I will be asked to participate in a focus group discussion about learning strategies that are employed by students when engaging in problem-based learning (PBL). I have been advised that the focus groups, to be conducted by Lisa Kosta, will take approximately 45 minutes.

I have been informed that focus group discussions will be audio recorded and subsequently transcribed verbatim. In the transcript any real names that may have been used in the discussion will be changed to pseudonyms and data will be analysed and reported as a whole. I understand that participants in this research will not be identified and all data shall be stored securely in a locked filing cabinet and/or a password protected computer owned by the researcher. This data will only be accessed by the researcher.

As participation is voluntary, I am free to refuse to participate or withdraw from the research at anytime. My refusal to participate or withdrawal from the study will not affect my relationship with the University of Wollongong or any specific units within the University. If I chose to withdraw from the research after participation in the focus group, data collected from my focus group discussion will continue to inform the research, as participants will not be identifiable.

If I have any enquiries about the research, I can contact Lisa Kosta on 42213465 or by email at lkosta@uow.edu.au. Alternatively, I may contact Lisa’s supervisor, Lori Lockyer on 4221 5511 or by email at llockyer@uow.edu.au. If I have any concerns or complaints regarding the way the research is or has been conducted, I may contact the Ethics Officer, Human Research Ethics Committee, Research Services Office, University of Wollongong on 42214457.

By signing below I am indicating my consent to participate in the research project “Using Learning Designs to Scaffold the Learning Process in a Problem-Based Medical Curriculum” as it has been described to me in the information sheet and in discussion with the researcher. I understand that the data collected from my participation will be used for a doctoral thesis, conference presentations and journal articles, and I consent for it to be used in that manner.

Signed Name (please print) Date

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Focus Group Schedule

Hi. I’m Lisa and I’m a PhD student from the Faculty of Education. For my research, I’m interested in the learning strategies that are used or could be used by students when engaged in Problem Based Learning. I’m hoping to use this information to look at ways that novice learners can be supported. Now that you have all been in this context for 7 months, I want to find out from you some of the things you do when working through a CBL case, and also some of the things you wished you had known (in terms of learning strategies) right back at the beginning of the year.

This should take about 45 minutes. So that I can concentrate on the conversation, rather than take notes, would it be ok with you all if I record this interview? (If ‘yes’, start the recording. If unsure, explain that the recording will only be used for transcription and only available to the researcher. If still ‘no’ from entire group - take notes. If ‘no’ from some participants, suggest an alternative, non recorded focus group session).

Before we begin, let’s think about what it is you do in a typical fortnight.

  - CBL Intro
  - Lectures
  - Labs
  - Study Time
  - CBL small group tutorial
  - CBL wrap up
  - Anything else?

Ok, here’s a scenario for you. I’m a new student about to start studying in the course which you are currently enrolled. I want you to help prepare me for the challenge I just accepted. Describe to me, any of the frustrations you experienced when you first started in this course and give me advice to help me organise my information and how I approach learning to make my transition easier? (I’m interested here, in the things that only I will have control of, and not external factors such as how a particular person teaches or the way an assessment is structured)

Prompts for each learning component

  -Do you do anything prior to the session?
  - What do you take into the session with you?
  - How do you organise your information during the session?
    (concept maps, note taking etc)
  - How do you determine what it is you need to know?
  - How do you decide on the resources you’d need?

Have you, at any stage, attended workshops or sought some kind advice or support, to increase your learning skills?

If it was possible for those experienced in PBL to share their learning strategies with novice learners, how do you think that could be achieved?
Experiment 1

Developed by:
Lisa Kosta

For the purpose of research in a Doctor of Philosophy degree (2009)

Faculty of Education
University of Wollongong
This project is being undertaken to inform a research project seeking to promote quality teaching and learning.

Background to the research:

- In 2008, students enrolled in the MBBS degree at the Graduate School of Medicine (GSM), University of Wollongong, discussed the trials and tribulations of being a novice learner in a problem-based learning medical curriculum.
- The findings of these discussions, and relevant research literature, illustrate the need for support for students in knowing and using a greater range of learning strategies to make learning more effective.
- This resource has been developed, and refined through consultation with experienced students at the GSM, in order to respond to these concerns.

We need you to:

- Participate in the trial of the resources to determine their efficacy in supporting learning.

The trial has been developed to integrate into your normal timetable to ensure maximum benefit to your learning with minimal disruption and impact on your time. The following timetable indicates when and where your assistance will be required.

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<thead>
<tr>
<th>Date</th>
<th>Time</th>
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<tbody>
<tr>
<td>Monday 27th July</td>
<td>10:30am – 11am</td>
<td>Lecture Theatre</td>
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<tr>
<td>Monday 3rd or Tuesday 4th August</td>
<td>In your CBL small groups</td>
<td>Researcher to visit your small groups session</td>
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<tr>
<td>Friday 4th August</td>
<td>12pm - 12:30pm</td>
<td>Lecture Theatre</td>
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<tr>
<td>Monday 10th August</td>
<td>10:30am – 11am</td>
<td>Lecture Theatre</td>
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<tr>
<td>Monday 17th or Tuesday 18th August</td>
<td>In your CBL small groups</td>
<td>Researcher to visit your small groups session</td>
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<tr>
<td>Friday 21st August</td>
<td>12pm – 12:20pm</td>
<td>Lecture Theatre</td>
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<tr>
<td>Friday 21st August</td>
<td>12:20pm – 1pm</td>
<td>Student common room – lunch provided</td>
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SELF-REGULATED LEARNING
Self-regulated learning (SRL) is:

- A process whereby learners demonstrate a proactive approach to the acquisition of academic skills \(^{(1)}\)

Learners who are described as self-regulated learners:

- Display metacognitive, motivational and strategic control, evident through acts of goal setting, planning, monitoring, regulating and evaluation, when learning \(^{(2, 3, 4)}\)
- Demonstrate aptitude for initiating and sustaining acts towards knowledge acquisition, rather than a reliance on a teacher or instructor
- Are aware of factors within and outside of themselves, and are able to consider these as they make choices towards choosing strategies to achieve academic goals

Zimmerman’s \(^{(5)}\) three-phase model illustrates the process of self-regulation. The model below has been adapted to demonstrate three stage cycle learners engage in as they plan, engage in and reflect on their learning.

![Figure 1: Adapted from the Self-regulation cycle](image)


The practice of medicine in a rapidly changing world requires health professionals who know how to keep up-to-date with current knowledge in order to have the skills to solve problems and work effectively in their domain. Problem-based learning (PBL) was developed as a pedagogy in which learners could learn whilst acquiring professional attributes relevant to the medical role for which they were training (6).

Empirical studies investigating the value of PBL, characterise successful PBL students as life-long learners who display the ability to recognise gaps in their knowledge and aptly employ strategies to fill these gaps (7, 8, 9). The essence of PBL is that students are required to make their own decisions in planning for, engagement in and evaluation of knowledge and skill acquisition, hence employ skills in SRL.

Research on novice learners in PBL has shown that many students struggle to ‘fall across’ effective learning strategies, and discuss the effect this can have on academic success and general mental wellbeing (10, 11, 12). Such studies make an appeal to educators to make learning processes and strategies more salient in order to better support learners moving into the PBL environment.

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This booklet is designed to:

- Clearly illustrate the processes involved in SRL – See Figure 2
- Prompt you through the SRL process to increase your learning strategy repertoire and content knowledge
- Focus on one particular learning strategy

Figure 2: A learning design for self-regulated learning
Concept mapping:

- Is an information organisation strategy derived from theoretical developments in educational psychology (13)
- Enhances learning by allowing learners to recognise relationships between concepts and make new meaning that they may not have consciously considered previously
- Is shown to promote meaningful learning, i.e. as opposed to rote learning, meaningful learning allows knowledge to be integrated with existing knowledge and stored in ways that it can be easily retrieved to apply in a variety of contexts (14)

A concept map:

- Is a graphical or pictorial arrangement identifying key concepts within a specific subject area
- Presents concepts in a hierarchical structure, linking selected ideas with lines and labels to show relationships between concepts
- Is useful for a range of purposes, e.g. organising information from a presentation, planning an assignment, studying and preparing for examinations, understanding current knowledge and identifying gaps in knowledge

Figure 3: Concept map (Novak and Gowin, 1984, p. 37)

Figure 4: Example concept map, from:
A 35-year-old man presents to the clinic for routine medical care. He is well, with no complaints. His past medical history is remarkable for long-standing uncontrolled hypertension. On physical examination, his blood pressure in the right arm is 170/80 mmHg and in the left arm is 165/85 mmHg. The femoral pulses are diminished.

Figure 5: Example concept map, from: Rendas, A., Fonseca, M, & Pinto, P. (2006) Toward meaningful learning in undergraduate medical education using concept maps in a PBL pathophysiology course. Advances in Physiology Education (30), 23-29.
James Green is an obese 57 year old male who presents to the GP with increasing central chest pain - sharp in nature and radiating to his back. He also complains of pain and difficulty when swallowing.

List concepts that you already know with regard to the topic:

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On the opposite page, construct a concept map to illustrate the relationships within the above information
Set goals for learning and create a plan to work towards achieving your goal

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FORTNIGHT (CBL) 1

RESOURCES
List concepts that you already know with regard to the topic:

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On the opposite page, construct a concept map to illustrate the relationships within the above information
Set goals for learning and create a plan to work towards achieving your goal
As you engage in learning, take time throughout the fortnight to monitor your learning. List what you have learnt with regard to a topic, then complete a concept map of it. Use this monitoring activity to re-evaluate gaps in your knowledge that will need to be filled, and return to goal setting task set new goals and plan towards achieving them.

On the opposite page, construct a concept map to illustrate the relationships within the above information.
RESOURCE 2
GOAL SETTING AND

Set goals for learning and create a plan to work towards achieving your goal

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As you engage in learning, take time throughout the fortnight to monitor your learning. List what you have learnt with regard to a topic, then complete a concept map of it. Use this monitoring activity to re-evaluate gaps in your knowledge that will need to be filled, and return to goal setting task set new goals and plan towards achieving them.

On the opposite page, construct a concept map to illustrate the relationships within the above information.
Set goals for learning and create a plan to work towards achieving your goal

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List concepts that you now know with regard to the topic:

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On the opposite page, construct a concept map to illustrate the relationships within the above information.
Discuss successes and challenges in achieving your goals this fortnight:
FORTNIGHT (CBL) 2

RESOURCES
List concepts that you already know with regard to the topic:

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RESOURCES 2

GOAL SETTING AND

Set goals for learning and create a plan to work towards achieving your goal

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As you engage in learning, take time throughout the fortnight to monitor your learning. List what you have learnt with regard to a topic, then complete a concept map of it. Use this monitoring activity to re-evaluate gaps in your knowledge that will need to be filled, and return to goal setting task set new goals and plan towards achieving them.

On the opposite page, construct a concept map to illustrate the relationships within the above information.
Set goals for learning and create a plan to work towards achieving your goal

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Set goals for learning and create a plan to work towards achieving your goal

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RESOURCE 4
MONITOR OUTCOMES

List concepts that you now know with regard to the topic:

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On the opposite page, construct a concept map to illustrate the relationships within the above information
Discuss successes and challenges in achieving your goals this fortnight:

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Information Sheet

Using Learning Designs to Scaffold the Learning Process in a Problem-Based Medical Curriculum

Researcher: Lisa Kosta (PhD Candidate – Faculty of Education)
Supervisors: Associate Professor Lori Lockyer
Associate Professor Sue Bennett
Professor Elizabeth Farmer

You are invited to participate in a preliminary study for the project titled “Using Learning Designs to Scaffold the Learning Process in a Problem-Based Medical Curriculum”. This research is being conducted by Lisa Kosta for the purpose of PhD study within the Faculty of Education. This stage of the research seeks to workshop resources designed to support learning in problem-based learning (PBL) curriculum. Data will be used to inform the development of learning design models intended to communicate learning strategies to students entering the PBL environment.

Participation in this research is completely voluntary. If you choose to participate, you will be asked to participate in one of four focus group sessions, to workshop resources designed to support learning in the PBL process. The focus groups, to be conducted by Lisa Kosta, will take approximately 45 minutes and have been scheduled for the following times:

- **Monday the 4th May 2009**
  - Focus Group 1: 12pm – 1pm
  - Focus Group 2: 1pm – 2pm
  **5 – 7 participants required**

- **Monday the 18th May**
  - Focus Group 3: 12noon – 1pm
  - Focus Group 4: 1pm – 2pm
  **5 – 7 participants required**

As the focus groups will run over lunchtime, food will be supplied at no expense to you.

Focus group discussions will be audio recorded and subsequently transcribed verbatim. In the transcript any real names that may have been used in the discussion will be changed to pseudonyms and data will be analysed and reported as a whole. Audio recordings will be destroyed once transcription and de-identification of the data has occurred. Participants in this research will not be identified. All data shall be stored securely in a locked filing cabinet and/or a password protected computer owned by the researcher. This data will only be accessed by the researcher.

As participation is voluntary, you are free to refuse to participate or withdraw from the research at anytime. Your refusal to participate or withdraw from the study will not affect your relationship with the University of Wollongong or any specific units within the University. If you chose to withdraw from the research after participation in the focus group, data collected from your focus group discussion will continue to inform the research, as participants will not be identifiable.

If you have any enquiries about the research, please contact Lisa Kosta on 42213465 or by email at lkosta@uow.edu.au. Alternatively, you may contact Lisa’s supervisor, Lori Lockyer on 4221 5511 or by email at lockyer@uow.edu.au. If you have any concerns or complaints regarding the way the research is or has been conducted, you may contact the Ethics Officer, Human Research Ethics Committee, Research Services Office, University of Wollongong on 42214457.
Consent Form
Using Learning Designs to Scaffold the Learning Process in a Problem-Based Medical Curriculum

Researcher: Lisa Kosta (PhD Candidate – Faculty of Education)
Supervisors: Associate Professor Lori Lockyer
           Associate Professor Sue Bennett
           Professor Elizabeth Farmer

I have been given information about the project “Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum” and have had the opportunity to discuss the study with Lisa Kosta who is conducting the research for the purpose of her PhD study within the Faculty of Education at the University of Wollongong.

I understand that, if I consent, I will be asked to participate in an experiment aimed at enhancing teaching and learning in the problem-based medical curriculum. I understand that I will be randomly allocated to either Experiment 1, or Experiment 2 in which I will have access to training and resources designed specifically for this research. I understand that I will be asked to provide feedback on the training and resources. I also understand that there will be a pre and post-test of knowledge for which I will receive my results.

I understand that participants in this research will not be identified and all data shall be stored securely in a locked filing cabinet and/or a password protected computer owned by the researcher. This data will only be accessed by the researcher.

As participation is voluntary, I am free to refuse to participate or withdraw from the research at anytime. My refusal to participate or withdrawal from the study will not affect my relationship with the University of Wollongong or any specific units within the University. If I chose to withdraw from the research after participation, data collected from me will cease to inform the research.

If I have any enquiries about the research, I can contact Lisa Kosta on 42213465 or by email at lkosta@uow.edu.au. Alternatively, I may contact Lisa's supervisor, Lori Lockyer on 4221 5511 or by email at llockyer@uow.edu.au. If I have any concerns or complaints regarding the way the research is or has been conducted, I may contact the Ethics Officer, Human Research Ethics Committee, Research Services Office, University of Wollongong on 42214457.

By signing below I am indicating my consent to participant in the research project “Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum” as it has been described to me in the information sheet and in discussion with the researcher. I understand that the data collected from my participation will be used for a doctoral thesis, conference presentations and journal articles, and I consent for it to be used in that manner.

Signed     Name (please print)                    Date
……………………………………              …………………………… ………/………/………
Appendix 5.1 – Ethics approval – Phase Three

 INITIAL APPLICATION APPROVAL
 In reply please quote: HE09/151
 Further Enquiries Phone: 4221 4457

 28 May 2009

 A/Professor L Lockyer
 Faculty of Education

 Dear A/Professor Lockyer

 Thank you for your response dated 20 May 2009 to the HREC review of the application detailed below. I am pleased to advise that the application has been approved.

 Ethics Number: HE09/151
 Project Title: Investigating learning designs to support self-regulated learning
 Researchers: A/Professor L Lockyer, A/Professor S Bennett, Professor E Farmer, Ms Lisa Kosta
 Approval Date: 21 May 2009
 Expiry Date: 20 May 2010

 The University of Wollongong/SESIAHS Humanities, Social Science and Behavioural HREC is constituted and functions in accordance with the NHMRC National Statement on Ethical Conduct to Human Research. The HREC has reviewed the research proposal for compliance with the National Statement and approval of this project is conditional upon your continuing compliance with this document. As evidence of continuing compliance, the Human Research Ethics Committee requires that researchers immediately report:

 - proposed changes to the protocol including changes to investigators involved
 - serious or unexpected adverse effects on participants
 - unforeseen events that might affect continued ethical acceptability of the project.

 You are also required to complete monitoring reports annually and at the end of your project. These reports are sent out approximately 6 weeks prior to the date your ethics approval expires. The reports must be completed, signed by the appropriate Head of School, and returned to the Research Services Office prior to the expiry date.

 Yours sincerely

 A/Professor Steven Roedenrys
 Chair, Human Research Ethics Committee
Throughout the Semester 2, 2009, students in their first year of the MBBS at UOW will be offered the opportunity to participate in an investigation aimed at enhancing teaching and learning in the problem-based medical curriculum. This research is being conducted by Lisa Kosta for the purpose of PhD study within the Faculty of Education.

**Research Design:** In your CBL groups, you will be assigned to either an experimental condition or a control condition. Throughout the entire period, two experiments will be run, allowing each student the opportunity to participate in either Experiment One, or Experiment 2, as determined by your CBL grouping. Throughout the experimental period, class time has been allowed during which you will be offered resources and training which have been developed for the purposes of this study. At the completion of the experiment, your feedback shall be sought in order to understand the value of the supports. As part of the research, a brief pre and post knowledge test will also be conducted for which you will receive results. If you chose not to participate, the opportunity to engage in the training is still available to you, though no data shall be collected from you.

**Benefits to you:** The activities involved in this study have been integrated, as much as possible, to your existing timetable. The intention of this study is that you will benefit by engaging with learning strategies shown to used by effective self-regulated learners. By being supported to work with such strategies, embedded into your existing curriculum, it is aimed that you should gain maximum benefit of the strategy without the expense of your personal time.

**Benefits to the GSM:** By participating in this research, you will be adding to an understanding of how teaching and learning can be further enhanced within a PBL medical curriculum. This not only informs education at the GSM, but also other contexts which operate in a similar way.

Students who choose not to participate, will still be subject to the research conditions, however, data from them will not be collected. Participants in this research will not be identified. All data shall be stored securely in a locked filing cabinet and/or a password protected computer owned by the researcher. This data will only be accessed by the researcher.

As participation is voluntary, you are free to refuse to participate or withdraw from the research at anytime. Your refusal to participate or withdraw from the study will not affect your relationship with the University of Wollongong or any specific units within the University.

If you have any enquiries about the research, please contact Lisa Kosta on 42213465 or by email at lkosta@uow.edu.au. Alternatively, you may contact Lisa’s supervisor, Lori Lockyer on 4221 5511 or by email at lllockyer@uow.edu.au. If you have any concerns or complaints regarding the way the research is or has been conducted, you may contact the Ethics Officer, Human Research Ethics Committee, Research Services Office, University of Wollongong on 42214457.
Appendix 5.3 – Consent form – Phase Three

Consent Form

Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum

Researcher: Lisa Kosta (PhD Candidate – Faculty of Education)
Supervisors: Associate Professor Lori Lockyer
Associate Professor Sue Bennett
Professor Elizabeth Farmer

I have been given information about the project “Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum” and have had the opportunity to discuss the study with Lisa Kosta who is conducting the research for the purpose of her PhD study within the Faculty of Education at the University of Wollongong.

I understand that, if I consent, I will be asked to participate in an experiment aimed at enhancing teaching and learning in the problem-based medical curriculum. I understand that I will be randomly allocated to either Experiment 1, or Experiment 2 in which I will have access to training and resources designed specifically for this research. I understand that I will be asked to provide feedback on the training and resources. I also understand that there will be a pre and post-test of knowledge for which I will receive my results.

I understand that participants in this research will not be identified and all data shall be stored securely in a locked filing cabinet and/or a password protected computer owned by the researcher. This data will only be accessed by the researcher.

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By signing below I am indicating my consent to participate in the research project “Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum” as it has been described to me in the information sheet and in discussion with the researcher. I understand that the data collected from my participation will be used for a doctoral thesis, conference presentations and journal articles, and I consent for it to be used in that manner.

Signed Name (please print) Date

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Appendix 5.4 – Motivated Strategies for Learning Questionnaire (MSLQ)

The Motivated Strategies for Learning Questionnaire
Cognitive and Metacognitive Strategies Module

The following questions ask you about your learning strategies and study skills. Use the scale to answer the question. If you think the statement is very true of you, circle 7; if a statement is not true at all of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

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<tr>
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<th>Not at all true of me</th>
<th>Very true of me</th>
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<tbody>
<tr>
<td>1</td>
<td>When I study the readings for this course, I outline the material to help me organise my thoughts</td>
<td>1 2 3 4 5 6 7</td>
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<td>2</td>
<td>During class time I often miss important points because I'm thinking of other things</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
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<tr>
<td>3</td>
<td>When reading for this course, I make up questions to help focus my reading</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
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<td>4</td>
<td>I often find myself questioning things I hear or read in this course to decide if I find them convincing</td>
<td>1 2 3 4 5 6 7</td>
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<td>5</td>
<td>When I study for this course, I practice saying the material to myself over and over</td>
<td>1 2 3 4 5 6 7</td>
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<td>6</td>
<td>When I become confused about something I’m reading for this course, I go back and try to figure it out</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>When I study for this course, I go through the readings and my class notes and try to find the most important ideas</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>If course readings are difficult to understand, I change the way I read the material</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>When studying for this course, I read my class notes and the course readings over and over again</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>I make simple charts, diagrams, or tables to help me organise course material</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>I treat the course material as a starting point and try to develop my own ideas about it</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>When I study for this course, I pull together information from different sources, such as lectures, readings, and discussions</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Before I study new course material thoroughly, I often skim it to see how it is organised</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I ask myself questions to make sure I understand the material I have been studying in this course</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>15.</td>
<td>I try to change the way I study in order to fit the course requirements and the instructor’s teaching style</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16.</td>
<td>I often find that I have been reading for this class but don’t know what it was all about</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>17.</td>
<td>I memorise key words to remind me of important concepts in this class</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>18.</td>
<td>I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19.</td>
<td>I try to relate ideas in this subject to those in other courses I have studied in whenever possible</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>20.</td>
<td>When I study for this course, I go over my class notes and make an outline of important concepts</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>21.</td>
<td>When reading for this class, I try to relate the material to what I already know</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>22.</td>
<td>I try to play around with ideas of my own related to what I am learning in this course</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>23.</td>
<td>When I study for this course, I write brief summaries of the main ideas from the readings and my class notes</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>24.</td>
<td>I try to understand the material in this class by making connections between the readings and the concepts from the lectures</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>25.</td>
<td>Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>26.</td>
<td>I make lists of important items for this course and memorise the lists</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>27.</td>
<td>When studying for this course, I try to determine which concepts I don’t understand well</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>28.</td>
<td>When studying for this course, I set goals for myself in order to direct my activities in each study period</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>29.</td>
<td>If I get confused taking notes in class, I make sure I sort it out afterwards</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>30.</td>
<td>I try to apply ideas from course reading in other class activities such as lecture and discussion</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

FEEDBACK QUESTIONNAIRE

Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum

Researcher: Lisa Kosta (PhD Candidate – Faculty of Education)

Over the past 4 weeks you have engaged in activities aimed at supporting self-regulated learning skills specifically designed for your current learning environment. This questionnaire has been designed is to find out about how you engaged in, and your opinion of, the activities. Please provide as much detail as possible and feel free to provide additional comment if there is something else you would like to add.

Completing the Activities
The activities were designed to fit into your timetable. The following questions explore how you engaged with the activities.

Did you complete each of the activities in the book? ☐ Yes ☐ No
If, ‘No’ please give details of which ones you didn’t do and why:
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________

Did you do the set activities at the times made available? ☐ Always ☐ Sometimes ☐ Never

Did you do the set activities at other times? ☐ Always ☐ Sometimes ☐ Never

If you did the set activities at times other than the times made available in the timetable, please describe when you did them and why this was better for you
______________________________________________________________
______________________________________________________________
______________________________________________________________

Did the timing of the activities (when you were asked to do them) suit you, or do you have other ideas how the timing could be improved?
______________________________________________________________
______________________________________________________________
______________________________________________________________
Training Session
At the beginning of the experiment, may have been involved in a brief training session to learn about the activities and the background of how and why they were developed. The following questions explore your thoughts on that training session.

Did you attend the training session? ☐ Yes ☐ No

If you answered ‘No’, did you feel as though you were able to still engage in the activities without further explanation? ☐ Yes ☐ No

(Please go on to the next section – Resources)

If you answered ‘Yes’:
How helpful was the training session for you to understand the educational values of the activities?
☐ Very helpful ☐ Somewhat helpful ☐ Neutral ☐ Not helpful

How helpful was the training session for you to understand what was required of you in order to complete the activities?
☐ Very helpful ☐ Somewhat helpful ☐ Neutral ☐ Not helpful

Please comment on the positive features of or possible improvements for the training session:
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

Resources
In order to complete the activities and provide you information about the background to the study, you received a Resource Booklet. The following questions explore your thoughts on that Resource Booklet.

Did you find the information in the front of the book helpful to understanding the research behind the activities?
☐ Very helpful ☐ Somewhat helpful ☐ Neutral ☐ Not helpful

Was the booklet set out in a way that made it easy to understand and engage with the activities? ☐ Yes ☐ No

Please comment on the positive features of or possible improvements for the organization of the Resource Booklet:
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
Learning Design Model
In the Resource Booklet, a model of sequence activities was shown. The following questions explore your thoughts on this model.

Other than in the training session, did you look at the model at any stage?  
☐ Yes  ☐ No

Did you find the model helped to understand the processes involved in the self-regulated learning activities?  
☐ Very helpful  ☐ Somewhat helpful  ☐ Neutral  ☐ Not helpful

Please comment on positive features or otherwise, of presenting the learning structure in a model such as this:
______________________________
______________________________
______________________________
______________________________
Self-regulated learning

The activities were designed to lead you through the self-regulated learning cycle:

The following questions explore your thoughts on the activities around the self-regulated learning process.

How helpful did you find the process of outlining your knowledge at the beginning of the fortnight?
- Very helpful
- Somewhat helpful
- Neutral
- Not helpful

How helpful did you find the process of monitoring your learning throughout each fortnight?
- Very helpful
- Somewhat helpful
- Neutral
- Not helpful

How helpful did you find the process of setting goals for your learning throughout each fortnight?
- Very helpful
- Somewhat helpful
- Neutral
- Not helpful

How helpful did you find the process of reviewing your knowledge at the end of the fortnight?
- Very helpful
- Somewhat helpful
- Neutral
- Not helpful

Are there specific elements of the self-regulated learning process which were introduced to you in this program that you think you may add to your learning processes in the future? If so, please describe:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

Do you have any other comments about the self-regulated learning aspect of the activities:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
Learning Strategy

Concept maps are a learning strategy that were introduced into the activities. The following questions explore your thoughts on concept mapping, and the integration of a learning strategy into the self-regulated learning activities.

Did you use the concept mapping strategy?  
☐ Yes  ☐ No

If ‘No’, why not?
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________

If ‘Yes’, please describe what you liked or disliked about using them, or any other comment you feel is relevant to the concept mapping strategy.
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________

Did you use other strategies other than concept mapping?  
☐ Yes  ☐ No

If ‘Yes’, what were they and why did you chose to use them?
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________

Do you think it was helpful to introduce a learning strategy, such as concept mapping, into the self-regulated learning activities?
☐ Very helpful  ☐ Somewhat helpful  ☐ Neutral  ☐ Not helpful

Would you like to see other learning strategies introduced into the self-regulated learning activities?  
☐ Yes  ☐ No

Thank you for your participation in my research. I hope that there has been a learning benefit for you from your engagement in the activities. Please consider participating in a focus group to further discuss the activities to optimise future development. The following space has been provided for you to make further comment if there is something else you would like to add.
______________________________________________________________
______________________________________________________________
Appendix 5.6 – Semi-structured interview schedule – Phase Three

Semi-structured Interview

Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum

Researcher: Lisa Kosta (PhD Candidate – Faculty of Education)

Thanks for taking the time to meet with me today. As you know, I’ve asked you here to talk about the study that you participated in which focussed on supporting self-regulated learning, so the following questions are going to relate to that.

So that I may have the interview transcribed, do you mind if I record this session?

Can you please tell me your participant number

**Completing the activities**
To begin with, let’s talk about completing the activities:

Did you complete the activities in the resource book?
  No – can you tell me the reason why?
  Yes – when did you do them? (i.e. in timetabled time or in own time)
  If done in own time, why did you find it better to do then?

Can you tell me a little bit about the timetabling of the activities – was the frequency of the activities ok, not enough or too much?

Did it suit you to have time built into your current timetable?

Do you think the timing could be improved?

**Training**
Now if we can talk about the training session, can you remember back to the first session I did with you were we watched the YouTube movie about Procrastination? Did you attend the training session?

If you didn’t, do you think that you were still able to work through the activities even though you didn’t have the training?

If you did attend, did you find it helpful?
What information did you feel you took away from the training session – was it more about how to do the activities, or in relation to the background behind their development, so the research on self-regulated learning and concept mapping?

**Resources**
I’d like to hear what you have to say about the resource book.

Did anybody read the information section in the front?
If yes, did you find it useful? If ‘yes’ in what way?
What about the activity sections?
   Was it easy to follow?
   Were you able to understand what was expected of you for each activity?
   Do you have any suggestions for possible improvement?

Learning Design
In the resource book, there was a diagram to demonstrate the sequence of activities in the self-regulated learning activities.

Did anyone refer to this diagram at any stage?

Did you find that it helped you to understand the self-regulated learning process any better?

Did it help you to see the order of activities that you were doing?

Self-regulated learning
One of the focuses of this study was to get you to engage in the processes of effective self-regulated learning. Often, successful learners internalise these strategies. I want to know if you found the process of externalising these activities to be helpful.

Tell me a bit about whether you found it helpful to:
- Outline your knowledge at the beginning of the fortnight
- Monitor your learning throughout the fortnight (2 occasions)
- Set goals for your learning throughout the fortnight (2 occasions)
- Review your knowledge at the end

Is there any part of these activities that you think you might add to the way in which you study from now on?

Concept Maps/Tables
During the self-regulated learning activities, you were introduced to the learning strategy of concept mapping/tables as a way of organising information to allow you to explore your understanding and make connections in your knowledge.

Did you use the concept mapping/tables strategy?
Yes – Was this the first time you have used them
   Did you like using them?
   What was it you did or didn’t like about them?

No – Why didn’t you use them?
   Did you use another strategy such as tables or headings

Further comment
Thank you for your time. I’ve covered all of my questions for the focus group, but before we wrap up, are there any other comments or questions that I haven’t covered that you think are important.

Ok, thanks again for your time.
Appendix 6.1 – Tutor support sheet – Phase Four

Dear {tutor's name here},

Earlier this year, I met with you to discuss my PhD research project and the intention to work with students entering Phase 1 of the MBBS degree at UOW’s GSM in 2010. I would like to thank you again for volunteering your CBL tutorial group as participants in this research project, and also thank you for offering time in your tutorial slot to allow students to complete activities.

I have created this sheet as a guide for you in assisting the students to complete the activities in your tutorial time. I am also available to attend the tutorial to assist with running the activity if you would prefer.

Please take the opportunity to read through the student’s activity booklet attached, and direct any questions you may have to me. I will make contact with you prior to the commencement of the program to clarify any questions you may have, and also make arrangements to attend the tutorial if you would like me to run the activity.

CBL tutorial – 22\textsuperscript{nd}/23\textsuperscript{rd} March

5 – 10 Minutes: Students complete page 13 independently – Concept map guidance on pages 31–33 if required

Discussion timing dependant on participation and time available: Student consider questions 1 and 2 on page 14. Class to discuss learning strategies that they have incorporated and found that worked well. Sharing these ideas will help the other students to pick up strategies they may wish to add to their own study skills.

5 – 10 minutes: Students reset SMART goal on page 15. Refer to page 10 for SMART goal guidance if necessary.

CBL tutorial – 19\textsuperscript{th}/20\textsuperscript{th} April

5 – 10 Minutes: Students complete page 13 independently – Concept map guidance on pages 31–33 if required

Discussion timing dependant on participation and time available: Student consider questions 1 and 2 on page 14. Class to discuss learning strategies that they have incorporated and found that worked well. Sharing these ideas will help the other students to pick up strategies they may wish to add to their own study skills.

5 – 10 minutes: Students reset SMART goal on page 15. Refer to page 10 for SMART goal guidance if necessary.

Please contact me should you have any questions. I will also make contact with you in the within the next 2 – 3 weeks.

Lisa Kosta
PhD Candidate
0414718763
lkosta@uow.edu.au
Appendix 6.2 – Resource book - Phase Four

Name:

Strategies for Learning in Medical School

A program aimed at supporting new medical students to become effective self-regulated learners

Developed for Phase 1 students at the Graduate School of Medicine in the University of Wollongong

Developed by:
Lisa Kosta
PhD Candidate
Faculty of Education
University of Wollongong
NSW, AUSTRALIA
Contact: lkosta@uow.edu.au
So you want to know how to learn at medical school?

Research shows that students who survive and excel in a case-based learning environment are those who are able to regulate their own learning. These self-regulated learners are:

- proactive in learning
- effective goal setters
- able to choose appropriate learning strategies to achieve their goals
- not reliant on teachers and instructors \(^{(1), (2), (3), (4)}\)

Self-regulated learners plan for learning, engage in learning and reflect on learning.

Figure 1: Adapted from Zimmerman’s \(^{(5)}\) Self-regulation cycle

Not all learners are able to pick up these skills independently. The Learning Skills Workshops will guide you through the stages of an effective self-regulated learning process.


Becoming a self-regulated learner at the GSM

Plan for learning
Learning Skills Workshop –

Engage in learning
Independent pacing

Monitor and planning for learning
Learning Skills Activity –

Engage in learning
Independent pacing

Reflect on learning
Learning Skills Workshop –
Resources for Learning Skills Workshops (15th March – 26th March 2010)
Planning for Learning – What do I know?

Choose one of your learning objectives. Write it here:

_____________________________________________________________________
_____________________________________________________________________

In order to be able to plan for your learning, you need to find out what you already know.

To do this, create a concept map to illustrate what you already know and how this knowledge links together. If you need to know how to construct a concept map, look at pages 31 - 33 for some help.

Draw your concept map here – don’t forget to show links to other learning objectives where relevant.
Planning for Learning – What do I need to know?

Setting goals is an important part of self-regulated learning as it allows you to have a clear aim and be able to check your progress towards achieving it. Goals should be Specific, Measurable, Attainable, Relevant and Timely – these are known as SMART goals.

Thinking about the learning objective you choose for this task, work through the following prompts to set yourself a SMART goal.

SMART checklist
Is your goal:

<table>
<thead>
<tr>
<th>Specific</th>
<th>Does it contain a well-defined target?</th>
</tr>
</thead>
</table>
| Measurable | Does it state how you will know when you have achieved your goal?  
Does it indicate when it is time to stop seeking more information for this objective? |
| Attainable | Does it outline strategies you will employ to accomplish this goal?  
i.e. Where your information search will begin  
Where else might you look  
Who you might work with or speak to |
| Relevant | Does it clearly link to the ‘big picture’ of what you need to know for this learning objective or patient case?  
Does it illustrate how it integrates with any of the other learning goals? |
| Timely | Does it state how and when will you work on achieving this goal? |

SMART goal example:
(Specific) I will aim to understand the way the immune system prevents a bacterial infection. (Measurable) I will know I have achieved this when I am able to answer questions relating to this in my online formative assessments and contribute to discussion in my CBL group. (Attainable) I will begin to seek this information by reading my recommended texts textbook and revising lecture material. I will then seek clarification and greater understanding in more specific textbooks focussing on the immune system. (Relevant) This will help me to understand what usually prevents the spread of infection. (Timely) I will work on this goal before the end of the first week of the fortnight.
Look back at the SMART checklist. Re-read your draft goal and tick off each component if they appear in your goal.

S □  M □  A □  R □  T □

Revise your goal if necessary

Draft 1 of Goal:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Draft 2 of Goal:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Look back at the SMART checklist. Re-read your draft goal and tick off each component if they appear in your goal.

S □  M □  A □  R □  T □

Final Goal:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
Monitoring Learning – How am I going?

As you work towards achieving your goals, it is important that you spend some time monitoring your learning. This involves revisiting your goals to gauge where you are at, and, if necessary, revise your goals to allow you to move forward.

In order to monitor your progress, you need to find out what you now know. To do this, create another concept map to illustrate what you have learnt.

Draw your concept map here.
Monitoring Learning – How am I going?

Consider your goal and your concept map for these questions.

1. Have I achieved my goal?

_____________________________________________________________________
_____________________________________________________________________

2. What have I discovered about which learning strategies work for me, and which don’t? (After writing this response, discuss with CBL group if time allows)

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Use this space to record useful ideas from your class discussion
Planning for Learning – Moving on

Now it is time to reset your goal for this fortnight. If you are happy that you have achieved your previous goal, use this opportunity to set a new goal. If you have still not achieved last week’s goal, revise it so that you can continue to work towards achieving it.

Draft of Goal:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Look back at the SMART checklist. Re-read your draft goal and tick of each component if they appear in your goal.

S □ M □ A □ R □ T □

(If you need extra space to do a 2nd draft for your goal, use the back of this page)

Final Goal:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
Reflecting on Learning – How did it go?

1. Considering the wrap-up session do you feel as though you achieved your goal?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

2. What have I discovered about which learning strategies work for me, and which don’t?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Use this space to record useful ideas from your class discussion

3. Are there any learning strategies that you think you could implement in the next fortnight learning cycle?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Resources for Learning Skills Workshops (12th April – 23rd April 2010)
Planning for Learning – What do I know?

Choose one of your learning objectives. Write it here:

_____________________________________________________________________
_____________________________________________________________________

In order to be able to plan for your learning, you need to find out what you already know.

To do this, create a concept map to illustrate what you already know and how this knowledge links together. If you need to know how to construct a concept map, look at pages 31 - 33 for some help.

Draw your concept map here – don’t forget to show links to other learning objectives where relevant.
Planning for Learning – What do I need to know?

Setting goals is an important part of self-regulated learning as it allows you to have a clear aim and be able to check your progress towards achieving it. Goals should be Specific, Measurable, Attainable, Relevant and Timely – these are known as SMART goals.

Thinking about the learning objective you choose for this task, work through the following prompts to set yourself a SMART goal.

SMART checklist
Is your goal:

<table>
<thead>
<tr>
<th>SPECIFIC</th>
<th>Does it contain a well-defined target?</th>
</tr>
</thead>
</table>
| MEASURABLE | Does it state how you will know when you have achieved your goal?  
Does it indicate when it is time to stop seeking more information for this objective? |
| ATTAINABLE | Does it outline strategies you will employ to accomplish this goal?  
i.e. Where your information search will begin  
Where else might you look  
Who you might work with or speak to |
| RELEVANT | Does it clearly link to the ‘big picture’ of what you need to know for this learning objective or patient case?  
Does it illustrate how it integrates with any of the other learning goals? |
| TIMELY | Does it state how and when will you work on achieving this goal? |

SMART goal example:
(Specific) I will aim to understand the way the immune system prevents a bacterial infection. (Measurable) I will know I have achieved this when I am able to answer questions relating to this in my online formative assessments and contribute to discussion in my CBL group. (Attainable) I will begin to seek this information by reading my recommended texts textbook and revising lecture material. I will then seek clarification and greater understanding in more specific textbooks focusing on the immune system. (Relevant) This will help me to understand what usually prevents the spread of infection. (Timely) I will work on this goal before the end of the first week of the fortnight.
Look back at the SMART checklist. Re-read your draft goal and tick off each component if they appear in your goal.

S  M  A  R  T

Revise your goal if necessary

Draft 1 of Goal:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Draft 2 of Goal:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Look back at the SMART checklist. Re-read your draft goal and tick off each component if they appear in your goal.

S  M  A  R  T

Final Goal:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
Monitoring Learning – How am I going?

As you work towards achieving your goals, it is important that you spend some time monitoring your learning. This involves revisiting your goals to gauge where you are at, and, if necessary, revise your goals to allow you to move forward.

In order to monitor your progress, you need to find out what you now know. To do this, create another concept map to illustrate what you have learnt.

Draw your concept map here.
Monitoring Learning – How am I going?

Consider your goal and your concept map for these questions.

1. Have I achieved my goal?

_____________________________________________________________________
_____________________________________________________________________

2. What have I discovered about which learning strategies work for me, and which don’t? (After writing this response, discuss with CBL group if time allows)

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Use this space to record useful ideas from your class discussion
Planning for Learning – Moving on

Now it is time to reset your goal for this fortnight. If you are happy that you have achieved your previous goal, use this opportunity to set a new goal. If you have still not achieved last week’s goal, revise it so that you can continue to work towards achieving it.

Draft of Goal:
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Look back at the SMART checklist. Re-read your draft goal and tick of each component if they appear in your goal.

S □ M □ A □ R □ T □

(If you need extra space to do a 2\textsuperscript{nd} draft for your goal, use the back of this page)

Final Goal:
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
Reflecting on Learning – How did it go?

1. Considering the wrap-up session do you feel as though you achieved your goal?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

2. What have I discovered about which learning strategies work for me, and which don’t?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Use this space to record useful ideas from your class discussion

3. Are there any learning strategies that you think you could implement in the next fortnight learning cycle?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Concept Maps

Concept mapping:
- Is an information organisation strategy derived from theoretical developments in educational psychology (13)
- Enhances learning by allowing learners to recognise relationships between concepts and make new meaning that they may not have consciously considered previously
- Is shown to promote meaningful learning. i.e. as opposed to rote learning, meaningful learning allows knowledge to be integrated with existing knowledge and stored in ways that it can be easily retrieved to apply in a variety of contexts (14)

A concept map:
- Is a graphical or pictorial arrangement identifying key concepts within a specific subject area
- Presents concepts in a hierarchical structure, linking selected ideas with lines and labels to show relationships between concepts
- Is useful for a range of purposes, e.g. organising information from a presentation, planning an assignment, studying and preparing for examinations, understanding current knowledge and identifying gaps in knowledge

Figure 2: Concept map (Novak and Gowin, 1984, p. 37)

Figure 3: Example concept map, from:
A 35-year-old man presents to the clinic for routine medical care. He is well, with no complaints. His past medical history is remarkable for long-standing uncontrolled hypertension. On physical examination, his blood pressure in the right arm is 170/80 mmHg and in the left arm is 165/85 mmHg. The femoral pulses are diminished.
Learning Skills 2

Effective Note-taking

[1] Note-taking is an important skills that allows you to:
- capture information you are presented with verbally or you read
- process that information as an active learner
- create material for later study and review

[2] Different forms of note-taking
- listening and taking notes during class (especially in lectures)
- taking notes from a written text
- taking notes from a case
- taking notes ‘on the run’

[3] Principles of good note-taking:
- capture the information accurately
- condense it into forms that are more easily remembered
- organize your notes so that material is easy to find
- review your notes immediately after class and make any additions, and then regularly during study
- rephrase materials in your own words to make it easier to remember
- elaborate on your notes to add new material and new links
- annotate your notes with your own ideas and thoughts
- synthesise sections of your notes to draw out the key ideas

A. Take notes from verbal information such as a lecture and compare what you’ve written down with one of your classmates. Could you make any improvements to what you’re doing?
B. Take notes from written information such as a text book passage. Go back and compare your notes to the original. Have you rephrased the material in your own words? Did you leave out any important points?

[5] Strategies for note-taking to try
- the Cornell method using a two column and summary system to record notes and review them (see http://lsc.sas.cornell.edu/Sidebar/Study_Skills_Resources/cornellsystem.pdf)
- the outline method in which you identify main points and sub-points to organize your notes
- the mapping method in which you create a concept/mind map of concepts and their interrelations
- the charting method in which you tabulate information
- the sentence method in which you write each new concept as a new sentence
Learning Skills 3

Effective learning groups

Group study is an important aspect of problem-based medical education courses. The GSM curriculum structure makes formal use of group learning in activities such as CBL tutorials and clinical skills labs. Informal learning groups organized by students can provide an effective way to supplement your personal study. Some considerations when forming and organizing learning groups are:

**How many?**
Effective groups often comprise four to six people. In a larger group, someone may get left out, and smaller groups may not be responsive if someone is unable to attend.

**Who?**
Pick group members who complement your own strengths and weaknesses in terms of the knowledge and skills that you need to cover. What can you bring to the group? What can others bring to the group? You may want to have study groups for different purposes – CBL, clinical skills, etc.

**Where?**
Identify a consistent location that is free from distractions, is not dependent on access from one particular group member, and allows for access of the resources that you might need to support your study.

**How long?**
Establish a time limit and a plan for how you will use that time wisely.

**When?**
Find a consistent time that works within the regular fortnightly schedule. For example, does it seem best to meet before or after the CBL tutorial or other key learning activities.

Learning Skills 4

Exam Preparation

[1] Studying for exams – ‘Just do it!’
The main challenges to good exam preparation include:
- feeling overwhelmed by the amount of material to cover
- not studying in advance so that you end up cramming
- taking a superficial approach and relying on memorization
- lacking motivation and procrastinating

[2] Your goal is to be actively processing of information so that you can store it in your long term memory. The following study activities will help you study for understanding:
- rehearse the information
- ‘chunk’ related information together
- identify relationships
- compare and contrast
- identify general principles
- relate to learning objectives
- rewrite in your own words

[3] General study strategies:
- study what you don’t know first
- use past papers
- create your own questions
- work in a group with other students
- use diagrams, charts, and tables to organise information
- create note cards

[4] Other tips:
- get organised
- manage your time
- manage your environment
- work out what motivates you
- be realistic about yourself
- get into good habits early
- manage stress
Appendix 6.4 – Ethics approval – Phase Four

University of Wollongong

AMENDMENT APPROVAL
In reply please quote HE09/151
Further Enquiries Phone: 4221 4457

14 July 2010

Ms Lisa Kosta
Faculty of Education
University of Wollongong
NSW 2522

Dear Ms Kosta,

Thank you for your response to the HRRC's conditional approval letter dated 23 June 2010 for amendments to the following Human Research Ethics application. I am pleased to advise that the conditions have been met and the amendments have been approved. The University of Wollongong/SE Sydney and Illawarra Area Health Service Humanities, Social Science and Behavioural HREC is constituted and functions in accordance with the NHMRC National Statement on Ethical Conduct in Human Research.

Ethics Number: HE09/151

Project Title: Investigating learning designs to support self-regulated learning

Name of Researchers: Professor Lori Lockyer, A/Professor Susan Bennett, Professor Elisabeth Parmer, Ms Lisa Kosta

Amendment/s: Approval to access the following demographic data about participants from the Graduate School of Medicine:
- Age, gender, GPA, GAMSAT results, past degree, entry interview score, rurality score, Learning Styles Inventory score, weekly formative quiz participation rates.

Email to participants requesting additional data.

Amendment Approval Date: 7 July 2010

Expiry Date: 2 June 2011

Please remember that in addition to reporting proposed changes to your research protocol the HREC requires that researchers immediately report:
- serious or unexpected adverse effects on participants
- unforeseen events that might affect continued ethical acceptability of the project.

You are also required to complete monitoring reports annually and at the end of your project. These reports are sent out approximately 6 weeks prior to the date your ethics approval expires. The reports must be completed, signed by the appropriate Head of School, and returned to the Research Services Office prior to the expiry date.

Yours sincerely

A/Professor Steven Rodderys
Chair, Human Research Ethics Committee

Cc: Professor Lori Lockyer, Faculty of Education
Information Sheet

Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum

Researcher: Lisa Kosta (PhD Candidate – Faculty of Education)
Supervisors: Associate Professor Lori Lockyer
Associate Professor Sue Bennett
Professor Elizabeth Farmer

Throughout Semester 1, 2010, students in their first year of the MBBS at UOW will be participating in a series of Learning Skills Workshops. During this process it is hoped that information can be collected from students to gain a deeper understanding of the effectiveness of these workshops. This information will be used to inform research being conducted by Lisa Kosta for the purpose of PhD study within the Faculty of Education.

Research Design: In your CBL groups, you will be assigned to one of two Learning Skills programmes. Throughout this period, class time has been allocated for you to participate in the activities and provide feedback on them. While all students will be participating in the Learning Skills Workshops, you may choose not to provide feedback.

Benefits to you: The intention of this study is to understand how different learning strategies may work for you as a medical student. Being supported to work with such strategies, embedded into your existing curriculum will enable you to gain benefit from the strategies without impact your personal time.

Benefits to the GSM: By participating in this research, you will be adding to an understanding of how teaching and learning can be further enhanced within the curriculum. This not only informs education at the GSM, but also other contexts which operate in a similar way.

Students who choose not to participate in the research will still participate in the Learning Skills programme, however, data from them will not be collected. Participants details will remain fully confidential. All data shall be stored securely in a locked filing cabinet and/or on a password protected computer owned by the researcher. This data will only be accessed by the researcher.

Any data reported as part of the study in the PhD thesis, conference papers and journal articles will be de-identified to protect the privacy of participants.

As participation is voluntary, you are free to refuse to participate or withdraw from the research at any time. Your refusal to participate or withdraw from the study will not affect your relationship with the University of Wollongong or any units within the University.

If you have any enquiries about the research, please contact Lisa Kosta on 42213465 or by email at lkosta@uow.edu.au. Alternatively, you may contact Lisa’s supervisor, Lori Lockyer on 4221 5511 or by email at lllockyer@uow.edu.au. If you have any concerns or complaints regarding the way the research is or has been conducted, you may contact the Ethics Officer, Human Research Ethics Committee, Research Services Office, University of Wollongong on 42214457.
Appendix 6.6 – Consent form – Phase Four

Consent Form

Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum

Researcher: Lisa Kosta (PhD Candidate – Faculty of Education)

Supervisors: Associate Professor Lori Lockyer
Associate Professor Sue Bennett
Professor Elizabeth Farmer

I have been given information about the project “Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum” and have had the opportunity to discuss the study with Lisa Kosta who is conducting the research for her PhD study within the Faculty of Education at the University of Wollongong.

I understand that, if I consent, I will be asked to respond to questions relating to my learning and also the Learning Skills Workshops which I will participate in as part of my studies.

I understand that names of participants in this research will be kept confidential and all data will be stored securely in a locked filing cabinet and/or on a password protected computer owned by the researcher. This data will only be accessed by the researcher.

As participation is voluntary, I am free to refuse to participate or withdraw from the research at anytime. My refusal to participate or withdrawal from the study will not affect my relationship with the University of Wollongong or any specific units within the University. If I choose to withdraw from the research after participation, data collected from me will be removed from the data set.

If I have any enquiries about the research, I can contact Lisa Kosta on 42213465 or by email at lkosta@uow.edu.au. Alternatively, I may contact Lisa’s supervisor, Lori Lockyer on 4221 5511 or by email at llockyer@uow.edu.au. If I have any concerns or complaints regarding the way the research is or has been conducted, I may contact the Ethics Officer, Human Research Ethics Committee, Research Services Office, University of Wollongong on 42214457.

By signing below I am indicating my consent to participate in the research project “Supporting Self-Regulated Learning in a Problem-Based Medical Curriculum” as it has been described to me in the information sheet and in discussion with the researcher. I understand that the data collected from my participation will be de-identified and used for a doctoral thesis, conference presentations and journal articles, and I consent for it to be used in that manner.

Signed Name (please print) Date
........................................  ........................................  .........../........./.........
Appendix 6.7 – Learning-skills workshop feedback form – Experimental group

Name: Learning Skills 1
Leader: Lisa Kosta

In the Learning Skills Workshops, the activities involved goal setting, concept mapping and group discussion. Respond to the following statements on a scale of 1 to 7. If you think the statement is very true of you, circle 7. If a statement is not true of you at all, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Before the learning skills workshops, I did not set myself formal goals to guide my learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>During the learning skills workshops, I found it helpful to practice setting SMART goals to guide my learning</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>I plan to continue using a formal goal setting system to guide my learning</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Before the learning skills workshops, I already used concept mapping as a strategy to organise my knowledge</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>During the learning skills workshops, I found it useful to organise my knowledge using the concept mapping strategy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>I plan to continue using concepts mapping as a strategy to organise my knowledge</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>I found the small group discussions in our CBL tutorial to be useful to make me aware of new learning strategies</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>I found the large group discussion after the Friday CBL wrap-up session to be useful to make me aware of new learning strategies</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

The most helpful thing about the Learning Skills Workshops was:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Other comments:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are you able to participate in a feedback interview: YES/NO
Contact phone or email: ____________________________
Appendix 6.8 – Interview schedule – Phase Four

Interview

Thanks for taking the time to meet with me today. As you know, I’ve asked you here to talk about the learning skills workshops that you participated in. So that I may have the interview transcribed, do you mind if I record this session?

Prior to doing the learning skills workshops, what was your approach to learning?
(Prompt - Describe your fortnight in terms of how you structured your learning)

Do you (or did you) find this to be effective for you?
(Prompt – Were you satisfied with how you were approaching learning?
Were you ever trying to think up new ways to approach learning and trying them to see if they worked for you?)

Did you come to med school straight from another degree or from the workforce?
What was your previous degree/background?
How is studying for medicine in a CBL curriculum different to studying in your last degree?
In terms of learning, what has been particularly challenging for you in becoming a med school student?

The activities in the workshops that you were doing, were trying to help you develop skills in being a self-directed learner. For example the first concept map you did at the beginning of each fortnight was designed to get you thinking about where the gaps were in your knowledge so that you could set goals to address those gaps.

What did you do to create your first concept map (show map)?
What do you think this showed of your initial understanding of the topic?
Did it help you to identify what you didn’t know?
Did it help you to write your goal?
When you created (If you had time to attempt) the second concept map later in the fortnight, did it show (do you think it would’ve shown) a growth in knowledge?
Did you approach your subsequent concept maps in a different way to the 1st one?
Have you used concept mapping in any other learning activities since focussing on them in the workshops?

In the workshops, we also focussed on goal setting. The SMART system was provided to help you structure your goals.
How did you go about choosing an area/objective to focus on for your goal?
Did the goal help you to structure or focus your learning during the fortnight?
Did you use this, or another goal setting technique to focus on other learning objectives?

During the workshops, in CBL tutorial time and also after the Friday wrap-up session, we had the opportunity to discuss study/learning techniques with peers. Did you discover anything new in these discussions that you thought might be useful? What was it? Have you used it?

Thank you for your time. I’ve covered all of my questions for the focus group, but before we wrap up, are there any other comments or questions that I haven’t covered that you think are important.

Ok, thanks again for your time.