An exploration of metacognition and its interplay with other forms of conscious thought processing in independent learning at tertiary level.

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An exploration of metacognition and its interplay with other forms of conscious thought processing in independent learning at tertiary level.

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Abstract

Educators are increasingly required to assist learners not simply with subject content, but with developing metacognitive skills for independent learning, interdisciplinary learning and lifelong learning. However, there is a dearth of research on how metacognitive processing interacts with other forms of processing in authentic, real-world learning environments. In light of this, this study concerned itself with furthering understanding of metacognition, cognition and its interactions with other forms of *conscious thought* processing within the setting of a Self-Access Learning Centre (SALC) supporting independent learning at tertiary level in Japan.

This study employed a Grounded Theory Methodology, based on a constructivist paradigm, to explore the various forms of processing that occur during independent learning. A sample of 47 students in a Japanese University undertook a range of independent learning tasks individually and/or as part of a group. Verbal protocol analysis, discourse analysis, audio and video recordings were used to record forms of processing that emerged during the implementation of the tasks within this independent learning context. This data was then subjected to the rigorous process of constant comparison, through which codes were developed, and the categories of processing, the processing sequences and the interplay between thought processes during independent learning were elucidated. As an exploratory study, the findings cannot be considered widely applicable to larger, more diverse learner populations.

The findings have added new knowledge to the fields of metacognition and independent learning by identifying the categories of processing that account for all conscious processing occuring during independent learning. The resultant *grounded theory* posits that different types of processing, namely, *metacognitive, cognitive, affective, physical and off-task processing,* interact to influence the learning experience in independent learning. It postulates that each type of processing is multi-dimensional and that the interactions within and between these processes and the learning experience are non-linear and complex.

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List of Abbreviations

CGT	Constructivist Grounded Theory
GTM	Grounded Theory Methodology
SALC	Self Access Learning Centre

Chapter 1: Introduction

> *I once knew how to compute a cosecant. Today I don't even remember what that is. I once knew what a halogen is. Those days too are long past. In my own field of psychology, I got a terrible start with a C in introductory psychology. When I sat down to write my own introductory psychology textbook, published 27 years after my ignominious grade, I discovered that most of the material covered by textbooks in 1968 was no longer even being taught in 1995. The knowledge had become largely irrelevant. The important things to acquire from the course were not the textbook factoids, but rather, the learning to learn skills and the skills in accessing a knowledge base that form the heart of metacognition. (Sternberg, 2009, viii)*

1.1 Introduction

In the excerpt above, Sternberg (2009) identifies what should be at the core of education - developing metacognitive skills that can be used to facilitate independent learning and/or lifelong learning. Those of us involved in education are aware of the need for the development of metacognitive skills, or what is often naively coined 'critical thinking skills', within learners. However, much of the research to-date has examined metacognition within clinical settings, and as a result, there is a dearth of research on how metacognitive processing interacts with other forms of processing in authentic, real-world learning environments. This introductory chapter presents an overview of this thesis that explored the various types of *thought* processing that occurs within learners engaged in independent learning in a real-world learning context. It begins with the background to the study and an explanation of the key concepts underpinning the study, continuing with a discussion on the purpose, significance and methodology employed in this study, and ends with an overview of the structure of the chapters to follow.

1.2 Background to Study

Educators are increasingly required to assist learners not simply with subject content, but with developing metacognitive skills for independent learning, interdisciplinary learning and lifelong learning. In a knowledge-based society, where the need to perpetually learn (and do so with less support) is ever increasing, the manner in which metacognition is facilitated within learning warrants greater focus and emphasis. In the past, traditional teacher-centred learning environments often resulted in educators acting as *metacognitive mediators* (mostly ineffectively) in the learning process. In other words, teachers directed or regulated what learning strategies were to be deployed by learners and how the learning was to progress. Within this didactic model of learning, there were fewer opportunities for learners to engage in reflection on learning at a meta-level, thus limiting the degree to which learners monitored, regulated and ultimately took responsibility for and control of their learning.

The delivery of educational programmes is changing to more learner-centred or learner-directed formats for political, theoretical, ideological and institutional reasons (Benson & Voller, 1997). Learner-centred education is not a new idea, but one with a long history from the time of Socrates (Ellerman, 2004) through to the early twentieth century work of Dewey (1916) on experiential learning, and the more recent work of Piaget (1972) on emancipatory learning. Learner-centred learning environments have become a more widespread reality in the 21st century - a requirement of educational programmes, in the form of prescribed learning outcomes and/or manifest in the modes of educational delivery.

Many learners (particularly at tertiary level and beyond) are now required to be capable of controlling their own learning, in order to successfully complete their educational courses, and in order to effectively learn. Both the modes of delivery of education and its ultimate goals are shifting. Distance learning, modular learning, open learning and self-access learning are some of the ways in which university students may now receive their education. While the political, emancipatory ideology of allowing learners to receive education anytime, anywhere, across multiple modalities, and to learn and develop their independent learning capacity is laudable, it does change the traditional hierarchical roles of teacher and student, and the requirements and demands for both. This change in roles places a greater responsibility on learners to become more metacognitive in the process of learning.

Metacognition is of particular importance to independent learning. Benson (2011) notes that "*learners who are asked to take greater control of their learning, or who are forced by circumstances to do so, may be able to self-manage their learning, but they will not necessarily have the cognitive competencies that will make self-management systematic or effective*" (pp. 111 - 112). Hence, the degree to which learners are or can be successful at engaging in meta-level thinking needs to be more thoroughly investigated and such investigation must lead to evidence-based knowledge on how metacognition occurs during real-life learning contexts.

Therefore, this study concerned itself with furthering understanding of metacognition, cognition and its interactions with other forms of conscious thought processing within the real-world setting of a Self-Access Learning Centre (SALC) supporting independent learning at tertiary level in Japan. The author choose to undertake this study within the SALC as he was actively involved in the coordination and delivery of independent learning programmes within the centre, and as such had access to resources that could be harnessed throughout the research process. The participants in this study were third or final year students who chose to undertake independent learning elective courses within the centre. The goal of this study was to investigate real-time learning and the metacognitive processing as it occurs in authentic learning contexts. The findings that have emerged provide a credible picture of the practice of metacognition in independent learning, particularly in relation to the complex, non-linear interplay between metacognitive, cognitive and other forms of processing in a real-world learning context.

1.3 The Research

This study employed a Grounded Theory Methodology (GTM), based on a constructivst paradigm, to explore the multiple realities of the participants' experience and the various forms of processing that occur during independent learning. This pairing of constructivism and GTM is considered by some such as Glaser (2002) to be 'not true' GTM, but is, as will be discussed in detail in the research methods chapter, a justifiable pairing that is often used by researchers today who do not come from the positivistic research era (or philosophical stance) when GTM was created.

A sample of 47 students in a Japanese University undertook a range of independent learning tasks individually and/ or as part of a group. Verbal protocol analysis, audio and video recordings were used to record various forms of *thought* processing that emerged during the implementation of the individual and group tasks within this independent learning context. The data generated through the various tools was transcribed, and furthermore in some cases utterances had to be translated from the Japanese language into the English language. This data was then subjected to the rigorous process of constant comparison, through which codes were developed, and the categories of processing (including various dimensions and sub-elements), the processing sequences and the interplay between thought processes during independent learning were elucidated. The coding process was ongoing throughout the data collection phase., and progressed through detailed memoing and analysis of emergent data and codes – initial codes were often discarded or altered, and new codes created, until all codes rested solidly on and across the data. This process went back and forth across all learning episodes, and was facilitated through the use of a qualitative data analysis software package. When codes had been identified, categories of codes then were developed. These again were subjected to constant comparison. Ultimately, this led to a three-tier understanding of independent learning – the categories of processing, their dimensions and the sub-elements of those dimensions.

What emerged from this data was a model of not only metacognitive processing in learning, but of all conscious processing in learning. This has led to the development of a grounded theory describing the processing interplay that occurs in independent learning. The resultant *grounded theory* posits that different types of processing, namely, *metacognitive, cognitive, affective, physical and off-task processing,* interact to influence the learning experience in independent learning. It further postulates that each type of processing is multi-dimensional and that the interactions within and between these processes and the learning experience are non-linear and complex. This theory is explained in detail in the latter sections of this thesis.

1.4 Explanation of key concepts

Within education many terms are used interchangeably or considered synonyms for independent learning, such as autonomous learning, individualized learning, self-directing learning, self-regulated learning, self-regulation. Although unraveling the distinctions and/or similarities between these terms is not the focus of this thesis, it will be discussed in the literature review to follow, and the reasons for the use of the term 'independent learning' in this thesis will be explained. In this thesis, independent learning is conceptualized as '*the act of learning without (or with decreasing amounts of) external direction, guidance and evaluation, in volitional and non-volitional contexts*'.

This study also involved investigation into various forms of *thought* processing that emerge during independent learning. Conscious thought processing during learning are often categorized into cognitive or metacognitive processing. 'Cognitive processing' can be perceived as the *action of learning*; thus, engaging in activities such as 'reading' and 'writing' describe the act of cognition. 'Metacognitive processing' or 'metacognition' can be perceived as the type of thinking that an individual can use to understand, drive and control their learning. Metacognition has been defined in different ways, but perhaps the most commonly cited definitions are those from Flavell (1976, 1985). Flavell's (1976) initial definition: "*Metacognition refers to one's knowledge concerning one's own cognitive processes or anything related to them, e.g., the learning-relevant properties of information or data...*" (p. 232) focuses on what the individual *knows about how he learns*, while Flavell's (1985) later definition of metacognition as ''*Knowledge or cognitive activity that takes as its object, or regulates, any aspect of cognitive enterprise*" (p. 104) makes more explicit the central role of regulation (monitoring and control) of learning processes within metacognition. More recent definitions of metacognition refer back to its philosophical origins or ontological roots, such as that it is essentially "*cognition about cognition*" (Smith, Shields, & Washburn, 2003, p. 318), "*knowing about knowing*" (Koriat, 2000, p. 149) or "*thinking about thinking*" (Livingston, 1997, p. 2), and offer less direction on the epistemological or axiological perspectives of metacognition. The understanding of metacognition that has been emerged from this study is that it is a form of meta-level processing that is concerned with how learning is at a given point in time and how learning should proceed, and that the effective use and implementation of this processing is central to successful independent learning.

1.5 Significance of the Study

Metacognition and Independent Learning are two concepts that are discussed, taught and researched across many academic disciplines – psychology, educational psychology, philosophy, psychiatry, education, adult education, expert performance and more. I came to this research topic through my own work in the field of second language acquisition. Within this field and the broader field of education there are ever increasing calls for learning programmes and teaching pedagogies that engender independent learning behaviours. As Miliander and Trebbi (2008) note, the development of such learning ability are an element of many countries' national educational policies. Since the original defining of metacognition, there has been a "crossing of bridges" (Son, 2007, p. 484) particularly between the fields of cognitive research and education, bringing together the laboratory experiments of cognitive psychologists and the learning structures of educators. Yet despite the vast research that has been undertaken with regard to both these concepts, it is still an area that is not clearly understood, and there remains an absence of research looking at metacognition in more learner-centred environments, such as independent learning.

The need for such a study is clearly stated even in the most recent research in the field by researchers such as: Rahman & Masrur (2011, p. 135) who highlight that "*there is a need to explore the nature of metacognition through* *further research*", by Tarricone (2011, p. 217-218) who noted that "*There is a lack of [metacognition] research in the "context of complex problem solving*" (Tarricone, 2011) and by Efklides & Misailidi, (2010, p. 1) who declare that "*The conceptualization of metacognition and understanding of mechanism(s) underlying its functioning constitute the top priority of theory and basic research".* Tarricone's (2011) reference to the absence of research in complex problem solving contexts points to the need to examine metacognition within independent learning, particularly in the creation of learning scenarios with little or no teacher instruction and assistance. Metacognition within these contexts would be more dependent on learners successfully engaging in metacognitive processing, than in those learning contexts that are 'teacher-directed' or 'teacher assisted', and as such, understanding metacognitive functioning in these scenarios is essential.

There are several reasons for the lack of research in this area.

Firstly, metacognition as a concept is difficult to understand. As Alexander (2008) notes in her discussion of metacognition, self-regulation and self-regulated learning, "*It is perhaps a truism to say that there is an inverse relation between the popularity of any educational construct and its conceptual clarity within the literature*" (p. 369). How metacognition is defined, what its role is, what its elements are, what is and is not metacognition or cognition, varies depending on what direction your reading on the subject takes you. For instance, in the field of language learning, until recently, metacognition has tended to be spoken about mainly in terms of metacognitive strategies (Oxford, 2001; Wenden, 1998), with some discussion of metacognitive knowledge (Cotterall & Murray, 2009; Wenden, 1999). The concepts of monitoring and control are not seen or discussed as part of metacognition, unlike in the fields of psychology, learning and cognitive science. This is particularly problematic for those interested in metacognition in an applied sense – the lack of clarity may result in the concept being misinterpreted, leading to the creation of learning systems of structures based upon these misinterpretations.

Secondly, independent learning can be difficult to research. According to Zimmerman & Moylan (2009, p. 299) "*One of the most challenging issues that confronts educational researchers is explaining how students learn in self-regulated contexts, such as when studying or practicing on their own*". Independent learning, by its very nature is complex and difficult to research, and when the object(s) under scrutiny is not easily observable (i.e. metacognition) or highly complex (i.e. independent learning), it poses some difficult challenges for researchers. A review of the literature shows a dearth of research into metacognition in real-world settings, where 'looser' learning unfolds. What we see instead is more research in easily controlled clinical settings, whose findings may not be always applicable to more independent settings or complex learning (Pressley, 2000; Schraw and Impala, 2000). If we look at the early research from Flavell (Flavell, Freidrichs & Hoyt, 1970) we see his examination of recall, where young subjects were asked to study a set of items (vocabulary) until they could recall them. ‘Recall’ is an important but narrow skill, and not one that can illustrate what we now understand as the breadth and depth of metacognitive activity. In the case of learning, recall is only an element, and as understandings of education and learning change over time, along with the learning environments themselves, the importance of recall has decreased. Equally, young subjects will be less aware of ‘learning choices’ or indeed ‘recall choices’, and as such this narrow controlled examination cannot provide us with a full picture of metacognitive activity, as it might occur in a looser setting, as in this case, for example, the issues of choice and decision-making have been removed from the process. Simply engaging in ‘recall’ in a manner in which you have been directed is not indicative of a real world activity.

More recently, there has been a lot of research into metacognitive sub-element ‘Feeling of Knowing’ (FOK), which refers to “an individual’s judgments about their degree of accuracy for recognizing or knowing a task or answer or predicting one’s knowledge’ (Bembenutty, 2009, p. 592). The degree to which this element of metacognition is currently researched and published about would lead a reader to believe it to be a very central element of metacognitive processing. However, as will be seen in the chapters of this thesis that follow, the real world learning data is this study does not show a single instance of Feeling of Knowing processing. While this does not mean that FOK processing does not occur in learning, it does mean that for the learning in this study, it was not present and not relevant. The perhaps disproportionate research focus (an examination of recent research in the area of metacognition shows FOK research to be among the most published), can be traced back to Flavell's narrow 'recall' research (he found young children had difficulty predicting their recall accuracy), showing us the danger of relying too fully on information from more clinical settings to understanding concepts that occur naturally in real world settings. The continued research of the topic in clinical settings where participants are required to predict or judge their own accuracy (Anderson &Schmitter-Edgecombe, 2010; Yan, Yanjie, Guoqing & Chan, 2007; Rabinovitz & Peynirciouglu, 2011) needs to be counterbalanced by research that shows, as in the case of learning, that this is an occasional form of metacognitive processing. It is not surprising that individuals engage in FOK processing when listening to music that was popular during their lifespan (Rabinovitz & Peynircioglu, 2011), but the applications of this for other fields such as learning need to be more correctly situated.

Thirdly, much of the research into metacognition looks at specific elements of metacognition or the interaction between some of the elements. While this research is important and necessary to better understand the concept and develop applied solutions, it does not alter the situation that we are being presented with compartmentalized, mainly clinical-based research on micro-components of metacognition and other processes. Thus, we are lacking a macro-view of how meta-cognitive processing interplays with other forms of processing in real-life learning contexts.

Therefore, while there is a huge and ever-growing body of research on the topic of metacognition, there is not:

- A singular widely accepted definition of metacognition, that is understood and conceptualized in the same way across academic fields
- A singular widely accepted framework of metacognition
- Enough clear empirically-based accounts for how it occurs during learning
- Adequate research into its role in complex, learner-centred learning
- Adequate research into the role of metacognition and other processes in independent learning
- Adequate research into the role of metacognition and other processes in real-life learning scenarios.

The research undertaken in this study responds to each of the points raised above, in that it investigated how metacognition occurs during independent learning in real-world learning contexts.

1.6 Situating the Researcher

When engaging in research, the issue of power-relationships between researcher and participants needs to be addressed. In this study the researcher was also the teacher of the participants, so a pre-existing relationship did exist (as will be discussed in detail in later chapters, the participants were chosen as a theoretical sample). However, as will be discussed here, given the nature of the research and how data was collected, this relationship did not distort the data collected.

This research study was designed to collect data about naturalistic processing at a thought unit level, which was not something that participants could alter. Performance was not being measured and this was made explicit to students – there was no good or bad data to be collected, and the researcher was not physically present during the data collection.

In some research studies, the potential for researcher bias can be significant. However even in such cases, researcher bias cannot be removed, although it can be reduced by acknowledging the positions of the researcher and the researched. In this study, while the positions of both are acknowledged, and the researcher consciously maintained reflexivity throughout the study, the fact that the focus was on naturalistic processing at a thought unit level meant that this was a study where performance was not measured, nor was it impacted by researcher presence or engagement in the study.

1.7 Structure of the Thesis

This thesis is organized into eight chapters as outlined below.

Chapter 1: Introduction. This chapter introduces the research area to be investigated, and the background to the study, which situates and explains the motivations behind the research endeavour.

Chapter 2: Literature review. This chapter provides an in-depth review of the research to date relating to the central research areas of this thesis. It examines and evaluates how the literature defines, frames and understands metacognition processing and its role in learning. It also looks at how metacognition is seen to function in independent learning, examining whether metacognition research findings from more controlled learning scenarios are applicable to the context of independent learning. It examines the areas of metacognitive processing in both individual and group contexts, the importance of metacognition in education, and the area of metacognition and conscious and unconscious processing.

Chapter 3: Research Methods Chapter. This chapter outlines the rationale for the chosen methodology, namely, grounded theory. It explains how the Grounded Theory methodology (GTM) fits within the research paradigm of this thesis, constructivism, and how this is an example of a growing field of research using what has been termed Constructivist Grounded Theory (CGT). It also outlines how this choice of methodology impacted on the development of the study, as the use of grounded theory means following a research pathway or process that is directed by what emerges from the data. It discusses ethical and other issues emergent during the research process.

Chapter 4: The Coding Process

This chapter provides a chronological account of how the coding process was conducted and how the grounded theory methodology directed the generation of codes.

Chapter 5: Coding in Context: Case Studies

This chapter provided a contextualised picture of the codes and the coding process that were discussed in the previous chapter. As the presentation of lists of codes can be somewhat inaccessible, two case studies are provided to allow the reader an opportunity to see both how the researcher arrived at the coding decisions, and how the processing types identified interact, as a learner or group of learners are engaged in a learning experience.

Chapter 6: Typology and Interplay of processing in independent learning

This chapter presents the general findings of this research study. It outlines the findings on the typology of processing occurring in independent learning, the elements of metacognitive processing and of other processing types. It also presents findings about how processing occurred across three different learning tasks for both individual and group learning, and examines how processing and performance are linked, and looks at intra-personal performance. The final sections focus on the occurrence and interactions of cognitive, affective, physical and off-task processing.

Chapter 7: Discussion

This chapter discusses and analyses the findings and theoretical model in relation to the existing body of research in the field, as was outlined in the literature review chapter. It also discusses what the findings mean for further applied research and educational applications.

Chapter 8: Conclusion. This chapter summarizes the main findings of this study, and the grounded theory that has been generated. It outlines the significance of this grounded theory, and how it represents a significant addition to the body of knowledge in the fields of both metacognition and independent learning. It also discusses recommendations for future research and practice.

Chapter 2: Literature Review

2.1 Introduction

This study aimed to map metacognitive and other forms of processing during independent learning so as to better understand the process of metacognition and its interplay with other forms of processing (such as cognitive processing) in independent learning. The literature review therefore focused on the examination of two main areas - metacognition and independent learning. Metacognition refers to a *“type of meta-level processing”* that occurs in all learning, but that would seem to be more necessary in independent learning than in other forms of more guided or directed learning, where a teacher or facilitator may perform some of the metacognitive functions. Without the ability to understands one’s own knowledge, monitor one’s learning methods and progress, and control that learning, being an effective independent learner is highly unlikely, if not impossible. As discussed later in this thesis, independent learning refers to a “*mode of learning*”. The use of mode here refers to the manner in which learning is undertaken. As well as learning undertaken independently, other examples of modes of learning would be online learning, modular learning, and directed learning.

This chapter is strucutured into three sections. The initial section outlines in detail how the literature review process was undertaken. This is followed by a review of the literature with regards to metacognition and independent learning, and ends with a critique of the literature.

2.1.2 Literature Review Methodology

When embarking on a study that employs a grounded theory methodology (GTM), an initial hurdle particularly for the novice researcher is in deciding when to undertake and utilize a review of the extant literature on the areas under examination. Bryant and Charmaz (2010) highlight the three main positions on this, by looking at prominent researchers who use the methodology. They give the example of Holton (2010) who states that researchers should undertake GTM research with "*no preconceived problem statement, interview protocols or extensive review the literature*" (Bryant & Charmaz, 2010, p. 20). In this classical GTM scenario, the literature review generally takes place after the research cycle has been completed. They also give the example of Stern (2010) who, while agreeing with Holton in principle, sees practical difficulties in working in this way, such as dealing with funding committees or research approval mechanisms (Bryant & Charmaz, 2010, p. 20). They then give the example of Lempert (2010), who argues that by ignoring existing literature, the GTM research may simply cover old ground, or be denied insights or increased theoretical sensitivity that could develop with the use of extant research. Lempert (2010) thus argues for an iterative literature review, which starts at the outset of the research study.

This study adopted the position of recognizing that the researcher had prior knowledge in the field of metacognition and independent learning, and furthermore that the literature review was to be conducted as an iterative process from the beginning of the study. This approach was justified based on both the pragmatic reason of the researcher having read widely in the area prior to deciding to undertake this GTM study, and on Lempert's (2010) rationale that insights from extant literature could positively contribute to the quality and future direction of the research and ultimate theory generation. As Bryant and Charmaz (2010) point out, doing so can help assure that the research begins from a useful starting point, and that its progress can be orientated throughout (2010, p. 20). The research process was thus guided by insights (or indeed queries) emerging from the literature review and/ or the data analysis process.

The initial review of the literature involved a generalist search for research on the two topics of metacognition and independent learning, with a particular focus on searching for materials that examined both areas. A broad, multidisciplinary literature review was conducted, including (but not limited to) the fields of education, linguistics, neuroscience, philosophy and psychology. The main academic databases employed were – Academic Search Premier, Applied Social Science Index and Abstracts, Cambridge Journals Online, Dissertations Abstracts, Education Research Complete, ERIC International, JSTOR, Linguistics and Language Behaviour Abstracts, Oxford Journals, Oxford Scholarship Online, PsycArticles, PsycINFOS, Sage Journals Online, Science Direct, SpringerLink , Taylor & Francis Online and Web of Science. The keywords employed in the literature search reflected the various stages of data analysis and memoing. Both academic databases and research published in book form were used in the study. The iterative nature of the literature review afforded opportunities to review the most recent publications.

It is important here to note that the literature review not only informed the analysis of data, it also guided decision making on the research model and methodology. For example, the discovery of the lack of literature examining both metacognition and independent learning together, was a strong factor in the choice of constructivist grounded theory (CGT) as the chosen methodology, which is discussed more fully in chapter three. Grounded theory is a useful methodology for researching areas not clearly understood or deeply researched, as it can allow examination of the topic from an open position, and constructivism is the paradigm that underlies both the design and development of most independent learning environments and programmes (where the co-construction of knowledge between participants lies at the centre), and the researcher's understandings and beliefs about learning. While the literature review in a classical GTM study usually occurs after data analysis, in this Constructivist GTM study the literature was reviewed from the outset in an iterative manner. This led to more informed theoretical development, and guided the coding process. The researcher recognised that the coding progress (and corresponding memos) could be best understood and more accurately resolved by returning to the literature to examine certain concepts or relationships. Even on completion of the data analysis, and the generation of the grounded theory of metacognition, the literature review continued, providing a framework for understanding how the findings of this study fitted with the most recent body of extant knowledge in the areas of metacognition and independent learning, and to show what contributions this grounded theory study added to the fields of metacognition and independent learning.

In order to explain the influences of the literature review on data analysis, and vice versa, two cases have been outlined in Figure 1.

Initial Data Analysis Stages

1. Emerging point: Cognition and Affective processing seem clearly distinguishable as types of processing, and metacognition appears to have a control function over affective states	**2. Emerging point:** Categorizing critical thinking involves combining instances of cognition and metacognition into a single category
⇓	⇓
Examination of literature pertaining to cognition / affective distinction, and of metacognition and affective	Examination of literature pertaining to metacognition and higher order forms of thinking
⇓	⇓
As the goal of the thesis is understanding metacognition, it is important to see its interactions with affective processing	Goal of thesis to understand metacognition in independent learning, not in critical thinking or other higher order forms of thinking. Categorizing critical thinking would obscure metacognition data
⇓	⇓
Decision: Continue data analysis separating cognition and affective processing	**Decision:** Continue data analysis without categorization of forms of thinking such as critical thinking

Figure 1. Literature Review: Iterative process in-action

In the example in the left column above, returning to the literature informed the researcher that there was an absence of research on how and if metacognitive processing interacts with affective processing. As such, this was an important juncture in the data collection and analysis process, as it led to the examination of the data from a different perspective – not simply looking for cognitive and metacognitive processing and their interactions, but also examining the data for other possibly distinct categories of processing. This led to the ultimate theory generation, which accounted for all forms of processing during independent learning, and contributed to an understanding of the role of metacognitive processing in relation to them all. Without returning to the literature at various points during the analysis of data, this level of theoretical development may not have occurred.

In the example in the right column of Figure 1, returning to the literature confirmed that metacognition and cognition were both combined within and subsumed by categories of thinking such as critical thinking. As such, categorizing such forms of thinking would obscure the learning processing categories.

2.2 Situating Metacognition: Cognitive, Affective, Physical and Off-Task Processing

This study attempted to look deeply and qualitatively at metacognition during independent learning. While this required the isolation of metacognition, it also required an understanding of the other processing types (such as cognition) that occur alongside and interact with metacognition. This information was essential in order to understand the context, causes and results of metacognitive activity. Therefore, this section examines these distinctions.

2.2.1 Metacognition and Cognition

In order to discuss what metacognition is and is not, it is necessary first to look at what is meant by cognition. As it often the case, many of the broad concepts we are all familiar with (and confident we understand clearly) often defy detailed definition. "*What you know and think*" (Flavell, Miller, & Miller, 2002, p. 1), while not exactly forthcoming in complexity, may in fact be the most useful definition of cognition, given the scope of what can be said to be cognition. *'Intelligence', 'thinking', 'knowledge', 'classifying'* would be widely considered as cognition. However, as we examine the concept of cognition more fully, it increases in range and complexity. Flavell et al (2002) notes that, for example, fantasizing and symbolizing may also be considered cognitions, and that lower mental processes, organized motor movements and perception, can also be included within the concept of cognition (Flavell et al., 2002, p. 3). Therefore, it is hard to say what is not cognition, or to put forth a scenario where it does not occur. This lack of clarity has led to the growth of new fields of interactional research, where previously deemed 'separate functions' are seen as interactional and two-way; cognition and motivation (Bickhard; Boekaerts, 1996), social cognition (Augoustinos, Walker, & Donaghue, 2009), and cognition and emotion (Barnard, Duke, Byrne, & Davidson, 2007; Duncan & Feldman Barrett, 2007).

Cognition is therefore a broad concept within which metacognition sits. Metacognition is not separate to cognition, but rather a subset or particular kind of cognition (Nelson, 1999). Having a simple but broad definition of cognition is useful in one sense, but in another, particularly in an applied sense, this can be problematic. An example of this can be seen in the work of the National Council of Research, whose work shows the absence of a clear model of cognition to be a serious barrier to valid assessment (Pelligrino, Chudowsky, & Glaser, 2001). In distinguishing between metacognition and cognition, Tarricone (2011, p.1) concludes that there is general agreement that metacognition is second-order cognition, in which there is knowledge and awareness, monitoring and control of the flow of information occurring in cognitive processing.

While it is not the purpose of this thesis to solve or clarify this issue of what constitutes cognition, it is necessary to be able to distinguish metacognition from forms of cognition, so that it can be isolated, identified and its interactions with these other elements examined. For the purpose of this thesis, metacognition will be examined and defined in detail, but all other 'cognitions' (i.e., attention, memory) will be held within the single category of cognition. A further reason for placing all other cognitions in one category in order to isolate metacognition, is that the difference between the two is relational rather than absolute (Nelson & Narens, 1994). Nothing is always at the 'meta-level' – rather "one aspect is metacognitive in relation to the later aspect" (Nelson, 1999, p. 625). For example, 'knowing' can be either cognitive or metacognitive, depending on what is being known, and how and for what this knowledge is being used. Furthering this issue of complexity is that, other forms of cognition, that are often also considered higher order cognitions, such as critical thinking, involve a combination of both metacognition and cognition. If one was to isolate critical thinking as a separate distinct form of cognition, this would limit the degree to which metacognition could be seen. Thus breaking down all forms of cognition would make instances of metacognition more difficult to examine. In the later discussion of the data analysis process, it is shown how this decision (analyzing learners' thinking in terms of metacognitive and cognitive processing, rather than more global types of thinking that subsume and require them both, such as critical thinking or logical thinking) was justifiable based on the main research question (how metacognition occurs during independent learning), the data emerging, and the analyzability of the data.

2.3 What is Metacognition?

Dunlosky and Metcalfe (2009) highlight the evolution of research on metacognition from its earliest recorded beginnings in antiquity – "*Simonides heralding the power of his method of loci to control memory*" (Dunlosky & Metcalfe, 2009, p. 10), through to its present day incarnation as an increasingly researched concept in education, human development and other fields such as law (e.g. its role in the reliability of witness testimony), while others note that it is being researched in other domains, such as counseling, job performance recovery from brain injuries (Schwartz & Perfect, 2002). Efklides and Misailidi (2010) discuss more recent and future research direction such as research into social metacognition, and research into metacognition in nonhumans such as that undertaken by Beran, Couchman, Coutinho, Boomer, & Smith (2010).

However, despite the long history of research in the field of metacognition, it was not until 1976, coming out of work on researching theories of the mind in the fields of cognitive science, psychology and education, that the term metacognition was coined and defined by Flavell as "*knowledge and cognition about cognitive phenomena*" (Flavell, 1979, p. 906). Flavell's work was highly influenced by his perhaps more famous predecessors, Piaget and Vygotsky, respectively researching states of cognitive development (Piaget, 1972) and the social and interactional effects on cognition and learning development (Vygotsky, 1978). It was following Flavell's definition of metacognition that research began in earnest, and that there was crossover between disciplines, particularly cognitive science and education. Although this crossover has occurred, some researchers still feel that a problem in the field of metacognition research is that there is "a largely divided path of research – one for cognitive researchers and another for educators" (Son, 2007, p. 490). As such, any educationally situated applied research such as this study that still retains a cognitive focus can only help in bridging the gap between the two fields and increasing understanding of the concept.

2.3.1 Defining Metacognition and its Frameworks

Flavell's (1976, 1979) early definitions of metacognition have been followed by many others, which emphasize different elements or rename existing concepts within metacognition. Some of the more widely quoted definitions are listed below:

Table 1. Definitions of Metacognition

Flavell (1976)	"Metacognition refers to one's knowledge concerns one's own cognitive processes and products and anything related to them, e.g. the learning relevant properties of information or data….. Metacognition refers, among other things, to the active monitoring and consequent regulation and orchestration of these processing in relation to the cognitive objects or data to which they bear, usually in the service of some concrete goal or objective" (p. 232)
Flavell (1979)	"knowledge and cognition about cognitive phenomena" (p. 906)
Flavell (1985)	''Knowledge or cognitive activity that takes as its object, or regulates, any aspect of cognitive enterprise" (Flavell, 1985, p. 104)
Brown (1987)	"Metacognition refers loosely to one's knowledge and control of one's own cognitive system. Two primary problems with the term are: it is difficult to distinguish between what is meta and what is cognitive; and there are many different historical roots from which this area of inquiry developed. The confusion that follows the use of a single term for a multifaceted problems is

	the inevitable outcome of mixing metaphors" (p.66)
Metcalfe & Shimamura, (1994)	Knowing about knowing (p. 1)
Pressley & McCormick (1995)	"It is knowledge of thinking processes, both knowledge of the thinking occurring in the here and now (e.g.," I am really struggling to figure out how to write this introduction; I believe that the introduction I have just written makes sense") and in the long-term (e.g., " I know a number of specific strategies for planning a composition, rough drafting it, and revising the draft") (p.27)
King (1999)	Metacognition involves the ability to think about own cognitions, and to know how to analyze, to draw conclusions, to learn from, and to put into practice what has been learned (in Rahman & Masrur, 2011, p. 135)
Butterfield, 1994; Efklides, 2001; Flavell, 1976; Flavell, Miller, & Miller, 1993; Langford, 1986; Schraw, 2002; Schwebel, 1986; Slife, Weiss, & Bell, 1985	Knowledge and awareness of processes and the monitoring and control of such knowledge and processes (as cited in Tarricone, 2011, p. 1)
Zimmerman & Moylan (2009)	Metacognition refers to knowledge, awareness and regulation of ones thinking (p. 299)

Metacognition has been defined in different ways, but perhaps the most commonly cited definitions are those from Flavell (1976, 1985). Flavell's (1976) initial definition: "*Metacognition refers to one's knowledge concerning one's own cognitive processes or anything related to them, e.g., the learning-relevant properties of information or data…*" (p. 232) focuses on what the individual *knows about how he learns*, as well as how the individual regulates the cognitive processes - '*the active monitoring and consequent regulation and orchestration of these processing'* (p. 232). Flavell's (1985, p. 104) later definition of metacognition as ''*Knowledge or cognitive activity that takes as its object, or regulates, any aspect of cognitive enterprise*" recognizes the role of regulation (monitoring and control) of learning processes within metacognition, and continues to be echoed in recent explanations of metacognition (King, 1999; Zimmerman & Moylan, 2009; Tarricone, 2011). Other definitions of metacognition refer back to its philosophical origins or ontological roots, such as that it is essentially "cognition about cognition" (Smith et al., 2003), "knowing about knowing" (Koriat, 2000) or "thinking about thinking" (Livingston, 1997), and offer less direction on the epistemological or axiological perspectives of metacognition.

Although there are clear similarities in the definitions above, looking across the wider literature over the years, we see how these many definitions and conceptualizations become confusing rather than clarifying. Rahman and Masrur (2011), discussing this confusion, provide a myriad of terms applied to metacognition - "*metacognitive beliefs, metacognitive awareness, metacognitive experiences, metacognitive knowledge, feeling of knowing, judgment of learning, theory of mind, meta-memory, metacognitive skills, executive skills, higher-order skills, meta-components, comprehension monitoring, meta-learning, learning strategies, heuristic strategies, and self-regulation*" (p. 135).

In his review of the research in the last 30 years, Georghiades (2004) notes some further terminological differences of metacognition among researchers, who have referred to metacognition as: "self-appraisal and self-management (Paris & Jacobs, 1984; Paris & Winograd, 1990) 'metalearning' (White & Gunstone, 1989), 'duetero-learning' (Bateson, 1983), mindfulness (Salomon & Globerson, 1987)" (pp. 366 - 367). Further difficulty is caused by the fact that now prominent fields of research in their own right – *self-regulation* and *executive functioning and control* – are often used interchangeably in the literature to describe same phenomenon being discussed here as metacognition. The term *self-regulation* will be discussed in a later section (as self-regulation is often also used interchangeably with the term independent learning), but it is of relevance to take note of the more recent term *executive functioning* here. Parallels can be drawn between Moran & Gardner (2007,) notion of executive function where they declare: "*Executive function regulates a person's goal-directed behavior*" (Moran & Gardner, 2007, p. 19), and Flavell's (1976) references to self-regulation and goal setting in his initial definition of metacognition. Meltzer (2007), in discussing definitions of executive function, points out that 'most' definitions contain the following elements of "*Goal setting and planning, Organization of behaviors over time, Flexibility, Attention and memory systems that guide these processes (e.g., working memory), and Self-regulatory processing such as self-monitoring" (pp. 1 - 2).* Therefore, *executive functioning* involves self-awareness, monitoring and self-regulating in goal-directed processes, all of which are properties of metacognitive processing. There is no literature that clearly identifies how or if metacognition and executive function differ, and while any research around both these types of thinking processes or phenomena is welcome and of great value, the confluence of competing, or vaguely defined definitions and discussions, can unfortunately dilute the rate of progress of knowledge and application by practitioners, such as those in education.

As the study of metacognition has evolved, research has sought to define and frame the component elements of metacognition, and to understand their relationships, both within metacognition and with wider mental processing. Most of the early discussions divided metacognition into two areas – 'knowledge of' and 'regulation of' (Brown, 1987; Schraw, 2002). However, more recently proffered frameworks have divided the concept into three areas, each with several subcomponents – metacognitive knowledge, monitoring, and control (Dunlosky & Metcalfe, 2009; Pintrich, Wolters, & Baxter, 2000). It has even been divided further into four constructs (White, 1988) - however, these constructs lacks clear definition (Borkowski, Chan, & Muthukrishna, 2000). Essentially there is not a consistently agreed upon framework or theory of metacognition. However, two often used frameworks are Dunlosky and Metcalfe (2009) – as shown in Table 2 that follows - and Pintrick et al. (2000). They differ somewhat in sub-elements and definitons, but not in their main categorisations.

Table 2. Definitions of Important Concepts Relevant to Metacognition

Concept	Definition	Examples
Cognition	Symbolic mental activities and mental representations	Learning, problem solving, reasoning, memory
Metacognition	Cognitions about other cognitions	
Metacognitive Knowledge	Knowledge about a kind of cognition	Knowledge about how learning operates Knowledge about how to improve learning
Metacognitive monitoring	Assessing the current state of a cognitive activity	Judging whether you are approaching the correct solution to a problem Assessing how well you are understanding what you are reading
Metacognitive control	Regulating some aspect of a cognitive activity	Deciding to use a new tactic to solve a difficult problem Deciding to spend more time trying to remember the answer to a trivia question

(Dunlosky & Metcalfe, 2009, p. 3)

Despite the confusion caused by the 'mixing of metaphors' (Brown, 1987), the wide choice of terminologies, and the combination of terms (i.e. metacognition and self-regulation seemingly used as equivalents by Pintrich et al., 2000), commonalities are evident between Dunlosky & Metcalfe's (2009) framework and Pintrich et al. (2000) framework. Metacognition is generally agreed to consist of knowledge, monitoring and control elements. This three-element division, rather than the division into knowledge and regulation only, will be furthered explained in the discussion of monitoring and control that follows. As will be seen from the data analysis in this thesis, the existence of these three distinct elements is upheld in the context and for the population examined in this study.

2.3.2 Metacognitive Knowledge

In all learning, metacognitive knowledge plays a pivotal role, but it is of most importance to independent learning. Metacognitive knowledge is essential for independent learning because "*it represents the knowledge base that students draw on as they make decisions about their learning*" (Cotterall & Murray, 2009, p. 34). Consider the beginning of a learning task where teacher guidance is unavailable – if the learner is to undertake any learning task effectively they must according to Wenden (1999):

> *1. Identify the nature of the problem it poses*
>
> *2. Consider whether it is similar to one they have already done*
>
> *3. Determine how to approach the task, and the knowledge and skills they will need to do so.* (Wenden, 1999, p. 437)

Metacognitive knowledge in learning is what learners know about themselves (self-knowledge), the tasks the complete (task knowledge) and their learning strategies (strategic knowledge) (Cotterall & Murray, 2009). It can be seen as what learners know about learning (Flavell, 1979; Wenden, 1999).

- *Knowledge about cognition and cognitive strategies* – knowledge about the universals of cognition

  - Declarative knowledge of *what* different types of strategies are available for memory, thinking, problem solving etc.

  - Procedural knowledge of *how* to use and enact different cognitive strategies

  - Conditional knowledge of *when* and *why* to use different cognitive strategies

- *Knowledge of tasks and contexts* and how they can influence cognition
- *Knowledge of self* – comparative knowledge of intra-individual and inter-individual strengths and weakness as a learner or thinker; better seen as motivational not metacognitive self-knowledge

(Pintrich et al., 2000, p. 47)

The above explanation of *metacognitive knowledge* by Pintrich et al (2000) shows that although metacognitive knowledge encompasses strategy knowledge and knowledge of how and when to use such strategies, it is a much more expansive concept that simply strategies. This is an important clarification to make for all those involved in education, from curriculum designers to teachers to students. Although this is a stable body of knowledge (Wenden, 1999), it does change over time through cognitive maturing, socialization and both explicit and implicit learning and experiencing. It is relevant to note here that one of the issues in defining metacognition and understanding its elements, is the difficulty in knowing how to 'delimit it' (Hacker, Dunlosky, & Graesser, 1998; Tobias & Everson, 2000, 2009). This is visible above in Pintrich et al's (2000) definition of the element of 'knowledge of self' as being best seen as motivational not metacognitive self-knowledge, despite their inclusion of it as an element of metacognitive self-knowledge. The fact that Pintrich et al (2000) are conceptualizing and delimiting issues *within* a definition of metacognitive knowledge is indicative of the complexity of metacognition, and of the state of play of understanding metacognition clearly.

2.3.3 Metacognitive Monitoring and Control

Prior to discussing metacognitive monitoring and control separately, it is important to clarify why such a separation is useful. The three component frameworks of metacognition, that separate monitoring and control are greatly strengthened by the seminal and widely agreed upon research of Nelson and Narens (Nelson, 1997, 1999; Nelson & Narens, 1994) on the meta-level and object-level system. This system shows the flow of information between the cognitive object-level and the metacognitive meta-level. Put simply, cognitive activity is monitored – "the meta-level is *informed* by the object-level" (Nelson & Narens, 1990, p. 127), and in a control sense, "the meta-level *modifies* the object-level, but not vice versa" (Nelson & Narens, 1990, p. 127).

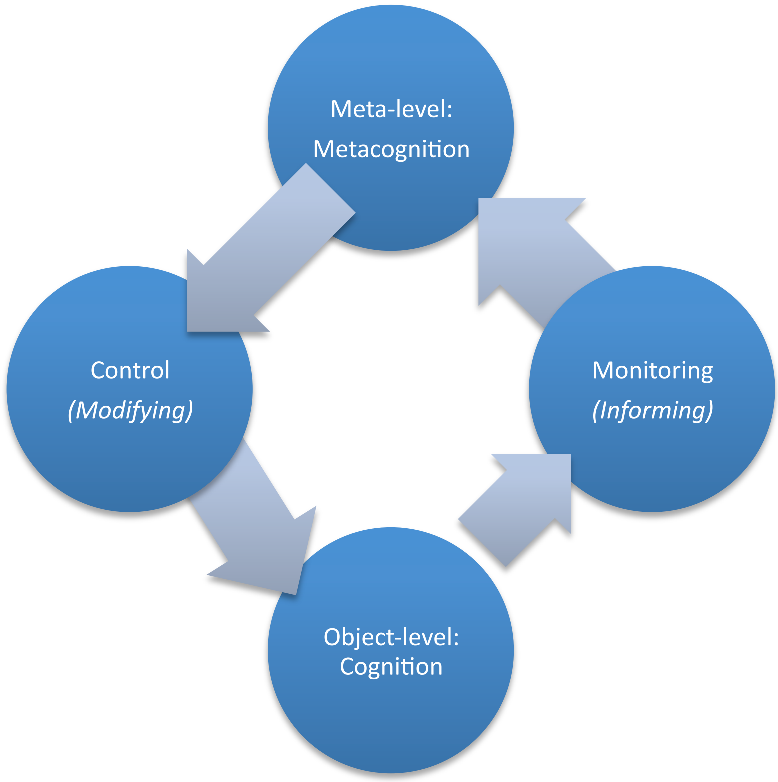

Figure 2. Metacognitive Monitoring and Control (Adapted from Nelson & Narens, 1990)

As can be seen in Figure 2, metacognitive monitoring and control perform two very different though related functions – informing and modifying. An instance of accurate monitoring (where a learner makes an accurate judgment about how their learning is proceeding) does not mean that an effective control action will occur. Theoretically (and as is borne out in the data to follow in this project) it is possible for accurate monitoring to be followed by ineffective control activity (where a learner, for example, despite clearly noticing a lack of comprehension of a text section, makes a decision not to re-read but to skip on, despite the section containing necessary information for task completion). This highlights the need to examine these two elements separately, rather than to view them both as one entity or process, as 'regulation'.

2.3.4 Metacognitive Monitoring

Metacognitive monitoring, defined as "*assessing the current state of a cognitive activity*" (Dunlosky & Metcalfe, 2009, p. 3) is perhaps most easily understood through understanding it in action. Returning to the early work of Flavell (pre-dating his coining of the term metacognition in 1976), we find some clear examples in his work with younger and older school children undertaking learning tasks, where effective and ineffective (or absent) metacognitive monitoring was visible, as was the impact on learning results. Flavell, Freidrichs and Hoyt (1970) asked participants to study a set of items until they were able to recall them. Older students in the study worked for a while, said they were able to recall, and usually could. The younger students, however, following the same pattern of working for a while, saying they were ready, were usually not (Flavell, Friedrichs, & Hoyt, 1970). This study was later replicated with the same findings (Markman, 1977), which not only showed the importance of monitoring in learning, but also the now understood position that young learners are quite limited in their metacognitive activity, which includes metacognitive monitoring. The importance of metacognitive monitoring can also be seen in more specific learning situations, such as reading and comprehension. Kinnunen & Vauras, (2010) note '*Numerous studies show that the more skilled and mature a reader / comprehender is, the more probable it is that signs of comprehension monitoring can be found in his or her reading, whereas* *deficient comprehension monitoring seems to characterize poor readers / comprehenders*" (Kinnunen & Vauras, 2010, p. 211).

For the purposes of discussing the different types of metacognitive monitoring here, Pintrich et al's (2000) framework of four discrete types of Metacognitive monitoring is examined. Pintrich et al. (2000) refer to 'Metacognitive Judgments and Monitoring', rather than simply 'Metacognitive Monitoring' used elsewhere in the literature where there is a broad acceptance that the process of metacognitive monitoring implicitly includes making a judgment.

METACOGNITIVE JUDGEMENTS AND MONITORING

- *Task difficulty or ease of learning judgments (EOL)* - making an assessment of how easy or difficult a learning task will be to perform
- *Learning and comprehension monitoring or judgments of learning (JOL)* – monitoring comprehension of learning
- *Feelings of knowing (FOK)* – having the experience or "awareness" of knowing something, but being unable to recall it completely
- *Confidence judgments* – making a judgment of the correctness or appropriateness of the response

(Pintrich et al., 2000, p. 47)

All four elements in the framework of *Metacognitive Judgements and Monitoring* above by Pintrich et al (2000) perform the action of 'informing' the meta-level of how the cognitive activity (i.e. learning) is proceeding. Examples of this are

a) After reading an essay question to be answered, realizing it will be quite difficult as the subject matter has not been reviewed recently (Ease of Learning judgment).
b) Realising, while writing the essay, that the writing is progressing too slowly (Judgment of Learning)
c) Remembering that an article had been read recently that would assist the essay argument, but not being able to recall the point of the article exactly (Feeling of Knowing)
d) Realising that the introduction section of the essay has been completed well (Confidence Judgment).

Once these monitoring judgments have occurred and this information is now at the meta-level, according to the Nelson and Narens' (1994) model illustrated in Figure 2 earlier, a metacognitive control action can occur.

2.3.5 Metacognitive Control

Dunlosky and Metcalfe (2009) define metacognitive control as "*regulating some aspect of a cognitive activity*" (p. 3). Son and Schwartz (2002) define it as "*the ability to use those [metacognitive monitoring] judgments to alter* *behavior*" (p. 15). This second definition makes more explicit the relationship between monitoring and control, while the first makes clear the scope of such control activity. In this sense, 'regulating' during learning will encompass any decision the learner makes pertaining to their thinking during learning.

Again, Pintrich et al (2000, p. 47) have identified four main categories of *metacognitive control* -

- *Planning activities* – setting goals for learning, time use, and performance
- *Strategy selection and use* – making decisions about which strategies to use for a task, or when changing strategies for performing a task
- *Allocation of resources* – control and regulation of time use, effort, pace of learning and performance
- *Volitional control* – control and regulation of motivation, emotion and environment

Examples of each of these four elements are -

a) After reading an essay question to be completed, deciding when and where to write the essay, and how much time and effort to allocate to researching and writing (planning activities – Metacognitive Control of Learning – MC-COL)

b) Deciding to write the full essay quickly, and return to find and add in references later (strategy selection and use – Metacognitive Control of Learning – MC-COL)

c) Deciding to stop researching, as time is running out, and writing needs to begin (allocation of resources – Metacognitive Control of Learning – MC-COL)

d) Deciding to take a break from writing as frustration with the essay progress is inhibiting concentration (volitional control – Metacognitive Control of Affective Processing – MC-AP)

Again, as was seen with the elements of metacognitive knowledge earlier, the delineation of what constitutes metacognitive control is not without problem. The description of '*Planning activities*' above could be said to encompass the '*Allocation of resources'*, if we determined planning to be something that occurs not only prior to starting learning, but something that happens during learning, and as such, allocation of resources is not distinct enough from planning activities to warrant its inclusion as a separate element of metacognitive control.

Another point of interest here is the inclusion of the fourth element of '*Volitional control'*, with its description as the control and regulation of motivation, emotion and control. The inclusion of 'Volitional control' here frames the regulation of emotional control (affective processing) within metacognitive control. If this is the case, it would seem plausible, though not specifically defined in this way here, that metacognitive knowledge and metacognitive monitoring would also have parallel roles in the ‘knowing of’ and ‘monitoring of’ affective processing. The inclusion of volitional control is also illustrative of the scope of metacognitive control, given that Pintrich (1999) describes volitional control as encompassing control of motivation, control of emotions and moods, control of behaviour and control of environment. Metacognitive control decisions influence the direction and manner in which learning will continue.

2.4 Independent Learning

One of the first issues here is to be clear about what independent learning, as a *mode* of learning, refers to. This is somewhat complicated by the literature in the area having many definitions, and also by the use of other terminologies – autonomous learning, self-directed learning and self-regulated learning – that are often used interchangeably with independent learning, but sometimes used differently. Often it is not clear in what manner a particular terminology is being used. For example, in looking to clarify the concept of self-directed learning (SDL) as it is used in medical education literature, Ainoda et al. (2005) examined all the literature on the topic between the years 2000-2004, discovering that only 5% of articles had an explicit and concrete definition (Ainoda, Onishi, & Yasuda, 2005). In this section, terminologies often related or used synomously with independent learning are discussed, explaining how and why the different interpretations of what constitutes independent learning are relevant in this thesis, and justifying the decisions to define independent learning as *'the act of learning without (or with less) external direction, guidance and evaluation, in volitional and non-volitional contexts'* and its use as the context for an examination of metacognition.

2.4.1 Self-Regulation and Self-regulated learning

The terms self-regulation and self-regulated learning derive from the work of Vygotsky (Whitebread et al., 2009) and that of Bandura (1986), which "*helped to shape the direction and development of self-regulation*" (Dinsmore, Alexander, & Loughlin, 2008, p. 394). Table 4 summarises some common definitions of self-regulation and self-regulated learning.

Table 3. Definitions of Self-regulation and Self-regulated learning

"SRL (self-regulated learning) involves actively constructing an understanding of a topic/domain by using strategies and goals, regulating and monitoring certain aspects of cognition, behavior, and motivation, and modifying behavior to achieve a desire goal" (Azevedo & Witherspoon, 2009, p. 321)
"Self-regulated learning (SRL) refers to the setting of one's goals in relation to learning and ensuring that the goals set are attained. Key components of SRL are cognition, metacognition, motivation, affect, and volition (Boekaerts, 1996)" (as cited in Anastacia

Efklides, 2011, p. 6)
"Self-regulation represents the highest level of metacognitive activity. Changing cognitive skills and strategies in response to new or changing task demands is my own favorite operational definition of self-regulation (Butterfield & Belmont, 1977) . Other labels used to describe orderly changes in cognitive processes and skills are self-control and executive functioning (Borkowski & Burke, 1996). Examples of regulatory activities include planning, strategy selection and use, and resource allocation" (Borkowski, 1996, p. 392).
"Self-regulation is not a mental ability or an academic performance skill; rather it is the self-directive process by which learners transform their mental abilities into academic skills. Learning is viewed as an activity that students do for themselves in a *proactive* way rather than as a covert event that happens to them in reaction to teaching. Self-regulation refers to self-generated thoughts, feelings, and behaviors that are oriented to attaining goals" (Zimmerman, 2002, pp. 65 - 66).
"more recently self-regulation is defined as a broader set of knowledge and skills, including domain-specific knowledge, cognitive skills, metacognitive knowledge and skills, and motivational processes (Boekaerts & Niemenvirta, 2000; Schraw, Bendixen, & Dunkle, 2002; Schunk & Zimmerman, 1994)." (as cited in Veenman, 2007, p. 177)
"Self-regulatory skills may be conceptualized as the operational aspect of metacognition, including the planning, monitoring, and evaluation going on during learning and problem-solving (Braten, 1991; Brown, 1987). "(as cited in Stromso & Braten, 2010, p. 92)
"Self-regulation of learning (SRL) arises from the constructivist framework and integrates educational theories with teaching–learning strategies. The model suggests that cognitive processes, such as stimulus-response and memory storage described by behaviourism and information processing, are supported, enhanced, monitored and controlled with the development of metacognitive knowledge and processes" (Kuiper & Pesut, 2004, p. 386).

There are those who differentiate between the terms 'self-regulation' and 'self- regulated learning' (Alexander, 2008; Dinsmore et al., 2008), and others who use them interchangeably as we can see in the table above. These definitions spark debate about what is self-regulated learning and what is metacognition (Alexander, 2008; Azevedo, 2009; Dinsmore et al., 2008; Lajoie, 2008; Pintrich et al., 2000; Schunk, 2008; Sperling, Howard, & Staley, 2004; Veenman, 2007; Winne, 1996).

Self-regulated learning sometimes describes how students undertake tasks or homework by themselves, and work in educational environments that may still be very teacher-centred, and other times describes learning where students make all the learning choices. Zimmerman's (2002, pp. 55-56) delineation of self-regulated learning in table 3 as a '*self-directive process'* and as a form of activity that learners '*do for themselves in a proactive way'* is suggestive of a mode of learning that may be synonomous with independent learning. However, it is evident from a review of the definitions above that self-regulation and self-regulated learning is more widely considered to be a meta-level process of learning linked to metacognition rather than a 'mode of learning' (such as independent learning). It is also clear from a review of the definitions that metacognition is considered as either an overarching framework that encompasses self-regulated learning or is a sub-element of self-regulation or self-regulated learning. While more researchers see metacognition as subordinate to self-regulation, as in the definition cited by

Efklides, (2011) where metacognition is clearly considered one elemental part of self-regulated learning, some researchers see the opposite. Wenden (1998) defines the strategic component of metacognition as "*general skills through which learners manage, direct, regulate, guide their learning, i.e., planning, monitoring, and evaluation*" (p. 519). She goes on to say that *"the deployment of these three strategies in learning is referred to as self-regulation in cognitive psychology*" (Wenden, 1998, as cited in Cotterall & Murray, 2009, p. 35). This subordination of self-regulation to metacognition is somewhat mirrored in the ideas of Borkowski (1996)- *"self-regulation represents the highest level of metacognitive activity"* (p. 392), yet this is often the argument of the other side – that as the highest level, self-regulation is a separate and super-ordinate concept.

As outlined in the introduction, self-regulation or self-regulated learning is notoriously difficult to research (Zimmerman & Moylan, 2009), and as shown by the various definitions, equally difficult to simply conceptualize. Veenman's (2007) examination of the literature notes that there is not covergence among researchers on what the components of self-regulation are, or whether they are ubiquitous, spontaneous or not (p.182). Despite the different uses of terminologies, there are similarities running throughout the definitions of self-regulation. These ideas of "broader skills" (Veenman, 2007, p. 171) involving "self-directive" (Zimmerman, 2002, p. 66) actions that create "active construction" (Azevedo, 2009, p. 321) and "regulate activities" (Borkowski, 1996, p. 392) are common to all definitions.

It is however, when we move from the general to the specific in these discussions that we run into difficulty, particularly with the defining and separating of metacognition and self-regulation.

For the reasons outlined here – the different uses of the term self-regulation and self-regulated learning, the lack of clarity about the components of the construct, and the research disputes about the separation and hierachical relationship between it and the construct of metacognition under investigation, this study chooses not to use this terminology, as it does not adequately (nor consistently) describe the mode of learning under investigation and would more likely be confused with, or cause confusion in the delineation of what constitutes, metacognition.

2.4.2 Autonomous learning and Self- Directed Learning

Autonomous learning was defined by Holec as "*the ability to take charge of one's own learning*" (Holec, 1981, p. 3) . Although not as widely used as self-regulation, it has taken a strong foothold in some fields, such as language learning, and philosophy. According to Benson & Voller (1997) autonomous learning "*has been used in language learning at least five different ways, namely:*

1. *for situations in which learners study entirely on their own;*

2. *for a set of skills which can be learned and applied in self-directed learning;*
3. *for an inborn capacity which is suppressed by institutional education;*
4. *for the exercise of learners' responsibility for their own learning*
5. *for the right of learners to determine the direction of their own learning*."

(Benson & Voller, 1997, pp. 1- 2).

They go on to note that independence and autonomy are used as synonyms by some authors, but as distinct by others, that associate the terms with individual learning, and that further confuse the issue by discussions of whether or not the concepts are universal or "*western culture-bound values*" (Benson & Voller, 1997, p. 2).

A more comprehensive definition, and one that takes into account the cognitive nature of learning comes from Little (1991), who describes autonomous learning as follows –

> *Essentially, autonomy is a capacity - for detachment, critical reflection, decision-making, and independent action. It presupposes, but also entails, that the learner will develop a particular kind of psychological relation to the process and content of his learning. The capacity for autonomy will be displayed both in the ways the learner learns and in the way he or she transfers what has been learned to wider contexts*. (Little, 1991, pp. 3 - 4).

This capacity for autonomy in learning is not an absolute, but rather there are degrees of autonomy (Thanasoulas, 2004). Educators often speak of the continuum of learner autonomy that learners move along, moving up through stages of interdependence and independence as learning demands grow. This is a different conceptualization to self-regulated learning as outlined earlier, in that its focus is on a capacity that learners possess to different degrees, and that they may develop by working through stages of interdependence with teachers, facilitators and peers; that the stages of interdependence are an important learning aspect of becoming more autonomous.

Often central to the discussion of autonomous learning is the idea of volition or willingness, as Littlewood (1996) highlighted: "*At the core of the notion of autonomy are the learners' ability and willingness to make choices independently*" (p. 427). Su & Reeve (2011) also relate autonomy to independent, volitional decision-making by learners, by stating that learners are autonomous "*when they pursue their interests, study to satisfy their curiosity, and volitionally engage themselves in schoolwork*" (Su & Reeve, 2011, p. 160). However, this often-included element of volition in definitions of autonomous learning makes this term unsuitable to describe the mode of learning within this study. While autonomous learning that recognizes volition could be considered synonymous with independent learning, it excludes a huge range of learning endeavours that are undertaken independently, but where the initial impetus or decision to engage in the learning was not volitional, or perhaps where the content was pre-determined. Some examples of non-volitional but independent learning would be in-class learning without step-by-step instruction, project learning, individual test preparation, thesis writing and some work-based learning (learning that occurs as part of our working lives – while adults often volitionally chose what and when to learn, this is not always the case in career situations where acquiring new knowledge, of for example, a new computer system, is a requirement rather than a choice).

This argument also holds for the decision not to use the terminology 'self-directed learning' within this study. Knowles (1975) describes self-directed learning as a process in which individuals "*take the initiative, with or without the assistance of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes*" (Knowles, 1975, p. 18). The idea of "taking the initiative" again relates to volitional learning, and as such, as discussed above, excludes a huge range of un-directed learning scenarios that we engage in during our learning lives.

While it is true that volition is exhibited within the learning process when a learner is not responsible for the initial motivation for the engagement with learning, the fact the term volitional learning is strongly linked to the political and ideological emancipatory philosophies of autonomous learning means that it is often implicitly understood or interpreted to include initial decisions to learn. As such, the terminology of autonomous learning is not suitable to describe the learning under investigation in this study.

2.4.3 Independent Learning

In its broadest and most accessible, known context, independent learning is defined by the Open University (Moore, 1984) as "*working with increasingly less structured teaching materials and with less reliance on traditional kinds of tutor support*" (p. 27). Forster (1972), as cited by Candy 1991, defines independent study as a philosophy, process and method of education "*in which a student acquires knowledge by his or her own efforts and develops the ability for inquiry and critical evaluation*" (p. ii), and further emphasizes the role of freedom of choice, freedom of process, as well as increased learner responsibility in the achievement of learning objectives and goals within the mode of independent learning. One very important point of these definitions is that they fit with the idea of a mode of learning, and not an ability or a capacity for a way of learning, as is the case, with, for example autonomous learning (Holec, 1981; Little, 2001). What is under investigation in this thesis is processing as students engage in a mode of learning, not their capacity to engage in unguided learning. The fact that the term independent learning has been less used in the literature than the other terminology outlined in this section, means that its discussion is less developed, and as a result, less disputed, and less likely to be confusing to readers. It is, in other words, a less 'loaded' terminology.

Unlike modes of learning such as self-regulated learning and autonomous learning described earlier, independent learning includes learning scenarios that are not necessarily completely volitional, and as such can include a wider group of learning situations, included learning tasks and content that may be chosen by someone other than the learner, or learning that the learner might not personally choose to undertake based on personal preference. Rather, it describes an inclusive mode of learning, undertaken independently, that is not limited to (but rather is inclusive of) volitional, self-motivated or self-chosen learning.

As an educator and researcher working in the tertiary sector, it is my goal to provide students with a learning environment and learning experiences that help them to develop the abilities for lifelong learning. This necessitates a mode of learning that can support learning with or without the direction, guidance and evaluation of a teacher – "*the over-arching goal of all teaching is to help learners act more independently within a chosen range of domains*" (Littlewood, 1996, p. 428). Educators, who hold this viewpoint, pragmatically need to prepare learners for both learning that they will need to do and for learning that they may choose to do, on their own volition, not only one or the other. In this thesis, the independent learning that was facilitated involved volitional learning tasks, as well as prescribed learning tasks, but in all cases, the process of how learning was undertaken was chosen by the learners.

There are two reasons for including both volitional and non-volitional learning in this study. Firstly, it is not realistic to take the position that all learning is volitional. All learners will, throughout their lives engage in many learning endeavours, some prompted by external needs or demands, others undertaken as a result of intrinsic motivations. As such the researching of such learning, and the promotion of such learning to the exclusion of non-volitional learning, leaves gaps both in the knowledge we can gain from research, and in the knowledge we provide to learners about how to learn better.

One example of the dangers of limiting research and practice to that of only volitional learning can be found in the field of self-access language learning, which is a relatively new field that has grown out of the area of learner autonomy. Alongside traditional language learning programmes, many educational institutions, particularly tertiary institutions, now have self-access language learning centres (SALCs), where students can continue and expand on their language learning and practice independently. One of the points of discussion in this field is whether or not the usage of such centres should be voluntary or not (Gardner & Miller, 2011), with perhaps more practitioners agreeing with the voluntary stance. There are good reasons for this – doing so creates a separation between such learning and classroom learning and homework, which can have very positive motivational effects for learners. It also places the responsibility on the shoulders of learners for engaging in such learning, which does move them in an independent direction, which is the goal of such centres. However, the situation is not that simple. Most SALCs, as they have developed, have not only administrative staff, but also dedicated academic staff (often referred to as learning advisors). The reason for this is that independent learning is very difficult for learners (e.g. tertiary level students will generally, at that stage of their learning careers, have, to a large degree, experienced only more directed, guided forms of learning), and they need to be supported by educators. Given that we expect everyone to engage in lifelong learning, and that such learning will necessarily be more independent and less supported throughout learners lives, by simply having learners use such centres in a volitional manner, we have several problems.

Not all future learning will be volitional, so the experience of volitional learning, where high intrinsic motivation is present, will not mirror all future learning situations, for example where, independent learning is a requirement (e.g. the need to keep learning how to use the increasing amount of technology platforms in the workplace). The experiences of choosing to learn and needing to learn (possibly needed to learn something that holds no personal interest) are very different. Secondly, by making such learning volitional, we are excluding learners from the learning experience who choose, for their own reasons, not to take this learning opportunity (Carson, 2012b). This is educationally unsound, in that it excludes those learners from gaining experience in a supported environment of learning to learn independently, even though this is a mode of learning they will have to engage with, volitionally and non-volitionally throughout their lives.

The second reason, also pragmatic, pertains to the 'researchability' of elusive or less accessible areas of learning, such as independent learning. Zimmerman & Moylan, 2009, highlighting this issue, state that: "*One of the most challenging issues that confronts educational researchers is explaining how students learn in self-regulated contexts, such as when studying or practicing on their own*" (Zimmerman & Moylan, 2009, p. 299). By examining 'non-volitional' learning, it is possible for the researcher to create some degree of structure to allow for the accurate collection of valid data in independent learning, through, for example, setting specific learning tasks, or choosing a specific 'site' for learning, without creating a 'false' or laboratory-type clinical examination. Information gained in such a context, can then be used and built on by future researchers to research the even looser, less controllable learning scenarios of intrinsically motivated and self-chosen learning.

In light of the discussion above, the term independent learning has been chosen to describe the mode of learning undertaken within this study and it has been defined for the purpose of this study as "*the act of learning without (or with decreasing amounts of) external direction, guidance and evaluation, in volitional and non-volitional contexts*". This definition can accommodate the types of learning under investigation (learning where the control rests largely in the hand of the learner, whether 'required learning' or 'volitionally chosen learning' and the grey areas, or interdependent areas, in between). Finally, the reason for using and re-defining the term independent learning as the mode of learning in this study, as opposed to employing the possibly more widely used term of self-regulated learning, is that within both the research field of metacognition and self-regulated learning, there is much dispute over which concept is subordinate or super-ordinate to the other (Alexander, 2008; Dinsmore et al., 2008; Winne, 1996). By using the terminology independent learning defined in this way, this debate is nullified as it will be clear from the discussion of metacognition, and of its relationship to independent learning, that metacognition is a type of processing that occurs during this act of learning (though not only in this type of learning) and that independent learning refers to the mode of learning.

2.5 Metacognition in Education

2.5.1 Why examine metacognition?

In the dynamic knowledge-based society of today, we require the ability to engage with and transform increasingly more information across single and multi-disciplinary contexts. As technology advances, and access to information increases further, the process of accessing, choosing and distilling this information will become the learning task. As such, what we as lifelong learners increasingly need is "*not the textbook factoids, but rather, the learning to learn skills and the skills in accessing a knowledge base that form the heart of metacognition*" (Sternberg, 2009, p. viii). Although not referred to by the term metacognition, this idea of the importance of meta-level thinking or 'know-how', rather than the 'know-what', has already permeated many of the major learning theories – Vygotsky's activity theory (Bedny & Meister, 1997), Siemens connectivism theory (Siemens, 2005) and Bandura's social learning theory (Bandura, 1977).

The process of metacognating can be an emacipatory experience for learners. Hacker et al (1998) wrote " *the promise of metacognitive theory is that it focuses precisely on those characteristics of thinking than can* *contribute to students' awareness and understanding of being self-regulatory organisms, that is, of being agents of their own thinking*" (Hacker et al., 1998, p. 7). However, in his 2005 review of the state-of-the-art on self-regulated learning, Winne , while noting that self-regulated learning was 'ubiquitous' in the sense that all learners are agents who construct knowledge, concluded that not all learners self-regulate or meta-cognate to the same degree -"*That is, although they self-regulate learning, they do so at times and/or in ways that are less than optimal*" (Winne, 2005, p. 560). If institutions and educators require students to undertake independent learning in increasingly less-directed environments, whether because of economic conditions facing the education sector, or so that they develop into autonomous learners ready for life-long learning, then they must be provided with the tools do to this optimally. Improving and fostering metacognition in learning may be one way of doing this, and this task can only become easier if we have a clearer understanding of metacognitive processing in this type of learning.

There is an ever-increasing amount of research being undertaken on metacognition in education. The main thrusts of educational research into metacognition have been driven by the possible beneficial learning outcomes resulting from effective metacognition - "*Metacognition is especially important because it affects acquisition, comprehension, retention and application of what is learned, in addition to affecting learning efficiency, critical thinking, and problem solving. Metacognitive awareness enables* *control or self-regulation over thinking and learning processes and products*" (Hartman, 2002a, xi).

Many researchers have shown the positive results of metacognition, such as Swanson's discovery that higher metacognitive functioning can trump higher aptitude, thus learners with low aptitude for a subject could outperform those with higher aptitude, if they functioned better metacognitively, (Swanson, 1990; Veenman & Beishuizen, 2004). Furthermore, effective metacognitive functioning has been shown to clearly improve learning outcomes (Adey & Shayer, 1994; Gunstone, 1991; Nuckles, Hubner, & Renkl, 2008). This is the case for both general learning (Jackson, 1998; Ku & Ho, 2010; Muis & Franco, 2010; Paris & Winograd, 1990; Rezvan, Ahmadi, & Abedi, 2006; Schraw, 2002; Sternberg, 2002; Veenman, 2004; Veenman, P & Beishuizen, 2004; Vos & de Graaff, 2004; Weinert, 1987) and more specific areas, such as reading (Carrell, Gadjusek, & Wise, 2002; Cross & Paris, 1998; Kinnunen & Vauras, 2010; Pressley & Afflerbach, 1995; Wagoner, 1983), mathematics (Goos, Galbraith, & Renshaw, 2002; Hurme, Palonen, & Jarvela, 2006; Martini & Shore, 2008) science (Georghiades, 2001; Hartman, 2002b; Yuruk, 2007), and language learning (Cotterall & Murray, 2009; Ellis & Zimmerman, 2002; Lam, 2008; Wenden, 1999) as well as for those with academic learning difficulties (Meshkatie, Allahvirdiyani, Kahnamouei, & Lohrasbi, 2011).

The positive impacts of metacognition have also been shown in work based learning situations, such as nursing (Kuiper, 2005; Kuiper & Pesut, 2004) and the use of technology (Azevedo & Witherspoon, 2009; L. Mason, Boldrin, & Ariasi, 2010; Sonnetag, Niessen, & Volmer, 2006; Veenman, 2007). Other researchers have shown that it is possible to improve metacognitive through training (Adey & Shayer, 1994; Baird, 1986; Brown, 1987; Brown & Palinscar, 1989; Brown & Pressley, 1994; Cross & Paris, 1998; Gunstone, 1991; Hartman, 2002c; Nuckles et al., 2008). What is very clear from this body of research is the power of metacognition for improved learning. Also, if, as some researchers believe and some research shows, that metacognition is not domain specific but domain general (Schraw, 2002; Schunn, McGregor, & Saner, 2005; Veenman, Elshout, & Meijer, 1997), these abilities will transfer across academic disciplines, and beyond solely academic endeavours.

2.5.2 Metacognition Research in Education

Applied metacognition research in education is now a huge and diverse field. In this section, the elements of this field that pertain to the concepts in this study are discussed, and are grouped into the following areas -

- Metacognition as a basic or general skill (Metacognitive training)
- Component / Element Analysis
- The Metacognition of Educators
- Metacognition and Consciousness

- Metacognition and Independent learning
- Cultural Contexts, Metacognition and Independent Learning

These different areas of research will be discussed here, with particular focus on how these areas of relevance to understanding metacognition in independent learning.

2.5.2.1 Metacognition as a basic or general skill

Metacognition can be taught as a set of basic or general skills, through which learners develop an awareness of how to optimize metacognition and related processes. Basic skills instruction is a field where the importance of metacognition is widely recognized and promoted. In this field, there is consensus that targeting only content or discrete skills is inadequate for deeper learning and for life-long learning (Hartman & Sternberg, 1993; Sternberg, 1986; Wagner & Sternberg, 1984), because it "*ignores many components now recognized as essential to deeper learning that enables students to link school instruction with real-world behaviors and to retain and transfer knowledge*" (Gourgey, 2002, p. 17). The fact that researchers have shown that students can be trained in metacognition makes it possible to design instruction with this goal in mind.

However, despite the fact that students can be taught to perform better metacognitively, this is not always an easy process, and something that Gourgey (2002) notes involves both resistance and discomfort on the part of the learners, who may not understand how to take on this new more active role in their learning, requiring "*patience and persistence on the part of both the instructor and the students*" (p. 31). This point is very relevant to metacognition in independent learning. If it is difficult for learners to improve metacognitive performance in guided, directed programmes such as basic skills instruction, then in independent learning contexts where learners have to perform the traditional metacognitive role of the student, in addition to the metacognitive role traditionally performed by the teacher, they will not only likely face increased difficulty, discomfort and resistance, but will have increased opportunities for failure. As more metacognitive activity is required in independent learning, it creates more opportunities for inaccurate use of knowledge, inaccurate monitoring based on a lack of knowledge or inaccurate knowledge, and for inappropriate control decisions.

A second issue here is that most training programmes are based on an understanding of metacognitive functioning as in occurs in controlled, usually less complex, somewhat directed learning, which may not provide the full picture of metacognition, or a picture that is applicable to more complex learning. An example of this was given earlier from the work of Flavell et al (1970), where students were given a list of words and asked to let the teacher know when they have studied them enough and then recall them. It is likely that the time spent and the number of instances of metacognitive activity in this learning task would differ greatly from a task where students were asked to prepare a presentation on an unfamiliar topic in a second language, for example. If much of our understanding of metacognition is based on these more simple tasks, and metacognitive training programmes are based on this understanding, then they may be based on the assumption that metacognitive activity is less prevalent than it is, particularly for more complex learning, involving more elemental parts. If we then train learners to 'perform metacognitively' at certain intervals (e.g. to use their metacognitive knowledge at the pre-task planning stage), we are not preparing them for or encouraging better use of metacognition throughout the task. Akyol and Garisson (2011) when examining the 'metacognition construct' in an online discussion, only looked for knowledge of cognition (or metacognitive knowledge) in pre-task reflection. Examination of independent learning in this thesis shows the continued occurrence of metacognitive knowledge throughout a learning task, which of course, includes the pre-task time phase, but extends far beyond it. Looking at even a short definition of metacognition – 'what learners know about learning' (Flavell, 1979; Wenden, 1999), it would seem likely that the use of this knowledge would be both prevalent and useful throughout any learning process. So while research and practice relating to metacognition in basic skills instruction is pushing the field forward, it may not be geared towards preparing learners for optimal metacognitive performance in independent learning scenarios, and it is at times, based on metacognition research coming from controlled experiment research, which does not always provide a realistic picture of metacognition.

2.5.2.2 Component / Element Analysis

As the research on metacognition has advanced, most studies have moved away from looking at metacognition generally, to focusing on furthering our understanding of one of the main categories (i.e. metacognitive knowledge) or indeed, one of the elements or sub-elements of that category (i.e. cognitive knowledge or declarative knowledge). Metacognitive Knowledge is widely researched as a singular entity, separated from other categories of metacognitive processing and other forms of processing (Colombo, 2010; Cotterall, 2009; Swanson, 1990; Wenden, 1999; Wilson & Bai, 2010; Zohar, 2006). Metacognitive strategy knowledge (an element of the category of metacognitive knowledge) is also widely studied in isolation from other elements of metacognition, and indeed other forms of learning processing (Aleven, 2002; Braten & Stromso; Ku & Ho, 2010; Lam 2008; Wong, 2011). Looking at another category, metacognitive monitoring, we can also find a substantial body of research focused specifically on its different elements. 'Feeling-of-Knowing' judgments, a widely recognized element of monitoring, which interestingly was not seen in the data in this study of metacognition in learning, is a popular research focus (Bernbenutty, 2009; Hertzog & Touron, 2011; Koriat, 2000; MacLavery & Hertzog, 2009; Souchay & Isingrini, 2012; Yan, Yanjie, Guoqing & Chan, 2007). However, understanding of the fuller concept of metacognition remains in flux, and research on the full concept of metacognition and its wider interactions and interplays is negligible. While this qualitative research study aimed to provide a better understanding of metacognition within real-world learning contexts, it recognizes the value of more experimental, quantitative research to-date on metacognition within clinical settings. It calls for a complementary approach to research on metacognition, where the knowledge from both streams of study could feed into each other (i.e. where micro-research on an sub-element of metacognitive monitoring, after controlled experimentation, could then be explored in real learning contexts). How a sub-element of metacognition appears to occur in a controlled environment may or may not align with how it occurs when the controls are removed and it begins to interact with environmental, affective and individual factors. These interactions can only tell us more about the sub-element itself. As discussed in an earlier section of this chapter, metacognitive processing seen in this study, regularly interacts with cognitive, affective, physical and off-task processing, creating a very complex interplay between all forms of processing, that may in fact tell us more about the processing than looking at elements in isolation in a clinical setting.

2.5.2.3 The Metacognition of Educators

Teaching metacognitively includes both teaching *with* and *for* metacognition (Hartman, 2002c). As teaching *for* metacognition is not the focus of this thesis (and has been discussed earlier in basic skills instruction), the focus here is on teaching *with* metacognition. This is very important in understanding metacognition in independent learning, as understanding the metacognitive role played by a teacher, gives us a picture of the extra metacognitive functioning a learner will need to undertake in a teachers absence.

> *Teaching with metacognition means teachers think about their own thinking regarding their teaching. It includes reflecting on: instructional goals, students' characteristics and needs, content level and sequence, teaching strategies, materials, and other issues related to curriculum, instruction and assessment. Such thinking occurs before, during and after lessons in order to maximize instructional effectiveness. (Hartman, 2002c, p. 149)*.

Teaching *with* metacognition is no easy task, as evidenced by the increasing amount of literature on the topic (Aydin, 2011; Bartimote-Aufflick, Brew, & Ainley, 2010; Berne, 2004; Billet, 2008; Burkert, 2008; Hartman, 2002c; Hurme, Merenluoto, & Jarvela, 2009; Liotta Kolencik & Hillwig, 2011; Niemi, 2002; Zohar, 2006). The fact that there is such a growing body of research of teacher metacognition shows how central it is to the pedagogic experience. If we look at the Hartman (2002c) quote above and replace the words 'teaching', 'teachers' and 'instruction' with the words 'learning' and ‘learners’, we see the complex metacognitive tasks facing learners in independent contexts where a teacher is not present.

Wilson and Bai (2010), looking at the impact of teachers’ metacognitive knowledge and pedagogical understandings of metacognition, found that the teachers’ understanding of metacognition included the concept of “*a metacognitive person as someone who monitors his/her understanding and uses strategies to regulate understanding*” (p. 285). The existence of, or belief in the existence of a metacognitive person, means that there is also a ‘non-metacognitive person’. This is in line with the desire of many educational training programmes, to help students “become metacognitive” (Wilson and Bai, 2010, p.285). As will be discussed later, the findings of this study contradict this in terms of independent learning, where the participants were all found to be ‘metacognitive’, and as such, did not need to ‘become metacognitive’. Rather, what the findings in this study show is that teachers need to understand how to improve and foster learner metacognition.

2.5.2.4 Metacognition and Consciousness

Sitting at the centre of much of the research and perceived wisdom about metacognition is Nelson & Narens model of the meta level and the object level (1994), and how they inform each other. However, recent research has put forward ideas of conscious and unconscious metacognitive processing

(Dulaney, Carlson, & Dewey, 1984; Anastacia Efklides, 2008; Efklides & Misailidi, 2010; Hsaoi & Reber, 1998; Koriat, 2000; Scott & Dienes, 2010). If some metacognitive processing is indeed unconscious, this then challenges the Nelson & Narens model, in that such activity is occurring without a conscious information flow between the two levels.

As will be discussed later, the findings in this thesis, although not definitive about this point, do indicate that some metacognitive processing may be occurring unconsciously. There are many instances in this study of learning decisions being taken and actioned without apparent monitoring (which would inform such a decision), yet "*theory would predict that all control behaviors must be preceded by internal monitoring*" (Whitebread et al., 2010, p. 237). However, it is beyond the scope of this study to say if in fact non-conscious metacognitive processing occurred, or if, in these instances, no monitoring processing occurred. However, studies using different methodologies would be better positioned to follow this line of research, for example the work of Scott & Dienes (2010) on mapping the transition from unconscious to conscious processing, or the observational methodologies of Whitebread et al (2009) and Kinnuen and Vaurus (2010), which include wider observations, such as the tracking of eye movements.

2.5.2.5 Socially Mediated Metacognition / Socially Shared Metacognition

This is a relatively new sphere of research in metacognition, but one that is gaining traction as metacognition research has expanded, and is a sub-field deserving of attention in education as learning experiences very often occur in collaborative environments where behaviour and the learning experience are co-regulated by the participants (Efklides, 2008; Larkin, 2009). What this growing body of research shows is that metacognition in group learning contexts is a "social practice" (Goos et al., 2002, p. 193), where metacognitive activity is co-constructed by the participants. Unlike early concepts of metacognition which focused on the individual (Brown, 1985; Flavell, 1976), more recently, some researchers have started to focus on what has been termed socially shared metacognition (Iiskala et al, 2004), socially mediated metacognition (Goos et al, 2002) and even collective metacognition (Hogan, 2001). Interestingly, just as research on metacognition and cognition tend to occur separately (Tarricone, 2011), the same can be said of this new area of research and its parallel, social cognition. For example, a recent textbook on social cognition (Augoustinos, Walker & Donaghue, 2009) makes only fleeting reference to metacognition, and does not discuss it as socially mediated or shared metacognition. This is again another example of the need for exploratory research such as this study that examine such concepts together.

According to Hurme et al (2009), "*Socially shared metacognition emerges when a group member regulated a group's problem-solving process and the other group members react to the initiative*" (Hurme et al., 2009, p. 503). What is important to clarify about the above definition is that the 'reaction' of other group members is part of the metacognitive activity, not separate from it. As is shown in the data in this study, while a single member will initiate the metacognitive processing, the other members will react to this initial impetus with further metacognitive processing. This may take an obvious vocalized form, for example when a group member responds to another members' initial introduction of metacognitive knowledge (i.e. the benefit of using a different strategy to improve the progress of the group learning endeavour), with monitoring processing about how successful the current manner of learning is (i.e. that the learning seems to be progressing smoothly and quickly with the current strategy). Less obvious however, are instances of tacit agreement, where less vocal, active or dominant group members by agreement follow the learning control suggestions of others participating in the metacognition control conversation – without their agreement and subsequent activity, the control decision and subsequent learning direction could not have occurred.

In their study of socially shared metacognition in mathematics learning, Iiskala, Vaurus, Lehtinen & Salonen (2011) found that there were "*significantly more and longer episodes of socially shared metacognition in difficult as compared to moderately difficult and easy problems*" (p. 379). The findings in this study support this, and show a parallel between 'difficult' learning and independent learning. In the independent learning examined in this study (both social or collaborative learning and individual learning), there is a higher level of metacognitive activity than that indicated by the research that looks at more discrete and less complex learning (Flavell et al., 1970). Another recent finding from this area of research, that is relevant to independent learning is that in group learning scenarios where metacognition is socially mediated or shared, individuals "*feelings of difficulty decrease*" (Hurme et al., 2009, p. 503). For educators seeking to develop independent learning capabilities in their students, moving students firstly to group independent learning before individual independent learning might allow for a more smooth transition between directed and independent learning formats. However, as a relatively new area of research, there are findings that would seem to contradict each other. Unlike Hurme et al's (2009) study, Goos et al (2002) show that the social context of a small group can actually hinder effective metacognition.

An interesting direction that this research is taking is within the field of social psychology where 'social metacogintion', although conceptualized in different ways, does refer to *'secondary thoughts that are shared with or communicable to other people'* (Brinol & de Marree, 2011, p. 5). One area of social metacognition that was beyond the scope of this thesis was unvocalised metacognitive processing in group learning situations. This area is beginning to be examined by researchers (Thompson & Cohen, 2011; Vorauer 2011) who are looking at the interpersonal nature of metacognition in terms of what metacognitive processing people choose to share or conceal, and how these decisions are made.

The process of socially mediated metacognition, as seen in this study, is presented in more detail in the findings and discussion chapters.

2.5.3 Metacognition and Independent Learning

Perhaps the most important point to note about metacognition research, and one of the drivers of this study, is that there is a glaring absence of literature on when and how often metacognition occurs during learning, and indeed, during different types of learning. There are many unanswered question in relation to metacognition in learning. For example: How often do students metacognitively monitor when learning by themselves? Is that enough? Is there any optimal amount? When are metacognitive control decisions made? How many decisions need to be made? Are some more important than others? How much time is naturally spent at the meta-level and how much at the cognitive level, and how does this differ from an optimal dispersal of time?

These are the questions that lay unanswered in the literature review, and are of great importance to understanding metacognition in independent learning, where none of these functions are decided upon or regulated by an expert, or teacher. It would also seem difficult to guide or train students to perform well metacognitively through the creation of metacognitive programmes without this information.

As was discussed earlier, much of the growth in research about metacognition was the result of the crossover between the fields of educational research and cognitive science research. This was the result of not only the growing understanding of the importance of the topic of metacognition, but also from the realization that much of the laboratory designed research and experiments from cognitive science could and did have applicability in applied scenarios such as education. However, by their nature, such experimentation relies on the ability to reduce the amount of variables in the research environment in order to establish causality and validity of quantitative findings. Transplanting such research into non-laboratory educational contexts poses difficulties because of the amount of variables at play and the need to control for these variables. As such, research in metacognition in education has been mostly quantitative and also occurred in learning scenarios that can to some degree be controlled (Flavell et al., 1970; Scott & Dienes, 2010). This is the central difficulty (and perhaps the reasons why there is less research in the area) in researching metacognition in independent learning, which tends to be more complex and takes place over a longer duration. Forster (1972) states that independent learning "*requires freedom of process to carry out the objectives*" (p.ii). There is therefore an obvious tension in researching metacognition in controlled environments (clinical settings) that restrict freedom in the process of metacognition for independent learners.

2.5.3.1 Cultural Contexts, Metacognition and Independent Learning

Another relevant issue is the cultural context of both learners and where learning occurs. While this has relevance for all forms of learning, it may be of greater significance when it comes to concepts such as metacognition and independent learning, concepts that relate to the control of learning. The participants in this study were Japanese learners. Asian students, unlike their Western counterparts, do not relish independence or the freedom of choice in education (Iyengar & Lepper, 1999). They also do not seem to construct thought, or make inferences in the same way (Davies, 2007), seeing things more in terms of relationships rather than inferential logic. What this may mean is that the delivery of educational programmes designed to improve metacognitive and independent learning behaviours or thought processes may need to be redesigned for the new context. However, a recent study undertaken with Japanese learners who had been engaged in and guided through independent learning (Carson, 2012a), showed that over 95% of participants viewed independent learning ability to be both an advantageous and necessary life skill for them. Yet many did struggle with taking control of their learning and did have negative affective responses to the experience initially (they also reported having no experience of taking control for any aspect of their learning pre-tertiary level, or of having any discussion of how to learn). While the research in this study was with a small specific population, and intended to be exploratory rather than comprehensive, this cultural sensitivity to the concepts under examination does need to be taken into account when generalizing the findings to follow in any way. In other words, the metacognitive processing and independent learning capacities of the learners in this study may not be representative of, for example, Western tertiary students of the same age.

2.6 Critical Observations on Literature Review: Metacognition & Independent Learning

The data in this thesis was collected and analysed using a Constructivist Grounded Theory methodology. The use of this methodology meant that the research was data driven; information emergent from the data analysis informed the discussion and understanding of metacognition in independent learning. That meant that the definitions of metacognition and its sub-elements, the frameworks of metacognition and its intra and inter-relationships emergent from the literature review at this point were not imposed on the data, nor was there any attempt to hypothesis-test or prove these positions. Rather, the findings have emerged from analysing the data to the point of theoretical saturation. This has resulted in the creation of some new definitions and new understandings of relationships occuring within metacognition, as definitions could only be applied to what was visible in the data. However, the analysis of data also confirmed some elements of exisiting models of metacognitive functioning. So while the previous discussion outlines what metacognition is most widely understood to be, and how it is understood to function, the data collection and analysis started from the position of only categorizing metacognition in a manner that is upheld by the information in the data. While some of the differences between what has been uncovered and what we understand as metacognition from the exisiting literature are touched upon in this chapter, they are discussed comprehensively in the Findings, Discussion and Conclusions chapters of this thesis.

The findings in this thesis support the three component framework of metacognition (Dunlosky & Metcalfe, 2009; Pintrich et al., 2000) that includes and separates metacognitive knowledge, metacognitive monitoring and metacognitive control, and does not support the two component framework of knowledge of cognition and regulation of cognition as espoused by some researchers (Brown, 1987; Schraw, 2002). The central reason for this is that when learning is examined, we see a lot of 'unanswered' monitoring – instances where learners often monitor their learning or themselves but do not engage in any regulatory action, even when it would be beneficial to do so. This cannot be considered as knowledge of cognition nor regulation, but rather only the separate component of monitoring. Also, if monitoring widely occurs in this manner, it may be indicative of ineffective learning. As such it an area deserving of more or different research (most of the research suggests that monitoring and control occur together), because of the potential for improving learning if we can understand why monitoring so often goes 'unanswered' by control. This is an under-researched area of metacognitive processing.

While the findings of this research do support existing frameworks of metacognition as outlined in previous paragraph, they do not support the existance of all of the elements included within the frameworks, when looking at metacognition in a learning context. This is not to say that they do not exist or do not occur during independent learning, but rather that they were not seen in the data examined in this study, or not seen as a significant element of the learning experience. For example, two areas of metacognition currently receiving a lot of research attention are the sub-elements 'feeling-of-knowing` (Bernbenutty, 2009; MacLaverty & Hertzog, 2009; Souchay & Isingrini, 2012), an element of metacognitive monitoring, and declarative, conditional and procedural knowledge (which are in fact, sub-elements of the sub-element cognitive knowledge, which is part of metacognitive knowledge). In this study of metacognition in learning, across 31 hours of learning, there was not a single coded instance of *feeling-of-knowing.* Also in this study, the division of cognitive knowledge into the sub-elements of *declarative, procedural and conditional knowing* was not useful, as these sub-elements did not occur in any divisable manner with any consistent significance – rather they occurred as a singular thought unit, compromising two or all three elements.

Most of the issues with the literature on metacognition that have come out of this study are the result of the fact that there is a disconnect between how metacognition is presented by a large swathe of the available literature and how it occurs in 'real learning' contents. Although there is some excellent research detailing metacognition in learning, what we see more of when we look at the literature is decontextualised or laboratory-like learning experiments, seeking to examine in detail an element a small sub-element or sub-relationship within metacognition. While this is, without doubt, of value, it may be resting on certain assumptions about the occurence of metacognition in wider learning. This research trend of component based research is built on the assumptions that existing component-based models of metacognition are valid. However, as current research is still making the point that metacognition itself is still proving elusive to definition and understanding (Efklides & Misailidi, 2010; Tarricone, 2011), it would seem wise to, at least, have a substantial body of research running parallel to this that looks at metacognitive activity as a whole. This can be problematic when research-based literature moves into the field of teaching and practice. Most of the practice based literature on metacognitive training in education discusses it in terms of the teaching of strategies (Hartman, 2002a; Liotta Kolencik & Hillwig, 2011; Wenden, 1998, 1999), almost to the exclusion of monitoring and control. While there is no doubt that the use of metacognitive strategies is a necessary part of learning, the data in this study shows shows metacognitive knowledge (which subsumes metacognitive strategies) to have the least occurence of the three components of metacognition. This clearly indicates that the interpretation of the research on metacognition has led to an incorrect weighting of aspects of metacognition that occur during learning. If it were the case that students naturally monitored and controlled their learning effectively, or that metacognitive strategies were the single most impactful element of metacognitve activity, this situation could hold some merit, but the data in this study, does not support either of these arguments. So while much of the existing frameworks do provide a largely accurate picture of metacognition, their decontextualised presentations can lead to misinterpretation as understanding moves from theory to practice.

In a similar manner, research on the processes that metacognition engages and interacts with is under-represented in the literature. This study, looking at processing occurring during independent learning, shows regular interplay between metacognitive processing and cognitive, affective, physical and off-task processing. It also shows that these interactions impact on the learning experience. Yet while it is possible for researchers and educational practioners to find abundant literature on specific sub-elements of metacognition, the same cannot be said for information about how metacognition occurs and interacts in general learning contexts. As discussed in the previous paragraph, this may lead both researchers and practioners to the development of teaching and learning enviroments and tools, which they hope will improve learner metacognition, but which have been built or created without a solid foundational understanding about how metacognition occurs in real or authentic learning contexts

The understanding of metacognition that has emerged from this literature review is that it is a form of meta-level processing that is concerned with how learning is at a given point in time and how learning should proceed, and that the effective use and implementation of this processing is central to successful independent learning. In the traditional learning setting, the teacher decides how learning will occur during the classroom, and makes decisions such as when to move on, how much emphasis to give to different topics, when to change approach etc., and thus, may decrease opportunities for learners to meta-cognate, specifically in terms of their own metacognitive monitoring and control of learning. In theory, within independent learning, learners have more opportunities to meta-cognate. By removing the teacher from the learning situation, a learning structure or scaffold has been withdrawn which necessarily means an increase in the amount of regulation, or learning decisions to be made by the learner.

The discussion in this chapter of the research on teachers' metacognition, is further evidence of the 'metacognitive role' that teachers play in classroom and lecture learning environments. If pre-tertiary students are learning in a manner where much of the metacognitive activity is out of their hands because of the presence of a teacher who performs that function by directing and monitoring and adjusting that activity, and assuming that this metacognitive functioning performed by the teacher is necessary for the successful undertaking of learning, it would seem to follow that the removal of the teacher from the learning situation will significantly increase the amount of learner metacognition needed. The findings that follow support this position in that they show all learners to engage in significant metacognitive processing as they proceed with independent learning.

2.7 Understandings of Metacognition in Cognitive Science and Neuroscience

Much of the research cited in this literature review and throughout the broader thesis comes from the fields of cognitive science and neuroscience.

As both of these fields are where many of our advanced understandings of brain functioning come from, it is important to situate this work on metacognition with recent and parallel works in these fields. A discussion of this follows now, with particular reference to the work coming out of the fields of embodied cognition and neuro-imaging. While these research fields hold a lot of potential for furthering our understandings of all forms of processing and processing interactions during learning, we again encounter the issue of differing terminological definitions (i.e. in how metacognition is defined) which feeds into how topics are researched, and how findings can be used and interpreted.

Embodied cognition is a new field that has seen rapid growth in the last 10 years. Unlike previously held traditional views of cognition, it posits that cognitive activity is "grounded in bodily states and action" (Atkinson, 2010, p. 599), rather than historic understanding of cognition as the result of processes that occur solely in the brain (Hotton & Yoshimi, 2010, p. 943). This understanding of the connection between the physical motor system and cognition appears to have cross-over potential with the work in this study that elucidates all the forms of processing, including processing related to our physical selves, that occur in learning, alongside and interacting with cognition. Not only this, but we can also see parallels in other ways – both this thesis and the field of embodied cognition are very clear on the importance of the cultural context in examining and situating cognition (Leung, Qui, Ong & Tam, 2011), and in understanding both the individual and social differences in cognition (Keener, Fisher & Martin, 2012).

Despite this exciting crossover potential, there are however, two reasons why this research thesis is not more situated in the field of embodied cognition. Firstly, what lies at the 'centre' of research requires elucidation and indicates positioning. At the centre of embodied cognition research endeavours sits cognition, and around it may move other elements, such as the physical motor system, which interact with it. As such, the concept of 'cognition' itself is largely held constant, and considered as the core. However, at the heart of this research study is the learning experience, or more specifically, the independent learning experience. It is around learning as the core that processing has been examined and positioned in this thesis. As will be seen in the chapters that follow, and in the models of processing that have been developed as a result of the data analysis, cognitive processing is one of the five processing categorized discovered to occur during independent learning, and is no sense automatically privileged with the models of processing over the other forms of processing that are occurring.

Secondly, central to this study is the need to understand the concept of metacognition, and metacognitive processing in learning. As has been discussed in this chapter, one of the barriers to clarified understanding of this concept (and clear research examining the concept) is the different manners in which metacognition is defined, and in turn, examined in research contexts.

When we search the embodied cognition literature for research and discussion of the concept of metacognition, we see research based on definitions of it as a form of 'reflection'. An example of this can be seen from Suwa's (2008) embodied cognition work - "meta-cognition is, by its definition, cognition of cognition; i.e. an act of reflecting on one's own thoughts, perception and movements" (p.142). As this chapter has already shown, while reflection is a central element of metacognition, it is only an element of metacognition, not the concept itself. While the field of metacognition and this study show, for example, control decisions and actions to be a central element of metacognition (as central as reflection), within embodied cognition literature, such action based or actioned processing is considered not as metacognition, but as, for example, 'executive function' (Koziol, Budding Chidekel, 2012). We can see this elsewhere in neuroscience, in the exploration of the 'division' between metacognition and 'executive control' (Shimamura, 2000). What we have is a resulting situation where in certain fields what are considered separate concepts and researched separately, may be being approached as singular concepts in research elsewhere. While this may have advantages in leading to different research approaches, it does make research comparison and interdisciplinary work difficult, and understandings of abstract concepts unclear.

The same issue is present in the field of neuroscience. Nuero-imaging encompasses a variety of techniques for examining structure and function within the brain. It is the area of functional imaging that is used in cognitive science and psychology research than can provide us with information about metacognition and other forms of processing during learning. It is making great advances in showing us where various types of functioning occur in the brain, and what other types of functioning occur in the same regions. This can help us to develop deeper understandings of the links and similarities between different types of functioning, for example, memory and metacognition. Neuroscience tells us that both of these functions occur in the same area of the brain, the prefrontal cortex, and as such, may have commonalities. The issue of the defining and limiting or delimiting our understanding of metacognition, becomes very important here as researchers now are beginning to look for neural correlates of specific elements or sub-elements of metacognition, while still defining and examining metacognition as only a reflective concept (Shimamura, 2000; Suwa, 2008), which excludes from the research large elements of metacognition. Examples of this would be the recent work that is attempting to isolate the neural activity related to judgments of task performance (Fleming & Dolan, 2012), or in the role of metacognition in perceptual decision-making (Huijgen, Fleming & Dolan, 2012). While this research will propel and improve our understandings of metacognitive processing, it needs to be situated within a clear understanding of what metacognition is, and this can only be achieved by firstly understanding and researching it in its entirety, in action, and in interaction, not only in isolation.

2.8 Summary

While there is much that has been discovered about metacognition, there is still much that remains elusive. In their recent book, Trends and Prospects in Metacognition Research, Efklides and Misailidi (2010) commented that the "*conceptualization of metacognition and understanding of the mechanism(s) underlying it constitute the top priority of theory and basic research the development of metacognition and the trainability of metacognitive skills are two of the main research areas in developmental and educational psychology.* "(p. 1)

It is with these points above that this study concerns itself – the conceptualization and understanding of metacognition, and metacognition in regard to a specific mode of self-regulation, that of independent learning. While much research in the area is pushing forward into more specific elemental aspects of metacognition, such as understanding different types of monitoring for a specific population, judgments of performance in children (Allwood, 2010) or monitoring of a specific skill area, such as reading comprehension (Kinnunen & Vauras, 2010), there is less of a research trend that provides a full picture of metacognitive activity, and less still that provides a full picture of metacognitive activity as students are engage in longer periods of independent study.

By arriving at a clearer understanding of metacognition as it occurs in real learning (in this case, independent learning) and not artificially controlled learning, it should be possible to uncover more optimal and accurate ways to foster it within learners. Although much of the research in the field is focused on specific constructs of metacognition, or metacognition in specific domains, given the issues with understanding the concept itself, an in-depth qualitative analysis of metacognition in learning can only add value to the research field, and improve its applications in education, psychology and beyond.

Chapter 3: Research Methodology

3.1 Introduction

> *Methodology refers to the choices we make about appropriate models, cases to study, methods of data gathering, forms of data analysis etc. in planning and executing a research study*. (Silverman, 2010, p110)

This thesis set out to examine metacognition, cognition and other forms of conscious thought processing within the real-world setting of a Self-Access Learning Centre (SALC) supporting independent learning at tertiary level in Japan. Stake (1995, p. 5) notes that '*the design of all research requires conceptual organisation'*. This chapter presents the conceptual underpinnings of this study, beginning with a discussion of the constructivist paradigm that underpinned the research, elaborating on the Grounded Theory methodological approach used to guide the research process and continuing with a justification for the choice of data collection tools and the data analysis process. In the latter sections of this chapter, there is discussion on the philosophical assumptions of the researcher, and how the 'emergent' research issues were resolved.

3.1.2 Paradigm

The purpose of this study was to map metacognitive and other forms of processing during independent learning so as to better understand the process of metacognition and its interplay with other forms of processing (such as cognitive processing), and to analyse the role of metacognition in independent learning. The two general questions to be explored in this study were:

a) How does metacognition occur during independent learning?
b) How does the occurrence of metacognition impact independent learning?

Creswell (2009) discusses research design in terms of "*worldviews, strategies and methods*" (p. 16). The worldview (or paradigm) that underpins this thesis is that of constructivism, A research paradigm can be defined as "*the basic belief system or world view that guides an investigation*" (Guba & Lincoln, 1995, p. 105). This investigation concerned itself with furthering understanding of metacognition, cognition and its interactions with other forms of conscious thought processing within the real-world setting of a Self-Access Learning Centre (SALC) supporting independent learning at tertiary level in Japan. A constructivist paradigm was chosen to guide this study, as research based on a constructivist paradigm is not seeking to uncover an absolute truth, but rather explores the multiple realities of subjects' experience. As Creswell and Clark pointed out (2007), such a "bottom-up approach" leads to the development of patterns and then theory generation. This study had no *a priori* hypotheses to prove or test, but was rather an exploration of metacognitive thinking processes, resultant patterns and/ or theories that accounted for the multiple learner experiences or expressions of metacognition.

Constructivism is the "*philosophical belief that people construct their own understanding of reality*" (Oxford, 1997, p. 36). It is a school of thought that believes that there is not an external knowable body of knowledge that can be simply transmitted, but that rather the knowledge individuals possess and gain is instead 'constructed' through our interactions and experiences. Constructivism can be traced back to the work of Giambattista Vico in the early 18th century (Warrick, 2008), when he published a treatise on the construction of knowledge in 1710. But it is in the 20th century that constructivism has really developed - "*constructivism has multiple roots in the pyschology and philosophy of this century*" (Perkins, 1991, p. 20). These 'multiple roots' have come from different perpectives, which although as theories are somewhat different, as a philosophy are unified. Driscoll (2005, p. 386) identifies the cognitive and developmental perspectives of Piaget, the interactional and cultural emphases of Bruner and Vygotsky, the contextual field of situation cognition, Kuhn's ideas on science, the philosophies of Dewey and Goodman, and the ecological pyschology of Gibson as drivers of and influences on the development of constructivism. Constructivist beliefs have been the driver behind student-centred and student directed forms of learning, which is the type of learning under scrutiny in this thesis (Jonassen, 1991, 1998; Jonassen & Easter, 2012; Land, Hannafin & Oliver, 2012; Merril, 1991; Sawyer, 2006).

Within any research paradigm, there are four central concepts – ontology, epistemology, methodology and axiology (Denzin & Lincoln, 2011). The ontology is an indicator of how the nature of *being* or the nature of *reality* is perceived – "*It involves asking what you see as the very nature and essence of things*" (Mason, 2002, p. 14). In a constructivist paradigm, the ontology is a relativist one; of a constructed reality, that our reality is made from our thoughts, rather than an external reality that is fixed and unchangeable. Epistemology can be considered as "*the theory of knowledge embedded in theoretical perspective and thereby, the methodology*" (Crotty, 2003, p. 3). in the context of the constructivist paradigm for this study, the epistemological belief is that "*meanings are constructed by human beings as they engage with the world they are interpreting*" (Crotty, 2003, p. 43). It is through the interactions between elements, ourselves and others that meaning can be made, felt and understood, and that subjective knowledge emerges. The methodology indicates how the research is conducted, and how the information is treated. A *Constructivist* Grounded Theory methodology was employed in this research, that sought to inductively allow meaning to be drawn throughout the research process through qualitative, dialectical participation. Finally, the axiology indicates what *goods* emerge or what is *valued* in the research. Within the construtivist paradigm underpinning this study, it was accepted that a range of *goods* would emerge from the Grounded Theory research process and thus, prioritisation of these goods would be required. The focus therefore from an axiological perspective, guided by a constructivist paradigm, was on the creation of progress through the appropriate prioritisation (rather than controlled and purposeful prioritisation) of these *goods*.

3.2 Research Approaches

Research approaches (the strategies and methods used) are influenced by worldviews, such as constructivism. Creswell (2009) gives us a clear breakdown of the philosophical underpinnings, appropriate strategies of enquiry and data collection methods of the three main research approaches, namely, Qualitative, Quantitative and Mixed Method, in the table that follows.

Table 4. Qualitative, Quantitative and Mixed Method Approaches (Creswell, 2009, p. 17)

Qualitative, Quantitative and Mixed Methods Approaches			
Tend to …	Qualitative	Quantitative	Mixed Methods
Use these philosophical assumptions	Constructivist / advocacy/participatory knowledge claims	Post-positivist knowledge claims	Pragmatic knowledge claims
Employ these strategies of enquiry	Phenomenology, grounded theory, ethnography, case study, and narrative	Surveys and experiments	Sequential, concurrent and transformative
Employ these methods	Open-ended questions, emerging approaches,	Closed-ended questions,	Both open- and closed-ended questions, both

	text or image data	predetermined approaches, numeric data	emerging and predetermined approaches, and both quantitative and qualitative data and analysis
Use these practices of research as the researcher	Positions him- or herself Collects participant meanings Focuses on a single concept or phenomenon Brings personal values into the study Studies the context or setting of participants Validates the accuracy of findings Makes interpretations of the data Creates an agenda for change or reform Collaborates with the participants	Tests or verifies theories or explanations Identifies variables to study Relates variables in questions or hypotheses Uses standards of validity and reliability Observes and measures information numerically Uses unbiased approaches Employs statistical procedures	Collects both quantitative and qualitative data Develops a rationale for mixing Integrates the data at different stages in the inquiry Presents visual pictures of the procedures in the study Employs the practices of both qualitative and quantitative research

This research study was guided by a qualitative research approach, underpinned by a constructivist philosophy or paradigm, and progressed using a Grounded Theory methodology. The approaches and methods were "*chosen based on the specific task at hand*" (Silverman, 2010, p. 9), which in this study was to understand and map metacognition in independent learning.

It is important to note here that there are three significant issues in undertaking research into metacognition. Firstly, interpretations, understanding and definitions of what constitutes metacognition and/ or independent learning vary significantly. This lack of clarity and/ or agreement on what constitutes metacognition and independent learning can result in very different interpretations of data. Secondly, it is difficult to gather data on a meta-physical entity such as *one's thinking*. The process of gathering meta-data in independent learning is reliant on participant/s abilities to express their thoughts in a coherent manner, while undertaking a learning task. Thirdly, the analysis of this data is very subjective, as "*Both identifying and 'measuring' metacognition currently rely heavily on researcher's subjective interpretation in assessing what is cognitive, and what is metacognitive*" (Georghiades, 2004, p. 378). In the case of analyzing data gathered during metacognitive activity, there are disparities between theory, measurement and practice in the field, and different ways of defining and framing metacognition. As discussed in the previous chapter, the overwhelming body of research into metacognition has been undertaken in a quantitative or empirical manner, and much of it necessarily so. Yet despite the advances in understandings made by such research, the majority of studies have been implemented at a component level (looking at an element or elements of metacognition) within clinical settings.

The in-depth examination of two 'fuzzy' phenomena, such as metacognition and independent learning, would seem to warrant a return to the explorative possibilities that qualitative research provides (Pressley, Van Etten, Yokoi, Freebern, & Van Meter, 1998; Schraw, 2000). Qualitative approaches allow for examination of less understood phenomena, for research that is exploratory and open-ended, and for areas where existing research is somewhat incomplete or inconclusive. Efklides and Misailidi (2010) support the move towards qualitative methodologies in their discussion of recent and future research into metacognition, commenting that "*these developments promise a bright future for metacognition research, owing particularly to the development of new methodologies [exploratory qualitative methodologies]which will allow a deeper insight into the nature of metacognitive phenomena*" (p. 1). A qualitative approach allows opportunities for a richer examination of metacognition-in-action in a real-world context i.e. independent learning within the Self-Access Learning Centre. A qualitative approach, conducted within a constructivist paradigm, and strengthened by constant reflexivity on the part of the researcher, has yielded appropriate insights into metacognition in this research context.

3.2.1 Issues with Quantitative and Mixed Method Approaches

It is important at this stage to explain why quantitative and mixed methods approaches were not used, and to provide a further justification as to why it was necessary to adopt a qualitative approach to the exploration of the phenomena of metacognition under investigation. All three research approaches have inherent values and inherent problems.

The first problem with both quantitative and mixed method approaches, in relation to this study, are the paradigms, or worldviews, upon which both rest, and which are not in line with the constructivist paradigm of this research project. Quantitative research sits squarely on the shoulders of positivism, which as Denzin and Lincoln (Denzin & Lincoln, 2011) illustrate, has a naïve realism ontology, an objectivist epistemology and uses quantitative methods to 'prove' hypotheses. In other words, quantitative methods are generally employed to find a singular true reality that is measureable in terms of numbers and words. Such an approach does not fit with an exploratory study, seeking to examine participants' different experiences of a concept or process, particularly when researching an issue that remains 'enigmatic and confusing' as is the case with metacognition.

Mixed methods research poses a similar problem. Most research into metacognition has been quantitative. The initial dilemma faced in the design of this study was whether a solely qualitative study would be equally valued when compared within an existing body of research on metacognition, that was quantitative in nature and relied heavily on empirical data for validity. Therefore, the employment of Mixed methods research, which would involve triangulating data gathered through exploratory qualitative methods with data gathered through quantitative methods, was considered at the outset of this study. However, the use of Mixed Methods research was rejected for three reasons. Firstly, although the recent trend towards Mixed Methods is both exciting and valid, this new field has not yet been seen to work effectively in exploratory research that is grounded in constructivism, as outlined by Burke-Johnson & Onwuegbuzsie (2004):

> *We do not believe that mixed methods research is currently in a position to provide perfect solutions. Mixed methods research should, instead (at this time), use a method and philosophy that attempt to fit together the insights provided by qualitative and quantitative research into a workable solution. Along these lines, we advocate consideration of the pragmatic method of the classical pragmatists (e.g., Charles Sanders Peirce, William James, and John Dewey) as a way for researchers to think about the traditional dualisms that have been debated by the purists*. (p. 16).

In their book on mixed method research, Creswell and Plano Clark (2007) similarly advocate a pragmatic paradigm for exploratory mixed method research design.

Secondly, not only is the research paradigm constructivist, but so too are the foundations of the educational context under examination, that of independent learning specifically, and student-centred (or even directed) learning environments generally. Such learning environments, as Land & Hannafin (2000) call them "grounded constructivist learning environments", "*support individuals or groups as they attempt to negotiate multiple rather* *than singular points of view, reconcile competing and conflicting perspectives and beliefs, and construct personally relevant meanings accordingly*" (p. 6). It is therefore appropriate and important to research independent learning environments from the same theoretical perspective, i.e. a grounded constructivist perspective. A Mixed methods approach does not support this as discussed above.

Thirdly, educational programmes and approaches designed to 'improve' metacognitive awareness or increase the levels of metacognitive engagement are often constructivist in nature, like the Project to Enhance Effective Learning, or PEEL (Gunstone, 1991). As Hartman (2002c) comments on her own research into teaching metacognitively, "*some readers...will notice that a constructivist perspective permeates my view of the role of the teacher and how best to construct and organize instructional material for use in a course*" (p. 149). In another chapter entitled 'Metacognition in Science Teaching and Learning' (Hartman, 2002b), she shows how a constructivist approach has been used since the introduction of the Learning Cycle (Karplus, 1974) to "*help students move from concrete experience and thinking to formal, abstract thinking about science*" (2002, p. 175), and through the use of concept maps (Novak, 1998). It would seem that constructivism is deeply embedded in metacognitive instruction and learning. Given the three reasons above and their relation to the research at hand, using a pragmatic paradigm does not make sense.

The final reason for not moving forward with Quantitative/ Mixed Methods research was that the data collected (while of a significant quantity – over 2000 pages and 10000 items of data) would not lend itself to or benefit from quantitative analysis, as the data was specific to individual participants, groups of learners and/ or specific learning tasks and thus was not generalizable across populations of learners or learning tasks. The analysis of the data was enriched though deep analysis and cross comparisons within the context of each learner or group of learners.

Despite the points above, it is important to note that Mixed Methods research could be underpinned by paradigms other than the pragmatic paradigm (Leech & Onwuegbuzie, 2009). Furthermore, the researcher has to acknowledge his use in this thesis of a methodology (Grounded Theory Methodology) with a paradigm (constructivism) that it has not been traditionally paired with. A Mixed Methods research approach may be considered useful - the mixed use of quantitative and qualitative measurements, and whether such data sets would converge or depart could provide useful insights into metacognition and other processing in learning. However, even taking this position into consideration, as outlined in the literature review, what is of most need and use to this field of research at the current junction is the exploration of the concepts that in-depth qualitative research can provide.

3.2.2 Furthering the case for a Qualitative Approach

Although much of the research undertaken in the area of metacognition has been quantitative, there is, I believe, a strong case for qualitative examination, for several reasons. First and foremost, as Schraw and Impala's (2000) detailed examination of issues in the assessment of metacognition concludes, there is "*a large discrepancy between metacognitive theory and measurement practice*" (p. 299). The theoretical frameworks of what metacognition is and how it occurs do not always align with the results from quantitative measurement of the phenomenon. While this does not mean that quantitative research on the topic is ill-founded or incorrect (there has been and continues to be much excellent quantitative research into metacognition), it does strengthen the case for a different approach that can re-examine the concept and occurrence of metacognition through a different lens. Pressley (2000) has advocated using qualitative analysis of metacognition – "*Qualitative analysis of complex cognitive and metacognitive processes makes a great deal of sense before even attempting quantitative analyses of these processes* (p. 261)". More recent research similarly expounds the possible benefits to qualitative exploration of metacognition (Nuckles et al., 2008).

Pressley et al (2000) have used grounded theory and verbal protocol analysis (where participants orally communicate thoughts) and other qualitative methodologies to examine skilled reading because of their (and others) belief that "*the most telling analyses of complex, conscious, self-regulated cognitive processes have been produced using verbal protocol procedures*" (p. 261). Using verbal protocol analysis and other qualitative methods allow for a deeper analysis of both the frameworks of metacognition and metacognition in action.

Secondly, if qualitative approaches can be harnessed to clarify our understanding of or provide new insights into metacognition, this could facilitate future improvements in quantitative research and measurement tools. Quantitative measurements of metacognition, such as the Learning and Study Skills Inventory or LASSI (Weinstein, Schulte, & Palmer, 1987), the Motivated Strategies for Learning Questionnaire or MSLQ (Pintrich & DeGroot, 1990), the Self-Regulated Learning Interview Schedule or SRLIS (Zimmerman & Martinez-Pons, 1986, 1988), the Index of Reading Awareness, or IRA (Jacobs & Paris, 1987), the Metacognitive Assessment Inventory, or MAI (Schraw & Dennison, 1994), have all been shown to have construct validity issues (Pintrich et al., 2000). Some measure different parts of metacognition, some are domain-specific even though many researchers argue one of the main positives of metacognition is it being not domain-specific (Hartman, 2002a; Schraw, 2002), and this has been shown to be the case in research projects such as the Adley and Shayers' 1994 Cognitive Acceleration through Science Education project, or CASE (Georghiades, 2004).

This is not to say that qualitative attempts to understand and measure metacognition are without problems. Pintrich et al (2000) examined the deployment of Verbal Protocol Analysis (VPA) and interview methodologies (Pressley & Afflerbach, 1995), which also showed issues with domain-specificity and separating the "*theoretical divisions of metacognition*" (2000, p. 70). So a qualitative approach has its own issues. However the use of such tools in a constructivist grounded theory model that prioritises the triangulation of this data (from different data sets), with constant comparison and reflexivity within the data analysis process, may negate some of these issues.

Finally, returning to the state of the art of the field of metacognition, some of Schraw's (2000) conclusions about measurement illustrating problems in the general field further bolster the case for qualitative research. After examining all the measurements of metacognition (mainly quantitative, with some qualitative), they reached six conclusions –

> 1. The need for a comprehensive, unified theory of metacognition
>
> 2. There is a large discrepancy between metacognitive theory and measurement practice.
>
> 3. There is considerable debate regarding the relative pros and cons of different assessment methodologies.
>
> 4. Most available instruments that measure metacognition have unknown psychometric properties.
>
> 5. There is uncertainty (and discomfort) regarding the domain-generality of metacognition.

6. Difficulty relating metacognitive theory to educational practice. " (Schraw, 2000, pp. 298-303).

Three of the above conclusions (numbers 1, 2, 6) provide a strong case for a qualitative research approach – a qualitative examination into how the theoretical frameworks of metacognition compare to the realities of learners' situations, given that the field is "*perceived by some outsiders as too theoretically disparate*" (Schraw, 2000), and the use of grounded theory to do this and relate it to educational practice. Attempting to unify theories and research into metacognition has been growing in recent years, trying to bring together research historically development from two "parallel roots" (Perfect & Schwartz, 2002), from both cognitive psychology and developmental psychology. Qualitative research, underpinned with a constructivist philosophy and a Grounded Theory methodology, fosters the openness to look in-depth at metacognition, allowing its complexity to unfold without abstracting it, or forcing a historical framework onto it. A qualitative analysis will allow a more detailed look at learner metacognition. While there will be a trade off here in terms of detail for generalizability, the possibilities of greater understanding through this detail and complexity can only enhance knowledge of the concept. As Stern (1995) points out, grounded theory is useful not only for understanding unknown concepts, but also to give us a fresh perspective on familiar concepts.

In her 'loose, working definition', Mason (2002) says all forms of qualitative research exhibit the following general characteristics -

1. *Grounded in a broadly interpretivist philosophical position*
2. *Based on methods of data generation which are both flexible and sensitive to the social context in which data are produced*
3. *Based on methods of analysis, explanation and argument building which involve understandings of complexity, detail and context.*
   *(*Mason, 2002, *pp. 3-4)*

Independent and open learning contexts are ideally designed to be dynamic and diverse environments, whether physical or virtual. Such learning requires learners to actively participate, create and understand not just the declarative knowledge but also the procedural processes occurring and the connections between them. Such environments are firmly rooting in the interpretivist tradition. To examine any activity occurring in such an 'open' environment without consideration of the context runs the risk of falling foul of any of the many variables at work. In a learning environment where the traditional element of teacher control is absent to a greater or lesser degree, it is arguable that the issue of context becomes even more paramount. Qualitative analysis of metacognition in such a context may allow the 'complexity, detail and context' to be looked at.

As Creswell (2003) points out, when selecting a research approach it is essential to have a match between the problem under investigation and the approach – "*if a concept or phenomenon needs to be understood because little* *research has been done on it, then it merits a qualitative approach. Qualitative research is exploratory and is useful when the researcher does not know the important variables to examine*" (p. 22). Although it is not accurate to say that 'little' research has been done on metacognition, it is still a relatively young field. The absence of a unified theory, and the gap between theory and educational practice, does make it difficult to isolate and understand the 'important' variables within metacognition and their relationships to each other, leading us to conclude that a qualitative research design is necessary.

3.3 Grounded Theory Methodology

In this section the rationale for using Grounded Theory as the research methodology for this study is discussed, along with the coding and other processes involved, and the issues in adopting an approach that originates from a postpositivist background within a constructivist paradigm (though it must be noted that many researchers do not see this as an issue that requires explanantion, as illustrated by the placement of GTM within a constructivist paradigm and qualitative approach by Creswell – see Table 5).

This thesis was undertaken using a grounded theory methodology (GTM). Grounded theory, was developed by Strauss and Glazer in the 1960's as a framework for analyzing qualitative data and has been defined as "*a qualitative research method that uses a systematized set of procedures to* *develop and inductively derive grounded theory about a phenomenon*" (Strauss & Corbin, 1990, p. 24), the goal of which is "*to generate a theory that accounts for a pattern of behaviour, which is relevant to those involved*" (Glaser, 1978, p. 3). It is inductive, in that, by giving priority to data, rather than looking at existing theory, the research reveals itself and theories are generated.

Schraw (2000), in his discussion of the issues in the field of metacognition states: "*Grounded theories seem especially important at this juncture given the lack of a unified theory of metacognition*" (p. 314). Given the issues with the existing theoretical divisions of metacognition (discussed in the previous chapter), research beginning without a hypothesis to prove, that prioritises data over existing theories, may be a very fruitful and clarifying approach. Not only is there confusion within the concept of metacognition, but there is also "*general agreement that the relationships among self-regulatory constructs [background knowledge, metacognition, strategy use, motivational constructs, epistemological beliefs] are largely unknown and that future research should address relationships among self-regulatory constructs*" (Sperling et al., 2004, p. 118). Obviously, research into relationships within metacognition and/ or independent learning can only be assisted by a clearer understanding of each respective element. While there is much that is known about metacognition, there is still much debate about the validity of existing theoretical frameworks of metacognition, and the divisions within metacognition, upon which pedagogical approaches are developing. This ultimately means that educational practices that could provide benefits to students, may not be developing as quickly or as effectively as possible. This is of particular importance to student or learner directed environments, where their ability to control and monitor their own learning is essential. A model of research without a hypothesis to prove or disprove is highly appropriate for the exploration of a concept or phenomenon that is not clearly understood (either in terms of its composite parts, or the realtionships between them), which a review of the literature on metacogntion shows to be the case.

A strong example of the effective use of grounded theory to research metacognition is the work of Pressley et al (1998), in the examination of college studentship. Their use of grounded theory was prompted by the assumption that student experiences are very much their own "cognitive constructions" (p. 349), and research that includes and admits these student interpretations can provide more comprehensive understandings of the experience. This is an assumption that no constructivist researcher would deny. To explore a concept in a manner that excludes the individual interpretations that affect its construction, activation and resultant processing *before the concept is properly understood*, may run the risk of missing aspects, misunderstanding systems, processing and functional relationships. Grounded theory, however, can allow a concept to be explored without imposed boundaries, without limiting it. The analysis of the data governs where the research goes, so any propositions developed are truly grounded in the data.

3.3.1 Grounded *theories?*

Grounded theory is a research methodology often the subject of controversy and debate, not surprisingly, from researchers promoting other methodologies (Burawoy, 1991; Goldthorpe, 2000), but more often from within the world of grounded theory researchers themselves. Much of this stems from the different research paths taken by its two originators, Barney G. Glaser and Anselm L. Strauss , which led to methodological differences betweeen the two. Strauss continued to advance his 'version' of grounded theory with Corbin (Strauss & Corbin, 1990, 1994, 1998), in a manner that Glaser (1992) adamantly deems to be *not* grounded theory. Some specific differences between what became two separate 'schools' are outlined by Onions (2006) in the table below -

Table 5. Key differences between Glaserian and Straussian in GT approach

'Glaserian'	**'Straussian'**
• Beginning with general wonderment (an empty mind) • Emerging theory, with neutral questions • Development of a conceptual theory • Theoretical sensitivity (the ability to	• Having a general idea of where to begin • Forcing the theory, with structured questions • Conceptual description (description of situations)

perceive variables and relationships) comes from immersion in the data • The theory is grounded in the data • The credibility of the theory, or verification, is derived from its grounding in the data • A basic social process should be identified • The researcher is passive, exhibiting disciplined restraint • Data reveals the theory • Coding is less rigorous, a constant comparison of incident to incident, with neutral questions and categories and properties evolving. Take care not to 'over-conceptualize', identify key points • Two coding phases or types, simple (fracture the data then conceptually group it) and substantive (open or selective, to produce categories and properties) • Regarded by some as the only 'true' GT method	• Theoretical sensitivity comes from methods and tools • The theory is interpreted by an observer • The credibility of the theory comes from the rigour of the method • Basic social processes need not be identified The researcher is active • Data is structured to reveal the theory • Coding is more rigorous and defined by technique. The nature of making comparisons varies with the coding technique. Labels are carefully crafted at the time. Codes are derived from 'micro-analysis which consists of analysis data word-by-word' • Three types of coding, open (identifying, naming, categorising and describing phenomena), axial (the process of relating codes to each other) and selective (choosing a core category and relating other categories to that) • Regarded by some as a form of qualitative data analysis (QDA)

(Onions, 2006, p. 8-9)

Neither of these grounded theory approaches have been chosen for this research project. This is not simply because of the clash with the research paradigm (discussed in detail below), but also because of specific issues with each approach – the inflexibility of the Glaser school does not seem to fit in a world where new knowledge and understandings appear daily, and the Strauss and Corbin school, while perhaps attempting to facilitate analysis of data through lenses such as the conditional matrix, may be unnecessarily narrowing the view of a methodology that works precisely because it is wide-open. Perhaps one of my main disagreements or issues with both Glaser and Strauss, is the issue of delayed literature reveiw until after data collection and analysis seems to be complete. Firstly, this is not always realistic. My interest in the research is the result of extensive reading about the concepts involved. As such, were I to follow either Glaser or Strauss GTM, I would effectively have to 'pretend' I had not done this reading, rather than acknowledge it, and use it (in an appropriate sense, that still privileges the data). This is a pragmatic issue, and here I agree with Lempert (Lempert, 2010) when, in discussing her use of GTM, she says

> *In order to participate in the current theoretical conversation, I need to understand it. I must recognise that what may seem like a totally new idea to me (an innovative breakthrough in my research) may simply be a reflection of my ignorance of the present converasation. A literature review provides me with the current parameters of the conversation that I hope to enter. Utilizing comparisons from the literature alerts me to gaps in theorizing, as the well as ways that my data tells a different, or more nuanced story. It does not however, define my research*. (p. 254).

The discussion of GTM has changed in recent years as new research paradigms and new researchers have entered the discussion, adopting grounded theory in a manner disputed by Glaser (Strauss is now deceased). One of the people leading this charge, Kathy Charmaz, defined her version of grounded theory as

> *Grounded theory methods consist of systematic, yet flexible guidelines for collecting and analyzing qualitative data to construct theories 'grounded' in the data themselves. The guidelines offer a set of general principles and heuristic devices rather than formulaic rules. (Charmaz, 2006, p. 2)*.

She puts forward a constructivist model of grounded theory that has been adopted in this research study.

3.3.2 Grounded Theory and Constructivism

An important issue to address in this study is the use of Grounded Theory Methodology within a constructivist paradigm, which according to grounded theory purists is not appropriate. Glaser (1978), as a grounded theorist from this purist perspective, does not accept the researcher subjectivity faciliated within constructivist GTM, but instead requires the researcher to participate as an objective observer. Mills, Bonner & Francis (2006), in their discussion of adopting a constructivist approach to grounded theory, make the important point that grounded theory is a research methodology that is "*evolving to account for a range of ontological and epistemological underpinnings. Constructivist grounded theory has its foundations in relativism and an appreciation of the multiple truths and realities of subjectivism*" (p. 8). Just as Glazer and Strauss' work evolved from an era dominated by positivistic quantitative research, and then evolved in somewhat different directions for both of them, now their own initial theory is evolving and being adapted by researchers working in an era influenced by new thought. Arguing that "all is data", Glaser and Strauss did in effect put forward a *postpositivist* qualitative approach (Charmaz, 2006, p. 9). As a new age of scholars move away from postpositivism, they continue to use grounded theory despite having different ontological and epistemological beliefs. Theoretical and methodological developments since the 1960s have created an environment where researchers have taken grounded theory in new directions.

Although it has been clearly argued that a constructivist grounded theory is a valid research model by many researchers (Bryant, 2002, 2003; Charmaz, 2002, 2006; Clarke, 2003, 2005; Mills, Bonner, & Francis, 2006; Piantanida, 2002; Seale, 1999), such a model needs to clearly include and account for its foundations in knowledge and reality. "*Ontologically relativist and epistemologically subjectivist, constructivist grounded theory overtly reshapes the interactive relationship between researcher and participants in the research process and in doing so brings the centrality of the researcher to the methodological forefront*" (Mills et al, 2006, p. 9). The constructivist research process is very much a relationship between the subjects and the researcher. This requires not only that the researcher explicate and acknowledge their own worldview and assumptions and the effects of this on the research, but also that in the co-construction of the research, that there is not a hierarchical relationship between researcher and subjects (as is traditionally the case with objectivist research), but one where the researcher is always reflexive in his or her approach, developing reciprocity rather than a power structure.

As such, it is not possible, or from a constructivist standpoint, necessary or even desirable, to attempt to remove the researcher from the process. What is important is to visibly recognize the role of the researcher, as an actor in a social process, who is attempting to "*study how – and sometimes why – participants construct meanings and actions in specific situations*" (Charmaz, 2006, p. 131). The researcher must acknowledge the interpretivist nature of the process – not only is what the subjects do an interpretation based on their reality, but the same applies to the theory finally developed by the researcher. Unlike Glaser's 'all is data' dictum, both data and analysis of data are social constructions, involving interpretation on both sides. As such the development of a theory using this model differs from the objectivist view of theory that explains a 'real' knowable reality; rather it is focused on the development of understanding. The key elements of CGT are summarized in Table 6.

Table 6. Constructivist Grounded Theory

Constructivist Grounded Theory (CGT)
The researcher who can indentify their epistemological and ontological position from the outset can ensure a strong research design (Mills, 2006). As such, identifying the methodology to be used at the outset, in this case as CGT, can clarify and improve the design and research analysis to follow.
• CGT is ontologically relativist • CGT is epistemologically subjectivist • CGT, unlike 'pure' GT, does not view data as reality, but rather takes the view that "*the 'discovered' reality arises from the interactive process and its temporal, cultural and structural contexts (Charmaz, 2000, p. 524)*

- Researcher(s) and participants 'produce' data through their interactions (Charmaz, 1995)
- Coding uses *"active language"(Charmaz, 2000, p. 256)* in order to embed *"the narrative of the participants in the final research outcome" (Mills et al, 2006, p7)*
- Researchers include 'raw data' in the memoing process, and at all stages, even as analysis and memos become more complex. This maintains the participants' presence throughout the study

The ultimate goal of this research is to reach a point of greater understanding of metacognition and how it occurs during independent learning. It is hoped that the development of such a theory would then facilitate educators and researchers in the development of pedagogy, environments and curricula that better develop learner metacognition, and in turn independent learning ability. This fits with and will be influenced by my worldview as the researcher – I do believe that people experience different realities, and that their experience of metacognition will be dependent on their social experiences to date, and that their metacognitive functioning is a constructed cognitive process. This belief also underlies my interest in instructional design and teacher mediation to foster metacognition – as a constructed phenomenon. Furthermore, given the right facilitation, it should be possible to change how individuals use such processing (to deconstruct and reconstruct) in a manner that can improve learning.

The absence of any initial hypothesis to prove in Grounded Theory Methodology suits an exploration of metacognition, as it may serve to illuminate the differences seen between the existing metacognitive frameworks and that reality of metacognition seen through quantiative experimentation and testing to date. The fact that all propositions are grounded in data and the systematic analysis of this data to the point of saturation, may allow these somewhat 'covert' thinking processes to be framed in a more accurate manner. It is not an unguided process however – the research questions do form the basis for the exploration of metacognition, and its role in independent learning.

3.3.3 The Grounded Theory Process

Despite the disputes and philosophical differences between the various 'schools' of grounded theory, the central processes and methods are shared (although terminological use may differ) – the use of theoretical sampling, constant comparative analysis, coding and categorising, memoing and sorting, and theory development and generation is promoted across all grounded theory models.

<u>Theoretical Sampling</u>

Theoretical or purposive sampling is a manner of choosing a population to study that will enable the generation of information about the topic under investigation.

Constant Comparative Analysis

According to Glaser and Straus (1967, p. 193) "*The constant comparative method consists of four stages: (1) comparing incidents applicable to each theme that emerges from the data; (2) integrating themes and their properties; (3) delimiting the theory; and (4) writing the theory"*. The processes of sampling, data collection, and analysis proceed concurrently within Grounded Theory Methodology. Constant comparison is utilised in the coding, categorizing, and analysing of data. It is not a linear process, in that analysis begins as soon as some data is collected, and this analysis may direct the manner of further data collection and analysis. Initially open coding occurs – this is the stage where conceptual codes come out and bring with them further questions. Data becomes 'labelled' by the researcher in a manner that can bring information to the fore. New data is constantly compared with existing data, which may show the initial labels to be appropriate or not, or may start to show how certain labels can be grouped, or that inter-relationships between them exist. Lack of clarity at this stage is indicative of lack of theoretical development, and/or that the questions being asked by the researcher need to be more refined or re-defined.

As the objects of scrutiny of grounded theory are processes (whether social or mental), a successful manner of 'labelling' is to "code data as actions" (Charmaz, 2006, p. 48), or to use gerunds (i.e. reading, disagreeing) to illustrate what is occurring in the data.

After initial coding, the 'focused' or 'selective' coding stage occurs. In this stage, categories are developed which subsume groups of codes generated in the initial coding phases. Depending on what type of processes the researcher is looking at, this will have different outcomes. For example in this study, "reading" comes under the higher focused category of cognition, because of the need to understand the differences between cognition and metacognition ('deciding to re-read' is considered metacognition). However in another study, perhaps looking at private lives, reading might come under the category of "hobbies" or "non-work-time".

After focused coding, the theoretical coding stage occurs, where the researcher attempts to understand the relationships between and within these categories, in order to move the understanding of the concept(s) towards the generation of theory about the concept(s). As this is not a linear process, even at this stage, the researcher may seek more data, or return to and revise earlier open and focused coding, if there are apparent discrepancies. In other words, the researcher is constantly looking for data that refutes the direction of theoretical development, and as such is constantly testing the data. It is at this stage the core categories are formed. These are the categories that the researcher will use to develop his or her theory. The systematic nature of the process forces the researcher to define and redefine until the point where each concept and category are consistently visible in the data. This is the point of saturation. The data collection process ends at the point of 'saturation', where there no longer is any data that refutes other data, and when the addition of more data will not add further knowledge. It is at this point that the researcher is able to generate theory about the concept(s).

Although the constant comparison method does not end until the point of saturation, and this may mean many back and forth cycling between data sets, codes and categories, the simplified diagram below outlines how this occurs. It must be noted that there is not a 'fixed' number of cycles, as it depends on the data and how the researcher handles the data, and what emerges from each level of analysis and revision.

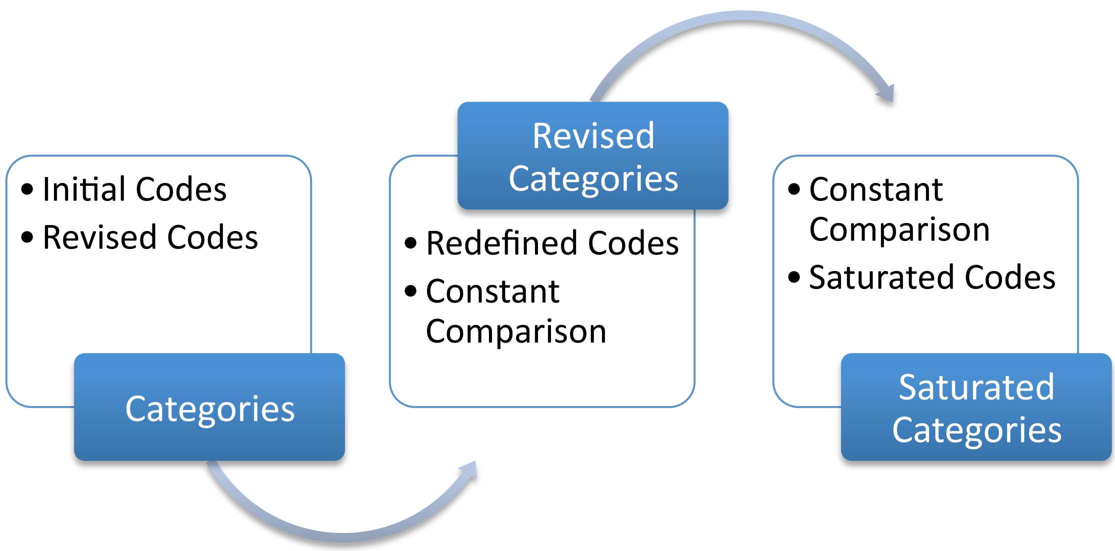

Figure 3. Movement between code and category creation resulting from constant comparison

Memoing and Sorting

GTM analysis is a difficult process for researchers, so memoing and theoretical sorting are used to help build categories and understand relationships between categories. According to Charmaz (2006), "*Writing successive memos throughout the research process keeps you involved in the analysis and helps you to increase the level of abstraction on your ideas. Certain codes stand out and take form as theoretical categories as you write successive memos*" (p. 72). The process of memoing essentially begins with the researcher writing down all his/her thoughts and concerns about codes being attributed to the data, and it is these thoughts and development of memos that lead to better understanding of the data being examined and how various codes will combine to make categories (i.e., 'reading' will be part of the 'cognition' category, or 'reading' will be part of the 'non-work-time' category). It is at this stage the ideas are formed, gaps in analysis are uncovered, and inter-relationship may be noted, and tested for in the data. This process runs from the beginning to the end of a grounded theory study.

Theory Development and Generation

Towards the end of the analysis phase, when the researcher feels that saturation has been or is being reached, the process of theory development or theoretical sorting occurs (although this will have been occuring to some degree during the memoing process as the researcher has learned more from the data as analysis has progressed). This involves using all the ideas from the ongoing memoing process, and sorting these memos in a manner that will lead to theory generation about the concepts. Charmaz (2006) suggests undertaking this sorting process in the following manner

> *Sort memos by the title of each category*
>
> *Compare categories*
>
> *Use your categories carefully*
>
> *Consider how their order reflects the studied experience*
>
> *Now think how their order fits the logic of the categories*
>
> *Create the best possible balance between the studied experience, your categories, and your theoretical statements about them.*
>
> Charmaz (2006*, p. 117)*

At this stage, many researchers attempt to visually represent and integrate their memos, through the use of diagramming and creation of mindmaps. This helps to uncover the relationships between categories, and move towards theory generation. This 'theory from data' (Glaser & Strauss, 1967) is the outcome of grounded theory. Creswell (1998, p. 56) notes that a grounded theory *"is articulated toward the end of a study and can assume the form of a narrative statement (Strauss & Corbin, 1990), a visual picture (Morrow & Smith, 1995), or a series of hypotheses or propositions (Creswell & Brown, 1992)".* In this thesis, the grounded theory is articulated as a narrative statement in the discussion chapter, and puts forward two hypotheses about processing in independent learning at tertiary level.

In summary, grounded theory has three basics elements – concepts, categories and propositions (Pandit, 1996). Through an examination of data, which occurs simultaneously with the collection of data, the researcher develops concepts which become the basic units of analysis. The discovery and constant comparison of these units lead to the development of more abstract, wider units, which become categories, consisiting of groups of related concepts. Strauss and Corbin (1990) exemplify this with their research on illness – *'pacing, self-medicating, watching one's diet' are some of the concepts discovered which then form the category ' Self Strategies for Controlling Illness'* (p. 7). Eventually, examination (through the data collected) of the concepts and categories and their intra and inter-relationships leads to propositions and emergent theory(ies) about the research situation. This is very relevant to any discussion of metacognition research, which is generally deemed to consist of knowledge, monitoring and control, and each element being made up of sub-elements, all of which interact, and may occur separately, or not, or which may occur sequentially or concurrently (as some researchers believe of monitoring and control). As constant comparison continues, the researcher ultimately reaches a point of "saturation" (reaching this point may require that the concept and categories be redefined) where any emergent propositions are always reinforced by the data. This point is determined *"by the discovery that additional interviews [or additional data] are yielding so little new information that more interviews [more data] would be a waste of time' (Schutt, 2004, p. 299)*.

3.4 The Research Journey

This section will discuss the research design, through discussion of the research setting, and participants, the learning 'episodes' examined and the data collection tools used. The process of data analysis will then be outlined. The research journey comprised two levels of research, as illustrated in Figure 4. The initial level of research involved a pilot study that resulted in the isolation of data collection tools suitable for analyzing metacognition in independent learning, as well as the refinement of the learning tasks. The second level of research involved an indepth examination of metacognition within independent learning and resulted in the identification of five types of conscious thought processing within Independent learning, as well as a grounded theory of conscious thought processing in independent learning.

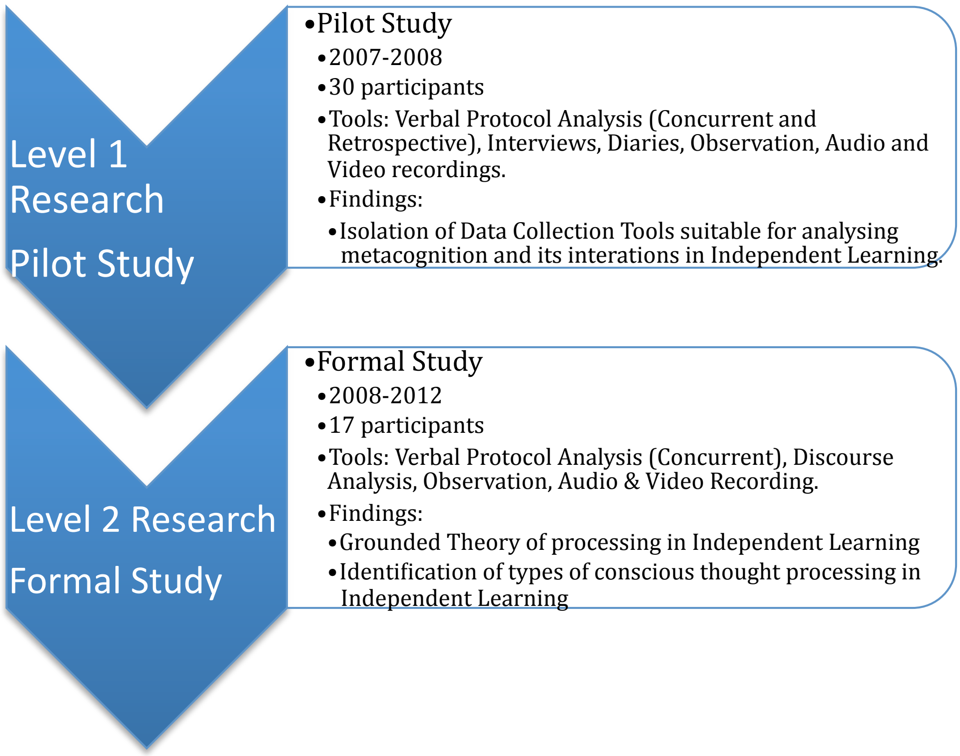

Figure 4. Levels of the research journey

Both level one (the pilot study) and level two (the formal study), as outlined in Figure 4, were undertaken using constructivist grounded theory methodology. In line with this methodology, the data drove the research process. While at the early stages of level one, it had seemed that the data might help to clarify how learners can be trained to improve their metacognition in independent learning, what in fact the data showed was the complexity of metacognitive processing and of all other processing that was occuring. As this emerged from the data, level two was designed, not to understand how to train learners, but rather to understand the complexity of metacognitive processing in independent learning, and its interplay with the other forms of processing that occur.

As a result of this shifting focus, and of the experience of using a variety of research tools in level one, the tools used in level two were altered, as not all of those initially chosen would provide data on the reality of real-time processing in independent learning (this is discussed in detail in section 3.4.5).

3.4 .1 Research Setting and Participants

This research was undertaking in a Japanese university. This setting resulted in a small and culturally-bound environment and population, which has implications for the degree to which the grounded theory generated from this study can be said to apply to other contexts and populations. However, as a small qualitative exploratory project, it was not the intention of this researcher to make such claims. Rather it is hoped that any data and theory generated from this research would be used by other researchers in other contexts, as a new starting point, with new insights.

The participants were chosen by method of theoretical sampling, also called purposive sampling, which involved "*selecting groups or categories to study on the basis of their relevance to your research questions*" (Mason, 1996, pp. 93-94). This research examined the occurrence and impact of metacognition, cognition and other forms of processing in independent learning. Therefore, the students were chosen from a group of students engaged on a module on self-directed learning.

In both the level one and level two research phases, a class of 30 students was initially chosen. All students were undertaking undergraduate degree courses where language and international communication were the major specialization, and all were Japanese, or had been raised in Japan. These classes were chosen as they included students who were taking an elective module on independent language learning. As such, this was not intended to be a representative sample that would provide data on metacognition in all learning contexts, but rather a population that would allow the researcher access to learners regularly engaged in independent learning (a strategic theoretical sample), in order to more deeply examine, analyse and ultimately understand the occurrence of metacognition during this type of learning.

In level one of this research, the pilot study, all 30 students gave permission and signed the informed consent form, while in the level two formal study, 29 out of 30 students signed. In level two, following an indepth examination of level one data, 17 participants from the 29 possible participants were randomly selected to participate in the second part of the study. This number of seventeen allowed for some participants to undertake all learning tasks in the study, facilitating cross-comparison of tasks completed by individuals, pairs and / or groups, as well as intra-personal comparison.

The elective course was open to only third and final year undergraduate university students. This is relevant in that students in the earlier stages of university often have ‘black and white’ understandings of knowledge, and the roles of teachers and students (Eaton, 1995; Marra, Palmer, & Litzinger, 2000; Perry, 1970; Seel & Dijkstra, 2004; Sinatra & Pintrich, 2003). This means they may hold views such as ‘there is only one answer’, ‘the answer is correct or wrong’, ‘the teacher has the answers, ‘it is the teachers job to teach me’. Such epistemological positions cause problems when students are asked to learn more openly, and to direct their own learning, in an independent sense. As such first and second year undergraduate students were deemed unsuitable for this project, as they would be less open to, and less experienced with independent learning.

3.4.2 Ethical Approval

Given the nature of the independent learning course, and the research to be undertaken, it was possible to imbed the data collection into the class work and class time of this course. The research had been deemed a ‘low-risk’ research project, and ethical approval had been given by both the institution where the researcher was undertaking his PhD (Dublin City University; see Appendix A) and the institution where the research was undertaken (Kanda University of International Studies, see Appendix B).

At the outset of the course, it was explained to the students that some research would be undertaken during the course, which would not require any extra work (apart from possibly short interviews outside of class), but would require observation (audio, video, and in-person observation) and examination of some of their work. Each student was then provided with a bilingual version of a Plain Language Statement and an Informed Consent Form (Appendix C & Appendix D). It was made very clear that agreement to participate was voluntary, and would have no impact on assessment of student performance during the course or evaluation at the end of the course. It was also explained that any data used in the research would be done so anonymously and no identifying information about any student would be used.

The stakeholders in this research project were myself, as the sole researcher, the students choosing to take an elective class about independent learing and the university in which the research occured. Students who chose to take the module did so from a desire to improve their ability to learn independently, specifically to work on an area of language learning of their choice, and to develop in terms of improving their understanding of learning. In terms of the university as stakeholder, two of the central explicit goals of the university in question are the ideas of individualised learning and the development of autonomy. Therefore, the goals of all stakeholders were in alignment.

3.4.3 The learning episodes

As discussed earlier in this thesis, independent learning can be interpreted in many ways and is difficult to research. As such, in this thesis, the learning under investigation needed to be in line with the working definition of independent learning - the act of learning without (or with decreasing amounts of) external direction, guidance and evaluation - and researchable. The learning scenarios chosen here fit both these criteria.

In this research project, three separate independent learning scenarios were examined. These were chosen to allow examination of different learning situations - individual, pair and group learning, and of different independent learning demands (domain-specific: understanding your language needs, understanding language content, preparing language; non-domain specific: learning individually, learning with others, planning, time-management, prioritizing etc). The different episodes are outlined below.

In the first learning episode, students were required to create a learning plan that they would later use (after consultation with their teacher) to form the basis of 8 weeks of independent language learning. This plan was scaffolded through the use of prompts (see Appendix E), but no other guidance or assistance was given. Students were given 90 minutes to complete this task. This time allocation was chosen as it both mirrored the length of learning periods students were familiar with (a class at the university lasts 90 minutes), and it provided enough time for students to engage in and complete complex tasks.

In the second learning episode, students in small groups were asked to prepare for an English presentation. They were given an academic text in English about which they had to give a five-minute presentation. They had two class periods (90 minutes by 2) to prepare for this presentation. Apart from this simple instruction, they were given no other information or assistance.

In the third learning episode, students were asked to prepare for an English language job interview with a multinational bank (it was not uncommon for graduates of this university to seek such jobs). They were provided with a website link to the company's bilingual website, and given 90 minutes to complete this task. This learning episode was undertaken individually by some students, and by others in pairs and/ or in groups.

All three learning episodes were audio and video recorded. They took place in private rooms in the university's Self-Access Learning Centre. This setting was chosen for three practical reasons -

1. There were 8 rooms available adjacent to each other. Each room had a glass front, so the researcher could see inside and interrupt if necessary. During the piloting phase, having a researcher or research assistant in the room during the learning episodes distracted students and interfered with the data-collection. Having rooms that

could be observed from outside without interrupting or interfering with the participants solved this issue.

2. Adjacent to these rooms were all the Self-access Learning Centre's language materials, which students could choose to use or examine to help them complete the learning task.
3. Students could ask for assistance with these tasks (as part of independent learning is seeking help when needed). The researcher was present in the self-access centre for students to access during the learning episodes, as were the staff in the learning centre.

3.4.4 The Language Issue

The student participants in this study all had Japanese as a first language, but were majoring or double majoring in English (they were either English or English and International Communication majors). While all participants involved could be said to have a working fluency in English, there was wide variation in their proficiency. This had implications for how data was to be collected. Participants with lower English proficiency could not undertake a VPA in English without processing being effected, as the effort of translation could disrupt the natural learning processing. Also for many participants, irrespective of proficiency, it was not natural for them to think about English learning in English – they would often do so in their native language. However, this approach to thinking during language learning varied across participants, As such, the initial decision was to have students use the language of their choice. During the piloting phase, it also became clear, and was retrospectively stated by some participants, that given the learning tasks, it made more sense or was more natural for some participants to use English at times (the degree to which this was deemed natural or necessary varied across students). As such all data was collected with participants using the language or languages of their choosing, so learning episodes often contained language switching between Japanese and English, though many participants used largely Japanese throughout. (Just as concurrent Verbal Protocol Analysis (VPA) has been chosen so as not to disrupt processing, allowing students to use the language or languages of their choice was chosen so as not to disrupt or alter their normal manner of learning when faced with such tasks).

It should be noted that the researcher resided in Japan for over a decade, has high Japanese fluency, and teaches some university courses in Japanese. When transcribing the data, the researcher translated the Japanese data into English. To ensure the accuracy of these translations, a professional translator was employed to translate and transcribe several of the learning episodes, and these were compared with the translations of the researcher, and deemed comparable, showing the researcher's translations to be accurate.

3.4.5. Data Collection Tools

In this project, it was initially planned to use a suite of qualitative data collections tools in unison to examine metacognition. Although no one tool is indisputably effective in examining metacognition, it was hoped that the data garnered from or through each tool, viewed both comparatively and in combination would provide in-depth and alternate views of metacognition, and the degree to which it is occurring.

Many of the tools traditionally used to research metacognition, such as closed questionnaires, were excluded as they are quantitative research tools, and as was discussed in the literature review, they do not provide the type of exploratory explication hoped for in this project, nor are they appropriate given the chosen research paradigm and model of research.

In a GTM research study, the emergent data and insights drive the research process, and in this study, this led to changes in the research tools used in the project. At the outset, it was my intention to use the following

- Verbal Protocol Analysis (VPA)
- Discourse Analysis of group learning scenarios
- Interviews
- Reflective Diaries

This was intended to be a multi-method approach (or methodological triangulation) – where multiple methods are used on the same object of study. This provides triangulation to increase the reliability and validity of the data, and decrease the possibility of researcher bias. However, as the practice of grounded theory research is an emergent process, it allows for changes to the proposed data collection tools as the study progressed.

The reasons for the initial choices of data collection, and also how these choices changed as the research progressed from the pilot phase to the main phase, are now discussed.

3.4.5.1 Data collection tools: Issues and choices

In this section, all tools employed in both level one and level two of the research are discussed. The tools used in level 2, verbal protocol analysis and discourse analysis, were actioned and recorded through the use of visual and audio equipment. All participants undertook their learning in physical enviroments where video cameras could record both their spoken words and physical actions. Mobile audio devices were also given to each participant to allow recorded data collection to continue should they choose to move from their initial physical location.

Verbal Protocol Analysis (VPA)

VPA is a method where subjects are asked to verbalize what they are doing and what they are thinking while undertaking a task, or verbalising this through prompting after undertaking a task, which some researchers claim *"offers a much more direct window on processing than other forms of comprehension measurement"* (Pressley, 2000, p. 291). Through training the subjects to vocalise all thoughts occurring during the activity, it is an attempt to get as close as possible to an individual's thought processes, and the reasons for the resulting actions, or what the subjects think they are doing. However, there are issues with VPA as a method of inquiry, as a data collection tool- *"These procedures may disrupt the verbal processing of the task. Second, many deeper level cognitive processes may not be accessible at a conscious level for verbal reports . . ." (Ward & Traweek, 1993, p. 427)*. This first issue is of great importance in terms of reliability and validity of the data and any inference that can be drawn from it. If the process of undertaking a VPA actually changes the spontaneous thinking of the subject, then what is visible in the data is not the naturally occurring processing. If by the simple act of thinking aloud, subjects thoughts are changed when verbalized, the data from such an endeavour is already a victim of the double hermeneutic, even before the researcher begin analysis.

However, by using the concurrent form of VPA, this can be avoided. In other words, subjects are not analyzing their learning by trying to interpret or reflect on what they are thinking and doing, and why (which is what occurs in other forms of VPA). Rather, they are simply doing the task, and verbalizing what is occurring, thus not disrupting the natural progression or sequence of their thoughts. This 'think aloud' protocol has no reactive effects, and avoids being *"a tool that potentially enables changes in consciousness"* (Smagorlinsky, 1998, p. 157), or one that disrupts or changes spontaneous thought. While a reactive tool has very beneficial effects on thinking, for the purposes of looking at metacognition exactly as it occurs, a non-reactive form is required. Ericsson & Simon (1998) have made a clear distinction between these two forms. By looking at the earlier work done by Groot (1946, 1978) on the thinking of chess players, we can see that the use of representative tasks (having chess players produce moves without an opposing player), can elicit thought processes. What is important here is that this 'covert thinking' is not altered by the process-

> *Perhaps the single most important precondition for successful direct expression of thinking is that the participants are allowed to maintain undisputed focus on the completion of the task while thinking aloud and merely to verbalize their thoughts rather than describe or explain them to anyone else.* (Ericsson & Simon, 1998, p. 181).

This led to the choice of concurrent VPA as a data collection tool.

The second issue, that deeper level processing may not be visible through verbal reports, with relation to metacognitive processing, can somewhat be countered by using VPA in a grounded theory model of research. The use of multiple subjects, multiple data sets, and the process of constant comparison to develop concepts and categories, allowed for participants' utterances to be conceptualized and categorised. In and of themselves, such utterances will not necessarily be clearly indicative of the various elements of metacognitive monitoring or control. However, when these verbalizations are subjected to constant comparison and coded, they can be conceptualized. In concurrent VPA, it is not the participant who will be asked to analyse their utterances (which as discussed above, would alter their thinking processes). Participants are trained to verbalise all their thoughts during learning – they are not asked to think about what these thoughts are (i.e., participants do not directly refer to their thoughts as metacognitive, cognitive or emotional, they simply verbalise what they are thinking about as they try to learn. Instead, using GTM and VPA as a tool (and also discourse analysis for pair and group learning), these categorizations of thoughts emerge from the data analysis, not the participants.

The piloting process did show that a small number of students were initially uncomfortable with VPA process. This occurred in two ways -

- Some students verbalized their discomfort about having to verbalize and be recorded at the beginning of a 'learning episode' (but this did not continue throughout the learning episode), and some expressed discomfort at having a researcher present in the room (at the piloting stage, observers remained in the room while students engaged in learning. This was to remind the learners to continue verbalizing if they were not doing so). This was dealt with by providing more VPA training so subjects felt comfortable with the process, and so that they no longer needed an observer presence in the room for guidance on the process.

- Some students felt uncomfortable if they had to move into an area where other students (not involved in the task) were present. This problem was solved by scheduling the data collection at a time and in an environment where this would not occur.

In order to effectively use VPA as a research tool, research participants need both clarification of what is required of them, and the opportunity to engage in guided practice of being in the process before the research is undertaken. During the pilot stage of this study, although the VPA process was explained orally, and modeled by the researcher, it became clear that not all participants automatically understood the idea of verbalizing 'all thoughts that occur'. This led to the creation of a more thorough and explicit three stage training process for the second stage of the study, which is described here.

In the first stage, the goals of the research were explicitly stated to the participants. It was made clear that the researcher wanted to look at all naturalistic thought processing that occurred during learning. Participants were informed that this meant all forms of thoughts, emotional and physical feelings, indeed anything that came into their minds. To clarify this for them, a video was shown which had been made by the researcher, showing a person engaged in VPA while doing a learning task. This video was deliberately seeded with a broad spectrum of verbalized thoughts - verbalizations of thoughts seemingly unrelated to the learning task (the person felt hungry and was thinking about what to have for lunch, became distracting thinking about a personal issue) and thoughts about personal disposition toward the task (the person was not interested in the learning task).

In the second stage, participants engaged in short practice VPA tasks. At this point, the researcher brought in colleagues to sit with the participants. In the pilot phase, while participants undertook the VPA tasks under research conditions, observers (colleagues of the researcher) were present throughout to remind participants to verbalise if they fell silent. However, as discussed earlier, participants did not feel this was helpful, and some found it uncomfortable or distracting. However, it proved useful in training participants to proactively verbalise their thoughts,, as the observers could ask students who fell silent to explain why they were silent at that moment, and again clarify to the participants that all thoughts were a necessary part of this form of data collection.

In the final stage, participants were given the opportunity to ask questions about the process, and again engaged in a further practice session, this time without the presence of an observer, as this would be how the actual VPA would occur. Finally, a second videoed VPA was shown, which was also deliberately seeded with a wide spectrum of the possible thoughts that could occur as someone engaged in learning. By the end of this process, all participants expressed comfort and confidence with the process of VPA.

Discourse Analysis of Group Learning Scenarios

As the transformation of knowledge into learning often occurs in social settings, it is important to examine socially-mediated metacognitive functioning, and how or if, metacognition is altered in group learning situations. Therefore, a number of group learning scenarios were designed. The groups of participants were recorded (using audio and video) while negotiating stages of a task in each group learning scenario. The recorded discourse was analysed in an attempt to gain a deeper understanding of students' metacognition in the interactive group learning setting, and the effect of group dynamics on the metacognition of individual participants.

Discourse analysis allowed for a cross-comparison between individual learners' metacognition in a group situation, and in an individual context (the previously discussed individual VPA).

The piloting of this tool proved successful. It does however, not provide the same picture of processing as the VPA. Unlike VPA, in group learning scenarios, learners do not nor cannot verbalise all thoughts. However in all group learning, it is only the verbalized thoughts (or noticeable physical activity) that are available to all group members, and as such, this is an accurate picture of 'group processing'. As such this tool did provide data that was analyzable as group learning, from which metacognition, or the "peer construction of metacognition" (Larkin, 2009) and other thinking processes could be isolated. All the student utterances within the discourse analysis were code-able in the same manner as the VPA data – the same processing codes were generated.

Interviews

Interviews are a 'good fit' for constructivist research, in that they allow the interviewees to detail their own reality, without seeing their knowledge as data that can simply be extracted.

In this project, it was my intention to use what Cohen et al (2007) have called the interview guide approach, (also called semi-structured or open interviewing). The characteristics, strengths and weaknesses of this method of interview are listed in the following table-

Table 7. Interview Guide Approach (Cohen et al, 2007, p. 353)

	Characteristics	*Strengths*	*Weaknesses*
Interview Guide approach	Topics and issues to be covered are specified in advance, in outline form: interviewer decides sequence and working of questions during the course of	The outline increases comprehensiveness of the data and makes data collection somewhat systematic for each respondent. Logical gaps in data	Important and salient topics may be inadvertently omitted. Interviewer flexibility in sequencing and wording of questions can result in substantially different

	the interview.	can be anticipated and closed. Interviews remain fairly conversational and situational.	responses, thus reducing the comparability of responses

Some of the issues with the semi-structured style of interview can be simply resolved. The possibility of 'inadvertent omission' of important and salient topics can be solved simply by the interviewer being experienced at interviewing, and well prepared for the interview. By having a simple checklist of required questions close to hand, the interviewer can let the conversation flow naturally. Then, through regular reference back to the checklist as the interview progresses (and noting which questions have and have not been answered), omissions can be prevented.

As the concept under investigation is metacognition, the benefits of allowing the interviewees to discuss these mental processes naturally, rather than through an imposed sequence of questions, had the potential to outweigh the possible reduction in comparability. A rigidly imposed sequence of questions might run the risk of confining a student's answers to a predetermined framework of metacognition which is already an existing problem in the field.

Although interviews were a seemingly suitable tool, the piloting phase showed it to be problematic. Participants were often unable to recall why they had done something during learning (even when the interview was conducting immediately after, in a stimulated recall manner). Also unlike the concurrent VPA, or discourse analysis, which through constant comparison, develop concepts and categories that are situated in the data, the interviews returned student opinions and beliefs about what had occurred. Also, as students were not very familiar with thinking about their metacognition (nor always conscious of its occurrence), this tool was deemed unsuitable for the research task, as it did not return evidence of metacognition, but rather beliefs and opinions about it, which, although a worthwhile avenue of inquiry, are not the subject of this research project.

Diaries

Diaries, particularly reflective diaries are widely used in EFL (English as a foreign language) contexts, in wider educational contexts, and particularly heavily in learner directed contexts, such as self-access learning. In the self-access learning context, they are generally used to provide the student with the opportunity to reflect on the learning, and then change their learning tools, methods and processes, based on their successes and lack of successes in their chosen approach to learning (Gascoigne Lally & Veleba, 2000; Howell-Richardson, 1988; Hyland, 2004; Nuckles & Berthold & Renkl, 2004; Yi & Kellogg, 2006). Effectively, this is to assist them in taking effective control of their learning, and encourage regular self-monitoring of learning, (roles that were traditionally that of the teacher). Diaries provide evidence for analysis but also opportunities for student reflection - *"Many scientists*

(Ericsson, Krampe, & Tesch-Romer, 1993) point to writing as the most effective (as well as demanding) activity to improve and develop their thinking" (Ericsson & Simon, 1998, p. 183). The process of reflective writing in this manner can bring to consciousness existing knowledge that we might otherwise not access.

In this research, diaries were initially chosen to be a data collection tool. The data collected in this way would be different from that collected through the VPA. While the VPAs were designed to garner data on metacognition in an unaltered state, the textual analysis of the diaries would provide data on students' thinking about metacognition, and their use of it, in what manner (and to what extent, and with what frequency) they incorporate it into their learning over time (rather than on a single instance task). As such, it was hoped that this data would be data that illustrates metacognitive behaviour as it pertains to learning decisions over time.

However, analysis of the data collected from diaries during the piloting phase revealed the same issues as with the interviews- lack of student recall about recently undertaken work, and again, opinions about why they had undertaken learning in a particular manner that did not always match with the manner in which the learning *had* been undertaken. Therefore, the use of diaries was discontinued after the pilot phase.

3.5 Data Analysis Procedure

This study began in 2007, and the level one piloting phase was conducted in 2007 and 2008. The level two 'formal' study occurred between late 2008 and 2012. At the end of the piloting phase, it was decided not to pursue the use of either interviews or diaries as data collection tools. From both the emergent data during this phase, and the parallel literature review, it became clear that the focus of this thesis would be to uncover metacognitive processing as it occurred, and neither the interviews nor diaries provided consistent or accurate data about this. While they do provide an effective way to look at metacognition in terms of learners views of it, and of its importance, which would provide a wider picture of metacognition in learning, this was deemed outside the scope of this research project. It was also anticipated that the large amount of data generated through the VPAs and Discourse analyses, across 3 separate, different learning tasks, with different learners, in different learning scenarios, would provide adequate data triangulation for reliable theory generation. Initial analysis of independent learning using VPA and Discourse analysis did show the learning to be codeable, and that what appeared to be metacognitive processing could be separated and isolated from other processing (such as cognitive processing or off-task processing) that was occuring.

3.5.1 The data collection phase

During the piloting phase, several learning tasks were trialled. One task was removed and replaced. This task was an independent grammar learning task. The pilot phase showed that all of the participants had a very narrow view of how to learn grammar in a foreign language, and that this narrow approach (which was not seen in the other piloted tasks) would not be representative of wider independent language learning, or of independent learning beyond foreign languages. This related to the participants experience in primary and secondary level schooling of the grammar-translation method of learning grammar in a foreign language. As such, research findings from this task would likely be too specific to this task, and the learning background behind it. This task was replaced with a learning task that was more representative of wider independent language learning – creating an independent language learning plan for any language skill or language issue the participants wished to focus on. Having undertaken the piloting phase and deciding on the three episodes of learning to examine using the two data collection tools of VPA and Discourse Analysis, the decision was made to attempt to collect 8 sets of data for each learning episode. This would result in over 30 hours of video and audio data. Seventeen students participated in the second level of research, some engaging individually, in pairs or in groups. It was an important undertaking to have some participants undertake all three learning episodes, and to undertake learning in different situations (individual, pair or group) to allow for comparison across different learning tasks on an intra-individual level. The table below shows how each subject undertook either 2 or 3 of the learning episodes (tasks), and the nature of engagement.

Table 8: Student Participant List and Learning Tasks Undertaken

Student	**Tasks undertaken:** **Task 1 (T1): Create an Independent Language Learning Plan** **Task 2 (T2): Understand and prepare for a presentation about an academic article** **Task 3 (T3): Research a company and prepare for a job interview**
A	T1 INDIVIDUAL, T2 GROUP, T3 GROUP
B	T1 INDIVIDUAL, T3 INDIVDUAL
C	T2 GROUP
D	T1 INDIVIDUAL, T2 GROUP, T3 GROUP
E	T1 INDIVIDUAL, T1 GROUP, T3 PAIR
F	T1 INDIVIDUAL, T2 GROUP, T3 INDIVIDUAL
G	T2 GROUP
H	T2 GROUP
I	T1 INDIVIDUAL, T2 GROUP, T3 GROUP
J	T2 GROUP
K	T2 GROUP
L	T2 GROUP
M	T1 INDIVIDUAL, T2 GROUP, T3 GROUP
N	T2 GROUP, T3 INDIVIDUAL
O	T2 GROUP, T3 PAIR
P	T1 INDIVIDUAL, T3 INDIVIDUAL
Q	T2 GROUP, T3 INDIVIDUAL

Ultimately, the data in this study comprises 21 learning episodes, each approximately 90 minutes in duration, constituting 31.5 hours of learning that was video and audio recorded, transcribed and translated. To assure confidentiality participants names are not used, and each is referred to alphabetically (Students A – Q, see table 9 above), and pairs and groups are referred to numerically (Pair 1, Group 2 etc.). The learning episodes happened in the following order –

Table 9. Learning Episodes

Learning Episodes
Task 1. Creation of an Independent Language Learning Plan
Task 2. Group Presentation Preparation
Task 3. Job Interview Preparation

The three tasks were undertaken across a semester (Task 1 at the beginning of the semester, Task 2 about 10 weeks into the semester, and Task 3 at the end of the semester). As soon as a task was completed, translation, transcription and coding began. HyperTranscribe software was used to assist the process of transcribing from video sources, to allow observational notes to be included i.e. physical movement during the learning task. HyperTranscribe is a companion software to HyperResearch, the QDA coding software used.

In the initial coding process, the goal was to code not single words or single sentences, but rather units that could be defined (which could be a word, group of words, a sentence or sentences, or even an interaction, long or short). If a useful definition be attributed to the utterance, it became a single code.

3.5.1.2 Coding Software

In GTM, as soon as any data is collected, data analysis begins – analysis of each learning episode began as soon as it had been completed, not at a later stage when all data had been gathered. In this project, the software Hyper-research was used to collate and analyse my data. Hypreresearch is a qualitative data analysis (QDA) software, similar to the more well-known Nvivo software. This choice of software was simply a pragmatic choice. At the time, this researcher was an Apple Macintosh computer user, and there were some functionality issues with Nvivo and Apple Mac computers. A colleague recommended Hyperresearch, which was trialled and then purchased and used for the duration of this project. While generally a very useful software for the coding of large amounts of data, it did pose some practical issues.

The manner in which the software will allow you to analyse data is as yet limited (although some updates have since been added to the software). For example in looking for possible relationships between categories, it is essential to be able to analyse the order in which they occur. While new search and analyse functionality has recently been added (ie ' is proceeded by', is ' followed by') it is not possible to execute across all data in a study. Nor it is possible to generate reports in such a manner if a code is often proceeded by a variety of elements, or to go back more than one step (i.e. A is preceded by B which is proceeded by C). So while the use of the software is hugely timesaving and beneficial in what is can do (i.e. generate frequency reports, simply make changes to multiple sets of data, have all data easily accessible), certain types of analysis were not possible within the confines of the software and had to be completed by hand.

A second issue was with saving and moving data. Once data had been entered into the software and analysis begun, it cannot be edited. Once it has been saved in an initial space (i.e. on your desktop or in a particular folder), if you move that data, the software will not be able to find or open it, as it remembers only that first pathway. This caused several problems, and a few false starts before I understood how to use the software correctly.

Another issue is with exporting and presenting data outside of the software platform. The only ways to export data are as 'pdfs' or text files, neither of which are ideal for those who will likely wish to share or present data in Microsoft Word format. Also when the data has been exported, it does so in a manner that presents codes on the left and transcribed data on the right. It does not, however, clearly indicate when one code starts and ends, and the next begins. This might not be too problematic in studies with few codes, but is rather difficult to understand if the coding is dense. In this case (as was the case across this study), all such exported data has to be rewritten and reformatted for clear presentation in the thesis.

A final issue is with support for the software. There was a 'malware' issue on my computer which corrupted some data and data analysis. The company was unable to provide any recovery solution, and one data analysis set was lost as a result of this. Because of the fixed pathways for saving files, it is not as simple as saving it in multiple locations, as the software will not recognise the new pathways. My solution to this was to have multiple sets of the software installed on separate computers, all with a pathway to data stored online. This was a rather cumbersome process, that may not be the case with other software, or software from a larger company that provide more support.

3.6 Methodological Issues

3.6.1 Qualitative Research Issues

Perhaps the most often discussed issue in relation to qualitative research is that of credibility. While this will be discussed in more depth in the concluding chapter, I will touch on it briefly here with relation to scope of study, triangulation and researcher reflexivity.

This is a small-scale qualitative study, with a largely homogenous sample population (in terms of nationality, culture and age. This means that broad-reaching claims cannot be made of the data, or indeed the data analysis in this study. Yet this does not pose a methodological issue, as from the outset, this was understood, and the metholodological approach was chosen for granular depth rather than breadth, or generalisability of findings.

The credibility of research is often established through the use of data triangulation, most commonly by using a variety of research methods to examine the same research problem. At the early stages of this project, this was the researcher's intention (to triangulate data through the use of VPAs, discourse analysis, interviews, and diaries). However, as is often the case with GTM, the trajectory changes, and it became clear that these tools would actually provide different types of data, so both interviews and dairies were removed from the data collection process. The use of VPAs and the discourse analysis did provide some degree of triangulation. However, these were also backed up by to two other sources of triangulation. Guba and Lincoln (1995) note that triangulation can come from 4 different sources – theories, methods, sources and investigators. In this study the other sources were the researcher's prior knowledge of the field of study, and his ongoing reading in the field at appropriate junctures during the research; also the volume of data generated in this study provide a credible triangulation point. By subjecting all the data (from each single code upwards) to comparison with all other data over 30 hours of data (which generated very high instances of constant comparison), the frequency and density of comparison adds another credible dimension of triangulation.

With regard to reflexivity, and how it can fit in a grounded theory context, Mills et al (2006) state that researches who have initially indentified their ontological and epistemological position "*are able to choose a point on the methodological spiral of grounded theory where they feel theoretically comfortable, which, in turn, will enable them to live out their beliefs in the process of inquiry*" (pp.7 – 8). By doing so in this study, it was possible to ask questions of the data and the research process itself, and to provide comparison, while simultaneously remaining aware of the subjective nature of such beliefs and opinions, and their possible affect on the research. By holding firm to the central pillar of data in this study, the researcher reflexivity was able to add value and insight to the research process, rather than detract from it.

3.6.2 Grounded Theory and Data Collection Issues

This researcher had some issues with using Grounded Theory Methodology for this study. Firstly it is a very time-consuming process, particularly for a single researcher to undertake. Rather than simply worrying about whether theoretical saturation has occurred or not, from the very beginning of the coding process, the researcher has to concern himself or herself with the 'accuracy' or 'appropriateness' of codes being attributing to the research data. While the process of constant comparison to the point of theoretical saturation does provide a level of assurance that the researcher will ultimately have solidly defined codes, categories, concepts, and inter-relationships, this can be a long and frustrating experience. From this researcher's perspective, undertaking a GTM project with multiple researchers would be preferable, not simply in that it would provide avenues for discussion and comparison and agreement, but it would also provide the data with an extra element of triangulation (multiple investigators). In this process, I regularly consulted my supervisor about the data analysis, which was both necessary and helpful, and often refocused or redirected the analysis. I also consulted colleagues, but because of the complexity of the data, this was less fruitful. As a researcher, who sees great value in this methodology, I would see great benefits to undertaking grounded theory research with a group of researchers.

Secondly, when looking at some object of study at a very granular level, particularly something somewhat 'invisible' (such as meta-level thought processing) the amount of codes generated may increase hugely, or be more difficult to identify or separate. GTM is most widely used for looking at social processes (Glaser, 1978, p.2), which in most cases will not result in such dense coding, or may be more easy to code as a result of interview methodologies where participants can vocalise on the topic under investigation. An example of this would be that a less intensive and more readily analysable version of this project would have been to interview students about metacognitive processing during independent learning. Such a project would provide a lot of worthwhile data, which would have a more direct path of analysis (though would have provided a different, but interesting, data set). So while GTM has proven a very useful tool for examining actual processing during learning, doing so has been difficult and very labour-intensive.

As this research study developed, it became clear that what was needed was a picture of metacognition as it occurred. This is not the same as a person's recall of what occurred, their opinion of what occurred, or their reasoning as to why something occurred. As Creswell notes "*grounded theory is a strategy* *of enquiry in which the researcher derives a general, abstract theory of a process, action, or interaction grounded in the views of the participants*" (2009, p. 13). What is important here is the point that the theory is usually grounded in the 'views of the participants'. This is why data collection tools such as interviews and self-reports are so often used by grounded theorists, and why such tools were initially used by this researcher in this project. However as this project moved forward, and it became clear that what was needed was not the views of the participants, but an understanding of metacognition in action, many of the tools traditionally used with grounded theory (e.g. interviews) had to be discarded, creating a more difficult process of analysis.

A final methodological issue is related to the qualitative coding of a concept to a very granular level, as in the case of all the learning processing coded in this thesis. By taking complex data to such a small level, it becomes difficult to present the data in a manner that would be easily understandable to readers. In this thesis I have included some fully coded learning episodes in the Appendices G, H and I, as it is only through seeing a learning episode in its entirety that the logic behind the coding and the credibility of the final codes can be seen. Removed from context, or only viewed separately, it is not always clear why one code and not another has been attributed to a certain utterance.

3.7 Chapter Summary

This chapter summarized the research methodology, with an overview of the Grounded Theory Methodology, within a constructivist paradigm, that was used to explore metacognition as it occurs during independent learning. It discussed how the research project itself emerged and evolved, from refining what was of most value to understand within the field of metacognition (actual metacognitive processing rather than perceptions or understanding of metacognitive processing), to how such a 'picture' could be uncovered (i.e. the discarding of typical GTM tools such as interviewing, in favour of verbal protocol analysis) within a qualitative research process guided by GTM. The constant comparison process was also outlined, showing how initial ideas become memos that ultimately contributed to credible analysis of data. The final codes, categories, concepts and their interrelationships with various forms of processing that occurs in independent learning, as well as the emergent grounded theory, is discussed in the following chapters,

Chapter 4: The Coding Process

4.1 The Coding Process

Data collection and coding in grounded theory does not follow a simple linear process, as discussed earlier, so it is somewhat difficult to represent in a linear chronological format. In this study, this is further complicated by two different participant' modes of engagement (individual and group) within the various learning episodes, requiring differing modes of data collection. This chapter provides a chronological account of how the coding process was conducted and how the grounded theory methodology directed the generation of codes.

Often in grounded theory, as data is collected and analysed, it provides the researcher with new insights that may change how that data is collected and from who (to ensure purposive or theoretical sampling). 'Interviews' are the most widely used tool in grounded theory as most researchers use the Grounded Theory methodology to better understand 'basic social processes' which requires asking participants questions that will elicit responses about their behaviours, reasoning or opinions. As such, where data has been collected and is telling the researcher something, it often makes sense to change the interview questions or format, or indeed, the manner of choosing interviewees. It would therefore not be possible or credible to have a completely predetermined set and structure of data collection from the outset.

The research in this project is somewhat different. During the piloting phase, the data emergent from 'interviews' presented participants' perceptions and understandings of the learning process. This data may have contributed to understanding *how to teach* or *improve the teaching of metacognition* but was not useful in terms of understanding how metacognition occurred at a meta-level during independent learning. The data collection process was re-focused towards simply observing and attempting to understand metacognition in-action in independent learning. In this sense, the research was following the 'traditional' GTM process, letting the data direct the study.

Therefore, as a result of the piloting phase, it became necessary to re-set the data collection process, as the area of investigation now had clearly become metacognition in-action during independent learning, and interviewing was no longer a viable tool in researching at this meta-level of thinking. Participants' perceptions and understandings of the learning process (that emerged through the interview process) were not required as part of the data set, as the pilototing phase highlighted that these did not contribute to understanding metacognition-in-action. The new focus of investigating metacognition-in-action meant that Verbal Protocol Analysis (VPA), Video recordings and Audio recordings were chosen as the tools-of-choice to gather data on meta-level thoughts or meta-level thinking in the case of independent participants and the social vocalisation of activity in the case of participants engaged in paired or grouped learning episodes. Unlike most GTM projects, the learning tasks in this project were pre-designed and ordered, and did not change as a result of data collection and analysis. Each learning experience provided useful data without a need to revisit or alter the tasks – as the study continued and real-time processing in independent learning became the clear focus of examination, it was clear that this data would be found through the tasks that were chosen after the pilot phase. If new ideas arose from the memoing process the same data set and subsequent data sets was revisited and re-examined – the learning tasks did not require alteration to provide data from a new perspective. Rigour was added to the research by using the constant comparison method not just across different episodes of one learning task, but across three different independent learning tasks (differing in terms content, format of learning and in the demands asked of the participants).

However, it must also be noted, that the researcher was aware at all stages that this 'linear data collection structure' might not lead to saturation nor theory generation, or might lead to new understandings that would require more or different data collection. So, the research, while seemingly different, was in fact following the GTM process, in that it was open to change as ideas and theory emerged. The coding process moved through three phases, starting with *Initial Coding*, then more *Focused Coding* and leading to *Theoretical Coding*, as explained in the following sections.

4.2 Initial Coding

The Initial Coding phase of analysis began as soon as the first learning episode had been completed by students. The transcribed learning episodes were openly analysed by applying gerunds, which is the process of applying a label (action verb) to utterances that clearly defines what occurs within that utterance. So the length of any utterance coded was determined by what constituted *a single action*. My first attempts at coding the learning episodes transcription resulted in the following 32 codes –

Table 10. First Initial Codes

Affective controlling, Allocating, Assessing, Commenting, Conditional knowing, Conditional knowledge, Deciding, Declarative knowing, Drifting, Generalising, Information gathering, Interacting, Judging, Method interfering, Non-verbal action, Personalising, Planning, Practising, Problem-solving, Procedural knowing, Questioning, Reading, Reasoning, Refocusing, Regulating, Remembering, Researcher, Selecting, Self-knowing, Self-motivating, Task knowing, Unknown

However, upon examination of these codes, attempts to define them clearly as they pertained to the data, and in a manner that would shed light on metacognition particularly, showed many of these codes to be unclear, or too broad to be useful. They may have constituted a 'single action', but not necessarily a 'relevant single action'. An example of this would be that it was not possible to give a concise definition to all the instances that had been categorised with the gerund '*assessing'*, as there seemed to be differences among these instances, which suggested this code might need to broken down further. In one instance the learner could be assessing *content difficulty*, where in another instance, he might be assessing *progress*. It seemed meaningful to re-label such distinctions, as *Judging task difficulty* and *Judging learning*. As such the same data set was examined again, and further data sets added. The table below gives a complete list of the second intitial codes, where the coding list has now expanding from the initial 32 codes to now 83 codes -

Table 11. Second Initial Codes

Adjusting, Affective State, Agreeing, Allocating Study, Assessing, Choosing, Cognitive Knowing, Confidence judging, Controlling, Deciding, Deciding on material to use, Declarative and conditional knowing, Declarative and procedural knowledge, Declarative knowing, Decoding, Discussing others approach, Discussing task, Drifting, Expectating outside assistance, Finding another student, Focusing, Goal-setting, Interacting, Judging, Judging learning, Judging personal feelings about task, Judging task difficulty, Listing possible material places, Method interfering, Moving in, Non-verbal action, Not knowing, Not understanding, Perceiving, Physical State, Planning, Planning to work together, Prioritising, Problem-solving, Procedural and conditional knowing, Procedural knowing, Quantifying learning, Questioning task, Reading task instructions, Reasoning, Recognising, Refering to method, Refering to researcher, Refocusing, Regulating, Repeating, Re-reading, Researcher, Researcher explanation of utterance, Researcher instructing, Reviewing, Searching for materials, Seeking help, Selecting, Selecting strategy or strategies, Selecting topic, Self-knowing, Self-monitoring, Situating task into wider life, Skipping section due to perceived difficulty, Strategic knowing, Talking about unrelated topic, Task explanation, Task knowing, Task monitoring, Thinking about personal issues, Thinking about time issues, Unknown, Unsure how to proceed, Using existing knowledge, Wanting help, Wanting to interact with others, Wondering, Wondering about other students, Writing

While most of the codes seemed to be present in the meta-level processing of all learners, not all were. For example, all learning episodes showed instances of *'Judging', 'Goal setting' and 'Selecting'*, but not all episodes showed instances of '*Expectation of outside assistance', 'Quantifying learning', or 'Wondering about other students'*. This did not mean that such codes were incorrect or not useful, particularly given the individual nature of independent learning. Such cases were noted, and through constant comparison, examined to see if they could or should be redefined in a manner which would tell more about metacognition and other processing occurring, or whether they were unrelated to these phenomenon, and could be removed. It is possible in grounded theory coding to only look at relevant data. However, given the nature of the mental processing concepts in this thesis, and their interrelationships, no data was removed or ignored at any stage. In other words, the coded pictures that developed were complete.

It is important to note at this stage that the researcher had to be very conscious about his existing knowledge of the subject matter, so as not to exclude or include anything that the data was not presenting. Having been involved with both the areas of metacognition and independent learning, and having engaged in reading on the topics prior to the decision to undertaking this thesis, and during this thesis, the researcher had a good working knowledge of the terminology and frameworks of metacognition from the literature. So rather than ignoring this possible researcher bias, the researcher made a conscious effort to acknowledge his literature based understanding of metacognition (and at times to use it in the memoing process to ask questions of the data), but to keep it separate for the data. However, at times during data analysis, concepts and terminology from the literature did seem to 'fit the data'. In these cases, the researcher, using the constant comparison process, was able to ensure that such ideas or terminology were only applied to this data if they 'fit' all the data. Several of the coding names or labels (i.e. MM-EOL, ease of learning which is a sub-element of metacognitive monitoring) used are elements found in some existing metacognitive frameworks (Pintrich et al., 2000). As the constant comparison procedure continued and more data was collected, some of them remained, or were renamed in a manner that more appropriately fit the data; some were combined, and others were removed as they were not borne out in subsequent data sets as shall be discussed later. Examples of some of these initial codes and the utterances they were ascribed to are given in the following table (finalized fully coded transcripts of learning episodes are provided in Appendices G, H and I).

Table 12. Examples of Initial Codes and Utterances

Codes	Utterances
Agreeing	S1: *Maybe "a".....eh?* S2: *yeah yeah yeah it's right I guess it should be "a"*
Allocating Study time	*As for my motivation...only 45 minutes left. Motivation...creating the reasons for this would definitely more difficult than thinking about self promotion, so 30 minutes for motivation and 15 minutes for self- promotion*
Physical State	*my stomach hurts....*
Prioritising	*Ok first go back to the main goal...I want to improve my vocabulary because very low score in the TOEIC vocabulary section*
Self-knowing	*My learning styles is very individual and not plan* *well...uhmmm..also I'm not good at keeping ....I'm not good at studying continuously?*
Skipping section due to perceived difficulty	*Hmm..can I skip-pass, the learning style section cause I have no idea....*
Selecting strategy or strategies	*Watch them with subtitles in English and take a note, if needed*

The process of initial coding is not easy. Lempert (in Bryant & Charmaz, 2010) says "*codes capture patterns and themes and cluster them under an evocative title*" (p605). As codes emerged in this stage, the 'memoing' process involved the use of notebooks, carefully dating, logging and recording memos. At later sorting stages, computer based mindmaps, and whiteboards were utilised to explore relationships between codes (see Appendix F for photographs of some of these explorations). These tools enabled the establishment of categories and the identification of interrelationships. As the memoing process continued, initial codes were grouped and more refined codes emerged. The memos themselves evolved from early to advanced memos (Charmaz 2006), from initially trying to see what a participant was saying or thinking, to comparisons and categorisations of thoughts and/ or actions.

4.3 Focused Coding

The goal of this stage was to make sense of the codes in a way that would move the analysis towards category development and elicit interrelationships. The memoing process prompted many possibilities regarding categories that could encompass the codes. The central questions (from the memoing process) that helped narrow these possibilities and moved the GTM process forward were:

1. *What is this a study of?*

2. *Were the codes the right codes?*
3. *Were the codes concise enough?*
4. *How and what do these codes contribute to the study of metacognition and its relationship with other forms of processing in independent learning?*

The first question was relatively straight-forward to answer, as this was a study of *metacognition-in-action*. This question was used as a focusing mechanism, to keep the analysis on-track and centred on the exploration of metacognition in independent learning.

The second and third questions were interlinked, and examined the validity of the codes. In order to try and understand whether these codes were the 'right' codes or 'concise' enough to elucidate the concepts, all codes were continuously re-examined and their position within various categories were tested, until acceptable codes that could be narrowly defined emerged.

The table that follows gives a sample list of codes from the focused coding stage, with definitions and transcribed examples of utterances to which they were ascribed.

Table 13. Examples of Initial Coding Definitions and Examples

	Code	Definiton	Example
1	Adjusting	Making a change to the current situation	*I'll go outside (said to interviewer, then leaves the room)* *I think I need to change this, to confirm tense and... preposition*
2	Affective State	Students affective or emotional state while undertaking learning	*I'm bored..I mean I waanna talk to someone*
3	Agreeing	2 or more students agreeing on information or course of action	*S1: Maybe 'a'..eh?* *S2: Yeah, it's right, I guess it should be 'a'.*
4	Allocating Study Time	Breaking down study into time sections	*As for my motivation... only 45 minutes left. Motivation.. creating the reasons for this would definitely be more difficult than thinking about self-promotion, so 30 minutes for motivation and 15 minutes for self-promotion*
5	Assessing	Making a judgment about progress or course of action to follow	*Ah...hmmm what should I do...ha ha...try and.......hmmm.....*
6	Choosing	Making a decision between two or more options	*S1: What else should we do?* *S2: What? Hang on, hang on. Collect information about the company, and interview oursleves.*
7	Cognitive Knowing	Knowledge of cognition and cognitive strategies	*Read explanation, so first...a,b,c. first read explanation. Second, make note. To make note..and third is..doing practice.*
8	Comprehending	Attempting to understand the learning content	*Clearn goal....clear goal.....hmmm.....*
9	Conditional Knowing	Knowing when and why to use different cognitive strategies	*Watch a movie every week...not only during this class*
10	Confidence Judging	Assessing the correctness of learning undertaken or in progress	*Is it ok?*
11	Controlling	Taking action to direct learning	*First of all, we need to make a plan, yeah?*
12	Deciding	Deciding on what course of action to take	*Let's finish!*

The final question attempted to examine, in an on-going basis, the alignment of the codes, categories and interrelationships within the context of metacognition. It did this by asking whether the emergent codes contributed to the understanding of metacognition, and whether these codes enabled the separation of metacognition from other processing, and/or the identification of other types of processing in independent learning.

The process of examining whether the codes contributed to the understanding of metacognition was very important, and impacted on the coding decisions. An example of this is the code of *'reading'*. The initial memoing of 'reading' resulted in its placement within the category of 'cognitive processing'. However, as the data collection continued, different kinds of 'reading' emerged (for example 're-reading). It became clear that the code of '*re-reading'* needed to be added and differentiated from the code of 'reading', as 're-reading' text is a 'metacognitive process' rather than a form of 'cognitive processing' (as when it occurred, students had stopped to monitor comprehension, and then made a decision that they had not fully understood something, and needed to reread it again – thus, they were 'metacognitively' processing). This led to the re-definition of codes and categories, allowing the process of 're-reading' to be acknowledged separately from 'reading'.

In order to clearly see, and ultimately understand the metacognitive processing, it is necessary to not only be able to identify and isolate this form of processing, but also to be able to indentify and isolate other processing that occurs and interacts with metacognition. So even at an early stage of data collection, the research attempted to look for broad categories of processing (namely, *Cognition, Metacognition, Effect of Environmental Factors*, and *Being Off-task)* from the initial open codes.

Table 14. Level 1: Tentative Coding Categories

Cognition
Metacognition
Effect of Environmental Factors
Being Off-task

However, looking at the initial codings and these tentative categories (and as more data was continually coded and analysed), it became clear that all of the codes did not fit neatly into these categories, and that the categories of physical state and affective state might need to be considered. At this stage, the literature was consulted to look at the issues of cognitive and emotional processing, to try and understand the state of the art in this field. As was discussed in the literature review, whether or not cognition and emotion are distinct categories of processing is still being researched. However in this thesis, the data showed these categories to occur and impact the learning process in distinctly different ways, and as such, they generated different definitions and subsequently became different processing categories.

Table 15. Level 2: Tentative Coding Categories

Cognition
Metacognition
Affective & Physical States
Being Off-task

As the data collection continued, these categories were borne out, all coded instances could fit inside these categories. At this stage of data analysis, it seemed that the existing codes fitted into these categories in the following manner –

Table 16. Cognitive Processing Codes

CORE CATEGORY	**Constituent Codes (Gerunds)**
Cognitive Processing	Agreeing, Comprehending, Decoding, Discussing others' approach, Discusing task, Interatcing, Reading, Re-reading, Not knowing, Not understanding, Perceiving, Problem-solving, Recognising, Reasoning, Quanitifing Learning, Wondering, Writing

Table 17. Affective and Physical States

CORE CATEGORY	CATEGORY	SUB-CATEGORY	Constituents (Gerund Codes)
Affective and Physical States	Affective State	Drifting	Drifting, Wondering, Talking about unrelated topic, Thinking about personal issues, Wanting help, Wanting to interact with others
		Positive state	Affective State
		Negative state	Affective State
	Physical State	Positive state	Physical State
		Negative state	Physical State

As data analysis progressed, the category of 'Affective and physical states' were separated, and the subcategory of 'Off-task' (drifting) was also removed from within affective state processing, and became a stand-alone category. The data could not back up its inclusion under 'Affective state processing', and the prevalence of 'Off-task processing' through all data sets showed it to be a significant processing category in its own right. So at this stage, 5 main categories came into existence:

Table 18. Level 3: Final Coding Categories – 5 CORE Processing Categories

Processing Categories
Cognitive Processing
Metacognitive Processing
Affective Processing
Physical Processing
Off-task Processing

At this stage it was decided that categories other than metacognition, once identified, and deemed discrete, stable, well-defined and important to the research, would be held as single categories, made up of dimensions (i.e. positive and negative affective processing, internal physical processing, and external/environmental physical processing), but these dimensions would not be analysed further. However the concept of metacognition, as the mainstay of this study was analysed in more depth. In other words, once metacognitive processing was identified, and all that was not metacognitive isolated and defined, all metacognition data was re-examined. So while all the data was examined until saturation and the higher categories of cognition processing, metacognitive processing, affective and physical processing, and off-task processing emerged, an iterative process ensued to further articulate the sub-categories and dimensions of metacognitive processing.

This iterative process revealed three *sub*-categories of metacognition, namely, Metacognitive Knowledge, Metacognitive Monitoring and

Metacognitive Control, which initially housed all the metacognitive codes in the following way.

Table 19. Metacognitive Knowledge

ELEMENTS	SUB-ELEMENTS	CONSTITUENTS (Gerund Codes)
Metacognitive Knowledge of Cognition	Declarative Knowledge	Cognitive knowing, Declarative knowing, Strategic Knowing
	Procedural Knowledge	Cognitive knowing, Procedural knowing
	Conditional Knowledge	Conditional knowing
Metacognitive Self Knowledge		Self-knowing, Using existing knowledge
Metacognitive Task Knowledge		Task knowing, Listing materials places

Table 20. Metacognitive Monitoring

ELEMENTS	CONSTITUENTS (Gerund Codes)
Metacognitive Monitoring of Affective Processing	Assessing/ Judging, Judging personal feelings about the task, Self-knowing, Thinking about personal issues, Using existing knowledge, Wanting to interact with others
Metacognitive Monitoring of Physical Processing	Assessing/ Judging, Questioning task, Searching for materials
Metacognitive Monitoring – Ease of Learning	Assessing/ Judging, Expecting outside assistance, Judging ease of learning, Judging task difficulty
Metacognitive Monitoring – Judgment of Confidence	Assessing/ Judging, Confidence Judging, Unsure how to proceed, Wanting help
Metacognitive Monitoring – Judgment of Learning	Agreeing, Assessing, Discussing others approach, Discussing task, Questioning task, Reviewing, Task monitoring, Thinking about time issues
Metacognitive Monitoring – Monitoring of Environment	Assessing

Table 21. Metacongitive Control

ELEMENTS	CONSTITUENTS (Gerund Codes)
Metacognitive Control of Affective State	Adjusting, Choosing, Focusing, Refocusing,
Metacognitive Control of Physical State	Adjusting, Choosing, Refocusing
Metacognitive Control of Learning	Adjusting. Allocating study time, Choosing, Focusing, Goal-setting, Finding another student, Moving on, Re-reading, Planning, Planning to work together, Quantifying learning, Prioritising, Refocusing, Regulating, Repeating, Reviewing, Searching for materials

The memoing process helped refine this code list. Firstly, certain codes were collapsed together. An example of this would be that initially metacognitive knowledge contained the separate categories of 'declarative, procedural and conditional knowledge'. Initial examination of data seemed to suggest these separate categories (each containing different codes). This was also in line with the literature on metacognition (Dunlosky & Metcalfe, 2009; Pintrich et al, 2000). However as data analysis progressed, this category division did not hold up (for the most part, these categories did not occur separately, but together as a single thought unit composed of two or all three of these categories), and as such was collapsed. Secondly, the definitions of some codes did not fit all utterances to which they were ascribed, requiring either re-coding, re-defining or creation of new codes. An example of this was the creation of a new code - Monitoring of Affective State (M-AS). This was necessary to distinguish such monitoring from other types of monitoring (e.g. monitoring of learning progress).

At the end of the focused coding stage, five conceptual types of processing had been identified as occurring during independent learning. At this stage, the decision was made to re-define these in terms of processing, as this was a more accurate picture of what the data was seeing. This meant, for example that 'affective state' was re-categorised as 'affective processing', as it was the processing about the affective state that was seen in the data. 'Off-task' became 'off-task processing', as this was also what the data was showing. Within these five types of processing, sub-categories and the distinct dimensions of these sub-categories were isolated, as can be seen in the tables above outlining the component breakdown of metacognitive processing.

4.4 Theoretical Coding

The goal of this coding stage was to confirm the categories of metacognition, and of the 'other' processing categories, and to be able to connect these categories together. At this stage 5 processing categories had been confirmed and defined:

- Cognitive Processing: Processing when learners are engaged with understanding the content of the task or doing the task, but not with *how to* do the task
- Metacognitive Processing: Processing occurring when learners are concerned with *how* learning should proceed

- Affective Processing: Processing involving learners' emotions, moods, motivational responses and states
- Physical Processing: Processing involving how the learners are feeling physically, and how the physical environment is impacting
- Off-task Processing: Processing occurring when the learners go off-task, become distracted, losing concentration

Three metacognitive processing categories (knowledge, monitoring and control) with twelve metacognitive processing subcategories were generated, which are listed and defined in table 22.

Table 22. Metacognition Codes

1	M-AP **Monitoring of Affective Processing**	Judging one's affective or emotional state and its impact on learning.
2	M-PP **Monitoring of Physical Processing**	Awareness of positive or negative physical internal states or of the physical environment, and the possible causes and/or impacts of this
3	MC-COAP **Metacognitive Control of Affective Processing**	Taking action to change or maintain affective processing
4	MC-COL **Metacognitive Control of Learning**	Taking action to maintain or change present course of learning actions
5	MC-COE **Metacognitive Control of Environment**	Taking action to change or maintain environmental conditions affecting learning
6	MC-PP **Metacognitive Control of Physical Processing**	Taking action to change or maintain physical state

7	MK-CK **Metacognitive Knowledge – Cognitive Knowledge**	Knowledge about cognition and cognitive strategies
8	MK-SK **Metacognitive Knowledge – Self Knowledge**	Knowledge of self; strengths and weaknesses, motivations and needs
9	MK –TK **Metacognitive Knowledge – Task Knowledge**	Knowledge of task and how it will influence how learning should proceed
10	MM-EOL **Metacognitive Monitoring – Ease of Learning**	Making an assessment of how easy or difficult a learning item will be to undertake
11	MM-JOL **Metacognitive Monitoring – Judgment of Learning**	Monitoring comprehension of learning; monitoring progress of learning, the correctness or appropriateness of learning activity
12	MM-MOE **Metacognitive Monitoring - Monitoring of Environment**	Monitoring how the environment is affecting the progress of learning

As can be seen from table 22, by this stage the codes have again undergone changes and re-defining. One example of this is the earlier division of metacognitive knowledge into declarative, procedural and conditional knowing. Earlier in the data analysis process, this division seems necessary and useful (and mapped onto metacognitive frameworks from the literature). However, as data analysis continued this division did not hold up, so the three codes were collapsed back into the single code of cognitive knowing. “Not holding up” means that the codes did not consistently present as discrete items in the data - what presented was usually a combination of two or even all three codes simultaneously. There were some utterances where it was possible to attribute only one of these codes (i.e. declarative knowing), but across all the data, such instances were few.

4.5 Conclusion

The coding process resulted in the coding of all verbalized thoughts and visible physical activity (from transcribed video observations) of all learning episodes in their entirety. No elements of the learning episodes were excluded or not coded. This provided a complete picture of the learning experience, which was possible to code in terms of processing types. By rigorously using both memoing and constant comparison from the beginning to the end of the coding process, it was possible to not only uncover the types, categories and dimensions of processing occurring, but also to see the interplay between them. This interplay will be illustrated and discussed in the Findings and Discussion chapters that follow.

Chapter 5: Coding in Context - Case Studies

5.1 Introduction

In a study guided by Grounded Theory Methodology, particularly one that utilizes Verbal Protocol Analysis (VPA) as a data collection tool, the process of coding data can be tedious and arduous due to the demands of line-by-line analysis of content. In this study, more than 80 codes and 20 categories were initially identified and through a process of constant *memoing*, re-reading and analysis of over two thousand pages of verbalized thoughts, these were eventually reduced to more focused codes and categories. The presentation of the codes and categories emergent from this process can make for quite turgid reading. Therefore, in an attempt to make the explanation of the coding process more accessible, the initial sections of this chapter present annotated extracts from two cases that allow the reader to experience both the richness and complexity of the coding processing in a contextualized situation.

5.1.2 Coding Density

One of the reasons for the 'density' of the picture of processing during learning is the result of how this processing occurs. Movement between processing categories, and between dimensions and sub-elements of those categories often occurs at the microsecond level. An example of this could be movement from cognition to metacognitive monitoring to metacognitive control back to cognition as shown in Table 23 below.

Table 23. Microsecond coding

Learner is writing (Observed)	Cognition: Learner is engaged with his essay content
⇓	⇓
"No good" (Verbalised - VPA)	Metacognitive Monitoring: Learner realizes his writing is not adequate
⇓	⇓
"Gotta re-write this paragraph" (Verbalised-VPA)	Metacognitive Control: Learner decides to stop, and go back
⇓	⇓
Learner is re-writing (Observed)	Cognition: Learner is engaged with essay content again

In the above example (which lasted 3 seconds), the occurrence of cognition, metacognitive monitoring, metacognitive control and re-occurrence of cognition took place within a couple of seconds. So while learners stayed engaged in single categories of processing for longer periods of time (sometimes seconds, other times minutes), there was also very fast interplay between different dimensions and sub-elements of processing, resulting in very dense coding, often at the level of single words. Therefore, the recording of movement and processing at this level added to the overall density of data.

This example also illustrates the need to show the data analysis and coding in contextualized excerpts. In the above example, the learner utterance of "No good" is coded as '*metacognitive monitoring'* . Metacognitive monitoring is a metacognitive activity that interrupts the learner's cognitive processing – in this case, the learner made a judgment on his ability within the learning task being undertaken – i.e. he decided that his writing was 'no good'. This led the learner into a metacognitive *control* decision, which was to re-write the paragraph, which changed the course of the learning. Viewed out of context, neither the logic nor accuracy of this coding decision would be apparent. Also, at other intervals during learning, the same utterance ('No good') could be part of any type of processing (i.e. affective processing). So rather than coding the language used to designate codes, it is the purpose of the language used 'at that moment' that is coded. The presentation of case studies allows this to be visible and understandable, whereas, for example a 'coding list' (as presented in the previous chapter) does not.

In this section, two case studies are presented. The background to the learning task undertaken in the case studies is also given. As a result of the length of the learning tasks in this study, the case study transcripts cannot be presented in their entirety. Therefore, what is presented is extended excerpts from each case study (full transcript examples are presented in Appendices G, H and I). Running alongside these excerpts are the memoing and coding processes of the research (memos are in italics). The excerpts in each case study, though not consecutive, are sequential.

5.2 Case Studies of Learning: Processing in Context

In this section, the reader will have a chance to visualise 'learning in action'. In the research process, all verbalizations (both in individual VPA sessions and group learning sessions) and observable actions were transcribed and coded. This is unlike some coding projects, and indeed some grounded theory projects, where the researcher(s) may code and analyse only those elements they seek to uncover and understand. However in this project, it was necessary to be able to understand and map all that was occurring during the learning process. This has resulted in a dense complex picture of learning activity. Case study 1 shows learning in an individual independent learning setting, and Case study 2 shows learning in a group independent learning setting. These were chosen to show how both individual processing and social processing occur, and to illustrate what this means for the interplay between all forms of processing occurring during independent learning.

5.2.1 Environment

At the university where this research was undertaken, there was a large self-access learning centre. This was chosen as the venue for this research for two specific reasons. Firstly, students were familiar with the environment of the self-access learning centre. Before the research was undertaken, participants were asked where they thought would be a good physical space to engage in the learning tasks, and this centre was the unanimous answer. Secondly, the centre, which was designed for independent learning, contained a vast number of language learning materials for all forms of language issues, and learning related issues, as well as support staff. As such students had access to a range of materials and physical spaces within the centre. All participants had received several orientations to the centre and to the materials and services offered. The centre was staffed, so students could ask for assistance. Also, the centre housed 10 small adjacent rooms, that students could independently book and use for group work or individual work. All of these rooms had desks and chairs and internet-enabled computers. This allowed for the deployment of simultaneous sessions. The rooms had glass-fronted walls, allowing the researcher to monitor all participants and rooms, without entering and disturbing. The activity within the study rooms was video-recorded. Furthermore, the researcher provided all participants with portable voice recorders, so that they were free to move from their initial rooms into the centre, while being continuously recorded.

5.2.2 Case Study 1: Individual Independent Learning

This case study involves participant C, who has for the purposes of the research, been given the pseudonym, Hiroshi. In this learning task, Hiroshi was asked to create an independent language-learning plan (see Table 24) that he would then undertake for the following 8 weeks (he would later discuss it with his teacher and perhaps revise this plan). This task was embedded into the course Hiroshi and all other research participants were taking, so was a real learning task for him. He was given 90 minutes to complete this task, and was provided with the sections below to complete. Prompts were provided, as the learners in this study were not familiar with creating independent learning plans.

Table 24. Independent Learning Task 1

Create your independent learning plan	
Big Goal	What is the area or areas of English that you most want to improve? Why? If you have a clear goal, and a clear reason for this goal, it will be easier to plan and learn successfully.
Achievable Smaller Goal(s)	What specific things can you focus on to achieve your bigger goal? Choose one or more small goals. Remember, you will have 8 weeks to achieve them.
Interests and Motivation	Sometimes it can be difficult to stay motivated when you are doing independent study. One way is to use your interests in your study. Can you use any of your interests in your learning to help you achieve your goal? Or, do you have any other ideas to keep your motivation up?
Learning Styles	We are all individuals who learn best in different ways. What do you know about your learning styles, and how can you use your learning styles effectively in this plan?
Resources	Please list some resources you will use for the next 8 weeks for this learning plan. Resources can be books, websites, movies, people or places – anything you will use. Discuss why you chose them, and how you will use them to help you achieve your learning goals.
Learning	Successful language learning involves more than just trying to memorize new language. You also have to understand new language, think about and monitor your ways of learning, review language, use language and experience language. Please write here about how you will organize your learning. Remember, you will have two ninety-minute periods each week for this independent learning.
Evaluation	What can you do regularly during these 8 weeks to see if your learning is effective? What can you do at the end of 8 weeks to see if you have achieved your goal, or how much you have improved?
Anything else?	Is there any other information you would like to include in your plan?

Hiroshi was a Japanese junior student (3rd year undergraduate) at the university where the research was undertaken. In Japanese universities, students begin job-hunting during their third year at university, in the hope of securing a position by the early part of their fourth and final year at university. This situation is reflected in Hiroshi's choices for his learning plan and his concerns. During the task, he is thinking about studying for the Test of English for International Communication (TOEIC), an English language proficiency exam. This test most widely recognized and required by Japanese employers seeking employees with English proficiency. Test results give the student a score out of 999 points, and employers can base their level of English language proficiency requirements on this point scale.

The excerpts provided below are verbatim transcriptions from Hiroshi's verbal protocol (vocalization of meta-level thinking), and some observations from the video recording are noted in italics (when an action occurred that was not verbalized). So while these excerpts have been chosen from the full transcription, each individual excerpt provides all consecutive thoughts and actions without exclusion. They are however translated into English – Hiroshi chooses to speak mostly in Japanese, which, as he noted himself, was the most natural and practical for him, as he was thinking in Japanese. Hiroshi's transcript is provided on the left, and on the right are the researcher memos, which explain Hiroshi's thoughts and corresponding processing categories and/ or pathways.

The gaps (or line spacing) in the transcripts that follow are not indicative of pauses, but are rather to allow the movement into a different form of processing to be clearly visible in written form (actually pauses are indicated with '…').

Hiroshi

Table 25. Case Study 1: Excerpt 1

Hiroshi: Excerpt 1	Coding	Researcher Memos
(Hiroshi is reading)	Cognitive Processing	*Hiroshi begins cognitively processing as his reads the task.*
I'm not sure about this.. Ah English is difficult....	Metacognitive Monitoring – Judgment of Learning	*He then moves into metacognitive monitoring, making a judgment of learning about his understanding of the task, and also a judgment of ease of learning – that "English", the object of the task, is difficult*
What should I do? Hmm (Begins to write on the paper)	Metacognitive Control of Learning	*He metacognitively controls, deciding to make notes.*
Well, at the moment, what I want to do is increase my TOEIC score *(reading)*	Cognitive Processing	*He returns to cognitive processing, deciding what he wants to study and relating that to the instructions and the prompts provided.*
So this means that..... my big goal will be increasing my TOEIC score, and my small goal will be, if I look at the different TOEIC sections…OK 860.... 860 points, 860 points would be ok...hmm	Metacognitive Monitoring – Judgment of Learning	*He monitors his thinking, and makes a judgment of confidence ("OK"), that he now knows what he wants to focus on.*
(writing) to get 860 points, in English is.... *(writing)*	Metacognitive Control of Learning	*He metacognitively controls his learning by stopping thinking about what he will study, and decided to write, making notes.*
because...because I want to be a teacher, be a teacher. If I get 860 in TOEIC, I will	Cognitive Processing	*He moves into cognitive processing, focusing on his choice of learning, and*

pass...pass...test Because, because I want to be a teacher, be a teacher. If I can get 860 points in TOEIC I will pass..pass.. the exam…the exam		*English language related to the topic* *(to pass an exam, to be exempted from an exam)*
Ah, its not pass, what is it...	Metacognitive Monitoring – Judgment of Learning	*He makes a judgment of confidence, that he does not have the necessary language to express what he wants to say.*
(takes out electronic dictionary) to be exempt...exemption..... ah here it is *(erasing, writing)*	Metacognitive Control of Learning	*He metacognitively controls his lack of knowledge of correct term by using a resource – an electronic dictionary.*
Ah I feel a bit nervous..	Affective Processing	*He enters affective processing, feeling nervous, but he does not respond to this processing.*
Exempt, exempted..exempt, exempt, exempted *(trying to correctly pronounce the word)* Exempt the first exam *(writing)*	Cognitive Processing	*He continues with cognitive processing, working through his language difficulty.*
Is this ok? Is it ok?	Metacognitive Monitoring- Judgment of Learning	*He monitors this, judging his learning, and being uncertain.*
Ah..I should have written down my current score, and want improve I want.	Metacognitive Knowledge – Task Knowledge	*His metacognitive knowledge comes into play, informing him how he could complete the task better, using prior knowledge and information.*
Ah that was a mistake....	Metacognitive Monitoring – Judgment of Learning	*He monitors, judging his learning progress as ineffective, mistaken*

What were my separate scores for listening and reading - I should know these...	Metacognitive knowledge – Self knowledge	*He realizes he should be using prior knowledge, that he should have this personal information*
Ah I made a mistake....what should I do....	Metacognitive Monitoring – Judgment of Learning	*He monitors again, judging his learning progress as ineffective, mistaken, and is unsure how to process*
What else is there to do *(starts to look through the paper plan)*	Metacognitive Control of Learning	*He metacognitively controls his learning by skipping ahead, and looking at another section.*
Interests and motivation...resources.... interests and motivation.. *(reading)*	Cognitive Processing	*He returns to cognitive processing, reading through the prompts for the next section.*

This excerpt in Table 25 shows Hiroshi moving, at times very quickly, between the different categories of processing (this excerpt was approximately four minutes in length). The most common movement is the back and forth interplay between cognitive processing and metacognitive processing.

Table 26. Case Study 1: Excerpt 2

Hiroshi: Excerpt 2	Codes	Researcher Memos
OK small goal…vocabulary, vocabulary, grammar, reading..and listening…there is no speaking in this test. That's it…hmm…Well, I have 8 weeks for this plan…so the time has come to start	Cognitive Processing	*Hiroshi is engaged in cognitive processing, working through a section of the task, by following the prompts provided, and thinking about the task elements.*
(looking out of the room) I wonder what everyone else is doing now? Well, my handwriting is not good…but this is probably ok..	Off-task Processing	*He moves into off-task processing, wondering what other students are doing, and thinking about his handwriting. Although he is off-task here, his thinking is still related to the task at hand (unlike some off-task processing).*
(reading)	Metacognitive Control of Learning	*He controls this, and returns to cognition and the content.*
Well first…..vocabulary	Cognitive Processing	
(looking out of the room again) Oh, there is Mai…I guess she is speaking English-amazing..is she thinking in English as well? I can't do that…	Off-task Processing	*He quickly goes off-task again, noticing another participant walking by. He wonders about how she is doing the task, viewing her language ability as greater than his.*
Thinking in English is not possible for me….hmmm…	Metacognitive Self-knowledge	*His off-task processing leads back to the task, as his metacognitive self-knowledge – that he needs to undertake this task by thinking in English – refocuses him into cognitive processing*
First is grammar, no, vocabulary, vocabulary	Cognitive Processing	
But I don't know if I really want to do it…..	Metacognitive Monitoring – Judgment of Learning	*He monitors, judging his learnign*
Actually, I really just don't want to study at all…	Affective Processing	*His affective processing with regard to the task appears*

In this excerpt (Table 26) Hiroshi is distracted from learning and engages in off-task processing. Interestingly, here the off-task processing is related to learning and the task at hand. It is not divorced from the learning and does lead him into metacognitive knowledge and back to cognition about the task.

Table 27. Case Study 1: Excerpt 3

Hiroshi: Excerpt 3	Coding	Researcher Memos
(Hiroshi has left the room, and is in the learning centre looking at textbooks for TOEIC)	Metacognitive Control of Learning	*Hiroshi metacognitively controls his learning, deciding and acting on the decision to search for useful resources.*
Ah all the books here are old. This is too old- it is for the older version of the test. 860 level text....ah but I think this is also for the old version	Cognitive Processing	*He cognitively processes, thinking how the books can or cannot help him.*
.... Actually I don't really know.........what should I do...	Metacognitive Monitoring: Judgment of Learning	*He monitors and realizes his is not sure how he should proceed*
Ah are there any of my classmates around - I want to get some other opinions about this	Metacognitive Knowledge: Cognitive Knowledge	*Seeing a classmate, his metacognitive knowledge makes him aware that getting others input would be helpful.*
Ah look at that student there - she is writing loads!! Uh oh, I'm in trouble. Everyone is probably doing that. Ah look, there is Ayaka and she is writing too - amazing!! There are all doing it....	Affective Processing	*Negative affective processing occurs as he notices other participants working, and feels negative about his comparative progress.*
(student goes back to the room)	Metacognitive Control of Learning	*He controls his learning and environment by returning to the room.*
Everyone is working hard	Off-task processing	*He becomes distracted. Looking outside the room*

		at other students
Uh-oh...	Affective Processing	*He enters affective processing.*
OK. So now...this is...topic.... goal....	Metacognitive Control of Learning	*He controls his learning again, refocusing.*
if it is to become a good husband.. to do this I have learn how to cook well, or things like that, so I if think in this way if it is to get 860 in TOEIC, I need to be able to use vocabulary and then.... eh...reading...Ah! Read, read, read what? Read paragraph, paragraph	Cognitive Processing	*He engages in cognition, using life examples to help him understand proceed with the task*
(writing)	Metacognitive Control of Learning	*He controls his learning, deciding to stop thinking and to write.*
(writing)	Cognitive Processes	*He engages in cognition as he writes*
Read paragraph quickly...Is quickly correct? *(checks dictionary)* Yes quickly..........and ...understand.... understand clearly.. What about listening...In order to get 860 points...listening.. What should I do for listening... Be able to read quickly and understand clearly.. that is necessary. Then for the listening side?... How can I increase my listening ability?	Cognitive Processing/Metacognitive Monitoring Judgment of Learning / Metacognitive Control of Learning/ Cognitive Processing	*His cognition is interspersed with control, judgment, choosing to check with a resource, and make a confidence judgment. He continues with the section.*

Ow, my tooth hurts	Physical Processing	His physical state impacts.
...I hope I can finish up with the dentist today...	Off-task Processing	It causes him to go off-task.
Eh...understanding clearly...Ah listening...what am I supposed to do for listening.... listening...I cant break this down...hmmm...So listening is...to listen is... to improve my ears, I should... Ah not paragraph - it should be passage. Passage *(checking dictionary)* yeah Passage	Cognitive Processing	*He cognitively engages with the task again, thinking about how he should study, and the language needed to write his learning plan.*
(sitting back, yawning) I'm not really sleepy, but I am just yawning	Metacognitive Monitoring of Physical State	*His physical state interrupts his learning. He monitoring his physical state, understanding it*
Yawn, what is yawn in English? *(checking dictionary)* YAWN...	Off-task Processing	*He goes off-task, thinking about his physical state.*

In this excerpt (Table 27), we see all categories of processing and many of the category dimensions interacting. We see combined metacognitive knowledge – cognitive knowledge and self-knowledge – in Hiroshi's desire to work with others, and in his understanding of the benefit of working with others. We can also see negative affective processing occurring, but not being consciously controlled for. Finally, we see physical processing, monitoring of this physical processing, and physical processing leading into off-task processing. These processing pathways will be analysed and discussed in detail in the discussion chapter.

5.2.3 Case Study 2: Group Independent Learning

This case study illustrates the manner in which research participants undertook the second learning task in this study. This task was undertaken in groups of four, and occurred in the same physical space (Self-Access Learning Centre) as the learning task in case study one. This task involved reading an academic article and preparing for a short group presentation about the article. Groups were given two ninety-minute learning periods (on two different days) to complete this task. No further instruction was given. The group was given the following English language article by Zimmerman (2002) - *Becoming a Self-Regulated Learner: An Overview*.

This group comprised of three female participants and one male participant. It is worth noting that, although all students were 3rd year undergraduate students, the three female participants were all aged between 20 and 23, while the male participant was a mature student, aged 35. Given the Japanese cultural context, this has implications for group interactions, in terms of both gender roles and age-based 'seniority'. These factors influenced how the participants interacted, and as a result of this, how the learning task progressed.

In the presentation of data that follows in Case Study 2, the translated excerpts are provided in parallel with corresponding coding, with the researcher memos inserted at the end. The letters A, B, C and D indicate the four participants. Rather than individual processing as seen in the previous case study, here we see social processing in action.

Table 28. Case Study 2: Excerpt 1

Group transcript: Excerpt 1	Coding
A: OK. C: So, let's speak in Japanese, OK? A, B and D: [laughing and nodding] C: This page so maybe uh, D: Speaking English	Metacognitive Control of Learning
C: Well, the first page is page 64, isn't it? A, B and D: Yeah. C: Page 64. B: What's page 64? C: The first page is 64. B: Oh right. C: Oh, this, it's 65. B: Uh-huh.	Cognitive Processing
C: So start from 64, and maybe the first person is from page 65 to B: Up until "Definition" C: Before "definition". Right.	Metacognitive Control of Learning

B: Yeah C: This is one section, I guess. This is one, and then the second is from definition to B: Definition to…Structure? A: Where is “Definition”? , D: Here..page 65. A: Thanks. D: Right. Right. Up until here is the second person. This is the second part. B: And then, from “Structure” to the end. C: That’s right. This is “self-reflection phrase”? Page 68?	
B: 68. Ah. C: What? Isn’t this a bit too short? D: This is fine.	Metacognitive Monitoring Judgment of Learning
C: What? B: It’s because 3 has a diagram. C: But because it has a diagram, so it’s OK.	Cognitive Processing
B: Yeah, it’s OK.	Metacognitive Monitoring Judgment of Learning
C: So we’ll make it the third part up until here, and then the last is from “self-reflection phase” to before “Notes”.	Metacognitive Control of Learning
C (continued): Well, it’s before “Notes”, isn’t it. D: Yeah. Until “Notes” on page 70, isn’t it? The fourth person? C: Isn’t it right? D: Yeah. C: And then, and then, each of us read it D: Read it, these A, B and C,	Cognitive Processing

D: What we think about C: We prepare to talk about what we think, well, we tell one another D: Yeah, yeah, yeah	
<u>Researcher Memos</u> *The group begins the task by metacognitively controlling how it will proceed – one participant (C) suggesting they do the task using Japanese, with two others in agreement. When the fourth participant attempts to change this, the others ignore the suggestion and proceed with cognitive processing – seeing what the text contains. But these interactions show 4 participants sharing a metacognitive processing space, with a metacognitive control outcome that directs the learning process and progress. The metacognitive control decision resulting from this will impact the learning outcome. Participant C again metacognitively controls the learning, dividing the text into 4 sections - one section to be read by each participant. As they try to divide up the text, meta-cognitive monitoring occurs in terms of how effective their divisions of the text are. The mechanics of how to do this becomes the content focus, as and such, shows a return to cognitive processing.*	

In the excerpt above in Table 28, participant C is a male mature student, and can be seen to largely metacognitively control how learning progresses. Apart from another participant questioning his decisions at the beginning of the task, all participants follow his lead – they shared in this metacognitive processing through their tacit agreement and subsequent following of his suggestion.

<u>Table 29. Case Study 2: Excerpt 2</u>

<u>Group transcript: Excerpt 2</u>	Coding
[Having engaged in individual reading of different sections of the text, the participants are now discussing it]	
B: To decide by one self. For example, I, I did it this way this time, but then what was I doing before? Oh it's improved. Or, like, I did this way, you did it that way. This part of mine is better than yours. Or, I should	Cognitive Processing

improve this part more than you do. Something like that. A: Comparison? B: Right, it's comparison. Things I did before, your partner, and assignments that a teacher gives…you compare those things anyway, that's the first thing. And then the second is, casu, casucer [Student can't read the word properly]…don't know but this, well, something like by thinking about why a certain cause arose, why I failed, why I succeed, you judge yourself. For example, in a math exam you got this much score, say eighty. Why you missed twenty. Why you successfully got eighty. You think about these things, it says. Those two things. Then, well… A: What is the second one you just explained just now included? B: Oh, this is the second thing within self-judgment. A: Yes. B: And, as I said earlier on, there are two major things, and I just explained about self-judgment but then the second thing, there is a thing called self-reaction, and there are two things within self-reaction, the first is feeling of self-satisfaction. So this is, your sense of the level of your satisfaction, and the other is positive affect in learning one's performance. It's like, positive effect? Self-reaction includes such as good things, things you thought were good, things you are satisfied with, but I'm still reading about this.	
A: OK. …It's good.	Metacognitive Monitoring Judgment of Learning
A (continues): Then, let's continue… D: oh, we booked here till ten, didn't we? A and B: Right	Metacognitive Control of Learning
D: I got the feeling that we won't finish everything. A: Right.	Metacognitive Monitoring Ease of Learning

D: In case we can't, another an hour? A: Yeah. B: Maybe A: Can't finish. B: today is Wednesday, so we read it individually A: Uh-huh. B: And we should be ready to share perfectly on Friday… D: And summarise. C: Yeah. D: Well, we can use that. Write them down by part. A: Uh-huh.	Metacognitive Control of Learning
B: What shall we do? Hey, shall we decide our homework? Things we should do today. Or shall we just continue?	Metacognitive Monitoring Judgment of Learning
C: I guess there is no harm deciding our homework. Read and summarise. D: Just like we did now. C: Yeah, yeah. Summarise	Metacognitive Control of Learning

<u>Researcher Memos</u>

Participant B, engaged in cognitive processing, explains her understanding of the content of the section of text she has read. This processing includes questions and understandings from other participants. She finishes her explanation with a judgment of learning – which she needs to continue reading.

Another participant metacognitively controls the group and the learning by moving them onwards, but again there is tacit agreement in part of the shared metacognition – they have decided to agree and follow the suggestion

Shared metacognitive monitoring now occurs as students discuss time left, and concern about their ability to complete the task. Participant D metacognitively controls the learning by setting a fixed time limit. Another participant shares in this metacognitive control of learning, by agreeing, and then deciding what needs to be done and when.

The sharing of metacognitive processing (otherwise knows as socially shared or mediated metacognition) is visible in the excerpt on Table 29. In the case of metacognitive monitoring, several participants verbalise their individual judgments of learning which combine and join together, resulting in metacognitive control of learning which impacts how the group proceeds. Also, when one participant appears to metacognitively control learning, this results in shared metacognitive control, as when others choose to follow his or her direction, they are making a metacognitive control decision to do so (whether silently or not, whether out of agreement or simply not wanting to make an alternative suggestion, or not having an alternative suggestion).

Table 30. Case Study 2: Excerpt 3

Group transcript: Excerpt 3	Coding
(Student A interrupts the discussion)	
A: When are we gonna do the presentation? B: It's…next Wednesday. A: Oh, it's written. Thanks.	Metacognitive Knowledge Task Knowledge
B: Then, do you think we should practice on Friday? D: Oh…	Metacognitive Monitoring Judgment of Learning
C: It's just that we tell Luke individually, so I guess we don't really have to practice (A and C: Uh-huh.) and just tell him in your words that you usually use. Five minutes…	Metacognitive Knowledge Task Knowledge

D: Individually. C: Yeah. Don't know well. So we sit as a group like this, (B: Oh.) and Luke comes to here (A: Uh-huh.) and just talk. A: Right, right. [48:35 Overlapping] C: Explain in your words. B: That's right. Five minutes, so about one minute per person. C: About one minute.	
B: OK. Got it, got it, got it.	Metacognitive Monitoring Judgment of Learning
A: Uh-huh. C: I don't think we need to be too nervous about this. B: OK.	Affective Processing
D: I'm tired. B: My concentration go on. …Not	Physical Processing
A: Well, I can't focus when it's very quiet. B: Oh. D: Why don't you listen to some music? A: Yeah, right. Like when TV is on, I can really focus. D: Can you? When I can see something visual moving, I tend to look at it. But when I'm listening to music, I can do lots of work. A: Is that so? B: You like somewhere quiet, don't you? C: Well, I prefer somewhere quiet. A: Huh. B: You always go to the library, don't you? C: Yeah, I do, I do. D: You are observing.	Metacognitive Knowledge Self Knowledge

B: Yeah, I always check. D: You are being watched. C: I can't focus if it's not quiet. B: I tend to talk. Well, I can't remember without mumbling to myself. A: I understand that. B: Yeah. D: Right.	
C: This [another participants mp3 player]…it's tiny. Great. D: Yeah. A: It's compact. C: It is compact, isn't it? D: You mean this? C: Does it have an audio function? D: None. Well, five years ago. C: Uh-huh. B: Five years ago, so you've been using it since you were a high school student? D: Quite a while ago. B: Wow… High tech. C: It's great that recent ones have audio functions, isn't it? B: Well, but if you press a button by mistakes during a lesson… C: Oh yeah. D: Like "apple". B: Yeah, yeah. D: Apple. C: I'm taking Russian class now. A and B: Wow. B: I was taking it too. C: Did you?	Off-task Processing

Researcher Memos
Participants use metacognitive task knowledge to impact the progress and direction of learning. They engage in cognitive processing about how to do the presentation. One participant (C) metacognitively monitors affective states, suggesting the task is not a cause for concern. Another participant comments on her physical state of tiredness, prompting another into physical processing about her lack of concentration. *Metacognitive self-knowledge processing is shared as participants discuss environments for learning.* *One participant goes off-task, distracted by another participant's mp3 player on the table. This leads all participants into off-task processing.*

In the excerpt above in Table 30, we can see how engagement with shared metacognitive knowledge related to the task actually moved processing away from the task into off-task processing, following a non-linear pathway – leading participants away from the learning task, rather than the perhaps expected linear pathway of immediately informing and / or modifying the task.

What the case studies presented here show is that the movement between and within (among dimensions) processing categories, is complex (in that the movement between categories, category dimensions and their sub-elements is not predictable) and it is non-linear in that it is not always moving in the direction of enabling the learning experience. This is expanded upon in the discussion chapter to follow.

5.3 Conclusion

The case study excerpts here have been provided as contextualized examples of the processing interplay and movement of the participants in this study as they engaged in independent learning, in individual and group contexts. This has been done to provide the reader with a sense of the flow of thought and progress as a learner (or learners) move forward with an independent task, and to show how this flow involves the movement both back and forth between processing types, and at other times, through a range of processing types. What is perhaps not clear from this chapter (and from the case study form of presentation) is that the processing types and codes attributed to the thoughts and interactions of the participants seen here are the result of a 24 month constant comparison data analysis process (which also involved the reviewing, reworking and rewriting of memos), across and between a much larger data set (2000 pages of data). The wider findings from this data set are discussed in the next chapter.

Chapter 6: Interplay of processing in independent learning

6.1 Introduction

As discussed in previous chapters, this research was conducted using a grounded theory methodology to examine the concept of metacognition in an independent learning context. As such, there was no initial hypothesis to prove. Instead, analysis of the data has developed a data-driven snap-shot of metacognitive processing, and in fact, of all conscious thought processing occurring during independent learning. All categories and definitions have been developed and defined through the constant comparison methodology, and were constantly refined and then ultimately confirmed when this methodology led to a point of theoretical saturation.

The level 2 data in the study comprises 21 learning episodes, each approximately 90 minutes in duration, constituting 31.5 hours of learning. A theoretical sample of 17 students was used. As discussed in the research methodology chapter, three separate learning tasks were used to elicit the data, which involved individual, pair and group learning scenarios.

This chapter presents the findings from the study, describing the five types of processing and corresponding sub-elements emergent from the coding process (typology of processing), detailing the instances of occurrence of the different types of processing, and the frequency of interplay between each type of conscious thought processing during independent learning.

6.2 Typology of processing that occurs during independent learning

A typology of five *conscious thought* processing categories (as illustrated in Table 31) has emerged from this study. These categories include: Cognitive Processing, Metacognitive processing, Affective Processing, Physical Processing and Off-task Processing.

Table 31. Typology of Processing Categories during Independent Learning

Cognitive Processing
Metacognitive Processing
Affective Processing
Physical Processing
Off task Processing

Analysis of the data resulted in the following definitions for these concepts within the context of independent learning, as illustrated in Table 32.

Table 32. Processing Categories and Definitions

Processing Category	**Definition**
Cognitive Processing	When learners are engaged with understanding the content of the task or doing the task, but not how to do the task.
Metacognitive Processing	When the learners are concerned with how learning is or should proceed
Affective Processing	When learning is interrupted or affected by the learners' emotions, moods and learning preferences (in terms of what to learn and how to learn)
Physical Processing	When learning is interrupted or affected by the learners' physical state, or by the physical environment
Off-task processing	When learning is interrupted by learners becoming distracted by either external or internal factors

At the centre of this research project was understanding metacognition in independent learning, and the findings related to this concept are illustrated in the following section.

6.3 The elements of metacognition: definitions and examples

The data shows that metacognition involves three different types of processing – metacognitive knowledge, metacognitive monitoring and metacognitive control, which are defined in Table 34.

Table 33. Upper Categories of Metacognition and their Definitions

CATEGORY	DEFINITION
Metacognitive Knowledge	Knowledge learners possess about how to learn that can be used to influence the learning process. This knowledge can be strategic knowledge, self knowledge or task knowledge
Metacognitive Monitoring	Any judgments or queries made by learners that concern how learning is progressing, or how learning should progress
Metacognitive Control	Any decisions or actions taken by learners that affect the progress of the learning task

These three categories break down in the following way to provide a more detailed picture of metacognitive activity. The three tables below provide definitions and examples of each sub-category of metacognition at a more granular level.

Table 34. Types, definitions and examples of metacognitive knowledge

SUB-CATEGORY	DEFINITION	EXAMPLES
Cognitive	Knowledge about cognition and cognitive strategies	Compare the letters which I write...the letters which I write every week. *(Student illustrating knowledge of comparisons as*

Knowledge		*a way of evaluating her work)* Website, read an article on web and get some vocabulary...3 to 5 a week...use those words in letters *(Student illustrating knowledge of the need to use new vocabulary to assist memorization)*
Self Knowledge	Knowledge of self; strengths and weaknesses, motivations and needs	Ah, I hate learning vocabulary, but maybe I should do because I need vocabulary I don't like using that textbook I'm interested in life, ahh, people, so I can keep, I think I can keep my motivation. *(Student thinking about using movies as a source of new language)*
Task Knowledge	Knowledge of task and how it will influence how learning should proceed	I must answer all the sections Not everyday but twice a week during the class times...so for 8 weeks, that means I should be planning for 16 study periods

Table 35. Types, definitions and examples of metacognitive monitoring

SUB-CATEGORY	DEFINITION	EXAMPLES
Ease of Learning	Making an assessment of how easy or difficult a learning task or element of the task will be to undertake	Difficult Easy, right? Ah this section is going to be the most painful to do
Judgment of	Monitoring of comprehension, progress	I don't know if we have got all the points we

Learning	and appropriacy of ongoing learning	need What way should I do this? I think this is ok Yeah that part is finished well now
Monitoring of Environment	Monitoring how the environment is affecting the progress of learning	Can I leave this room and work somewhere else. It is too hot? I am going to use the computer over there
Monitoring of Affective Processing	Judging one's affective or emotional state and its impact on learning.	I'm very depressed when I think about my job Why can't I concentrate?
Monitoring of Physical Processing	Judgments of positive or negative physical states, and the possible causes and/or impacts of this	I'm tired because I'm stressed My stomach hurts..maybe I ate to much I think I should eat something

Table 36. Types, definitions and examples of metacognitive control

SUB-CATEGORY	DEFINITION	EXAMPLES
Control of Behaviour	Taking action to maintain or change the course of learning activity	Let's come up with some interview questions. Let's think what kind of questions will come up Student erases and rewrites
Control of Environment	Taking action to change or maintain environmental conditions affecting learning	huh....right... resources, maybe I will go to SALC to see some books.. *(Student choosing to change location to a location where more resources for the task are*

		available)
Control of Affective Processing	Taking action to change or maintain affective or emotional state	I need to just forgot about the microphone and concentrate.
Control of Physical Processing	Taking action to change or maintain physical state	I am sleepy, so I will turn off the heater

Note: In this study both monitoring and control of affective and physical processing are considered metacognitive monitoring and metacognitive control, taking the position that by monitoring or controlling such states, they have been cognized prior to this (see the literature review chapter and the discussion chapter for further discussion of this).

As the goal of this thesis was to develop a clearer mapping and deeper understanding of metacognition, this required the delineation of its categories and sub-categories. In the presentation of findings that ensues, an instance of metacognitive activity is an instance of any one of the categories listed above. If an instance of a metacogntive processing activity, for example, *Ease of Learning*, is followed by a control of behaviour, this is considered as two instances of metacognition, even though it is not interrupted by non-metacognitive behaviour (i.e. cognition, affective state). It should also be noted that the instances discussed are not time-dependent, and so a high instance of a certain type of activity does not necessarily mean that more time was spent on that activity than on another with lower instances of occurrence

6.4 Findings from the three tasks

This section presents findings from the full data set, encompassing all participants and all learning tasks.

6.4.1 Task 1 Findings

Task 1 required subjects to create an 8-week independent language-learning plan that they would later undertake (as illustrated in the case study one of Hiroshi in chapter five). Information about which language area to study, and how to undertake this study was not provided; subjects were free to choose both the language content to study and the manner of study. However, they were provided with a structured learning plan (see Appendix E) to complete during this task that had a linear structure and specific prompts for each section. So although this task was independent, and performed without guidance, there was a clear structure to follow through the provided question and answer format. However, the participants were unfamiliar with this task.

Eight individual students undertook Task 1. Table 37 shows the numerical instances and percentage of instances of the five types of conscious thought processing, and the breakdown of instances of the three sub-categories of metacognition; metacognitive knowledge, metacognitive monitoring and metacognitive control.

Table 37. Task 1: Instances and Percentages of all types of Processing

(100% = all processing that occurred during the learning task)

Participant	**A**	**B**	**D**	**E**	**F**	**I**	**M**	**P**
Total Codes	81	76	129	80	141	97	157	188
Affective Processing	0 0%	4 5.3%	6 4.6%	3 3.8%	9 6.4%	2 2.1%	7 4.5%	2 1.1%
Physical Processing	0 0%	1 1.3%	5 3.9%	2 2.5%	2 1.4%	6 6.2%	5 3.2%	4 2.1%
Off-task Processing	2 2.5%	0 0%	9 7%	7 8.7%	8 5.6%	0 0%	4 2.5%	1 0.5%
Cognitive Processing	32 39.5%	27 35.5%	38 29.5%	24 30%	50 35.5%	36 37.1%	62 39.5%	67 35.65%
Metacognitive Processing	47 58%	44 57.9%	71 55%	44 55%	72 51.1%	53 54.6%	79 50.3%	114 60.65%
Metacognitive Processing Breakdown:								
Knowledge	4 4.9%	3 4%	7 5.4%	4 5%	8 5.7%	3 3%	13 8.3%	12 6.4%
Monitoring	22 27.2%	22 28.9%	36 27.9%	21 26.2%	36 25.5%	30 31%	39 24.8%	50 26.6%
Control	21 25.%	19 25%	28 21.%	19 23.%	28 19.%	20 20.%	27 17.%	52 27.6%

What is immediately clear from this data is the centrality of metacognition to how subjects undertook this learning task. It accounts for over 50% of all coded instances of processing activity, for all subjects, when each category of metacognition (or sub-category) is viewed as a distinct category of processing. However, this table shows clear differences in the number of instances of categories across the 8 participants. Looking at the total numbers of codes per individual we have the very wide range of 76-188 codes – each code indicates a switch within a processing type (such as metacognition) or from one type of processing to another (cognition to metacognition). The total codes illustrate the number of times the subjects processing switched from one type of processing to another (i.e. cognition to judgment of learning, judgment of learning to cognitive knowledge, affective state to control of behaviour). These figures show differing levels of switching within the typology of processing (illustrated in Table 38), and varying levels of metacognitive activity, across the eight participants. On task 1, the range of metacognitive processing instances is 44-114. What is clear from these figures is that the subjects who undertook this task engaged in very different amounts of metacognition, and indeed, in instances of all the 5 elements of the learning process.

Yet by looking at the data in terms of the percentage of instances across categories, we can see much tighter ranges, showing patterns of processing behaviour. Looking at metacognition processing instances as a percentage of total processing instances per subject, we have a range of 51.1% - 60.65%.

When we breakdown metacognition into its three main categories, we also see tighter ranges than the numeric instances would indicate-

- Metacognitive Knowledge 3% - 8.3%
- Metacognitive Monitoring 25.5% - 31%
- Metacognitive Control 19.9% - 27.6%

The percentage of instances for all categories of the learning process during this task fall in the following ranges-

- Cognitive Processing 30% - 39.5%
- Metacognitive Processing 51.1%-60.65%
- Off-task Processing 0% - 8.7%
- Affective Processing 0% - 6.4%
- Physical Processing 0% - 6.2%

The ratio of cognition to metacognition (instances of processing involving single categories or sub-elements of metacognition) in all cases is 1 to 1.5/2. So although there is large variation in the number of processing instances, there is a clear pattern in the ratio of the two main processing categories: cognitive processing to metacognitive processing. However, the occasions at which processing moves from one to the other is complex – there is not a predictive pattern.

Looking at the three sub-categories of metacognition, for all subjects, metacognitive knowledge has the lowest occurrence, followed by metacognitive monitoring and metacognitive control. In seven out of the eight learning episodes, there are more instances of metacognitive monitoring than metacognitive control.

Table 38. Types of metacognitive processing: Percentage and Numeric Frequency for Task 1

	A	B	D	E	F	I	M	P
Metacognitive Knowledge								
Know-ledge of Cognition	3 6.38%	0 0%	2 2.81%	1 2.27%	1 1.38%	0 0%	4 5.06%	6 5.26%
Self Know-ledge	1 2.12%	2 4.54%	2 2.81%	0 0%	5 6.94%	1 1.88%	2 2.53%	3 2.63%
Task Knowl-edge	0 0%	1 2.27%	3 4.22%	3 6.81%	2 2.77%	2 3.77%	7 8.86%	3 2.63%
Metacognitive Monitoring								
Ease of Learning	1 2.12%	0 0%	4 5.63%	0 0%	0 0%	2 3.77%	2 2.53%	8 7.01%
Judgment of Learning	20 42.55%	22 50%	28 39.43%	21 47.72%	29 40.27%	28 52.83%	36 45.56%	41 35.96%
Monitor-ing of Affective Processing	0 0%	0 0%	2 2.81%	0 0%	4 5.55%	0 0%	1 1.26%	0 0%
Monitor-ing of Physical Processing	0 0%	0 0%	2 2.81%	0 0%	1 1.38%	0 0%	0 0%	0 0%
Monitori-ng of Environ-ment	1 2.12%	0 0%	0 0%	0 0%	2 2.77%	0 0%	0 0%	1 0.87%
Metacognitive Control								

Control of Affective Processing	0 0%	0 0%	0 0%	0 0%	1 1.38%	0 0%	0 0%	0 0%
Control of Physical Processing	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
Control of Behaviour	21 44.68%	19 43.18%	28 39.43%	19 43.18%	27 37.5%	20 37.73%	27 34.17%	52 45.61%
Control of Environ-ment	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
Total	**47**	**44**	**71**	**44**	**72**	**53**	**79**	**114**

From this more granular view of metacognition, a number of interesting points are visible. During this task, despite the fact that 7 out of 8 subjects experienced interruption of their learning due to physical and affective processing, none of them attempted to control their physical processing in anyway, and there was only one instance of control of affective processing, despite 33 interruptions of learning. Also, there were no instances of students attempting to control or alter their environmental conditions. Affective and physical processing were rarely monitored by individuals, when compared with the degree of monitoring of cognitive processing.

6.4.2 Task 2 Findings

Task 2 required students to engage in small group-based independent learning for two ninety-minute periods, reading an academic article, and preparing for a group presentation on that article. A detailed example of this task was presented in case study 2 in chapter five. The following table provides the instances and percentages of all shared processing that occurred. In the table, T2P1 refers to the first ninety-minute period allocated for the task (task two, part one), while T2P2 refers to the second ninety-minute period of the task (task two, part two).

Table 39. Task 2: Instances and Percentages of all Learning Processing

(100% = all processing that occurred during the learning task)

Group	**T2P1 Group 1**	**T2P2 Group 1**	**T2P1 Group 2**	**T2P2 Group 2**	**T2P1 Group 3**	**T2P2 Group 3**
Total Codes	52	86	66	51	82	116
Affective Processing	0 0%	0 0%	4 6.06%	1 1.96%	0 0%	1 0.86%
Physical Processing	1 1.92%	0 0%	1 1.51%	0 0%	0 0%	3 2.57%
Off-task Processing	1 1.92%	3 3.48%	4 6.06%	3 5.88%	1 1.22%	11 9.48%

Cognitive Processing	11 21.15%	25 29.07%	14 21.21	15 29.41%	25 30.49%	37 31.9%
Metacognitive Processing	39 74.99%	58 67.44%	43 65.15%	32 62.74%	56 68.29%	64 55.17%
Metacognitive Processing Breakdown:						
Knowledge	11 21.15%	14 16.28%	9 13.64%	12 23.53%	4 4.88%	4 3.45%
Monitoring	18 34.61	15 17.44%	19 28.79%	12 23.53%	21 25.61%	33 28.45%
Control	10 19.23%	39 45.35%	15 22.73%	8 15.69%	31 37.8%	27 23.28%

As was seen in the first learning task (an individual learning task), in these group learning scenarios, there is a wide range of frequency of processing movements – from a total of 51 different instances of processing for one group in one learning period, to 116 for another group. As in task 1, metacognitive knowledge is the lowest occurring of the metacognitive processing categories.

The table below delineates the metacognitive processing for the same learning episodes.

Table 40. Types of metacognitive processing: Percentages and Numeric Frequencies for Task 2

	T2P1 Group 1	**T2P2 Group 1**	**T2P1 Group 2**	**T2P2 Group 2**	**T2P1 Group 3**	**T2P2 Group 3**
Metacognitive Knowledge						
Cognitive Knowledge	5 12.82%	7 12.07%	0 0%	5 15.62%	2 3.57%	1 1.56%
Self Knowledge	1 2.56%	4 6.9%	4 9.3%	2 6.25%	0 0%	2 3.12%
Task Knowledge	5 12.82%	3 5.17%	5 11.6%	5 15.62%	2 3.57%	1 1.56%
Metacognitive Monitoring						
Ease of Learning	5 12.82%	3 5.17%	2 4.65%	3 9.37%	3 5.36%	3 4.7%
Judgment of Learning	10 25.64%	9 15.52%	14 32.56%	8 25%	17 30.36%	24 37.5%
Monitoring of Affective Processing	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
Monitoring of Physical Processing	2 5.13%	0 0%	0 0%	0 0%	0 0%	2 3.12%

Monitoring of Environment	1 2.56%	3 5.17%	3 6.98%	1 3.12%	1 1.79%	4 6.25%
Metacognitive Control						
Control of Affective Processing	0 0%	1 1.72%	0 0%	0 0%	1 1.79%	2 3.12%
Control of Physical Processing	0 0%	2 3.45%	0 0%	0 0%	0 0%	0 0%
Control of Behaviour	8 20.51%	25 43.1%	14 32.56%	8 25%	29 51.79%	24 37.5%
Control of Environment	2 5.13%	1 1.72%	1 2.36%	0 0%	1 1.79%	1 1.56%
Total	39	58	43	32	56	64

While there are low instances of metacognitive monitoring and metacogntive control of affective and physical processing, both affective and physical processing are, at times, monitored and controlled by metacognition in the same manner that it monitors and controls cognition.

6.4.3 Task 3 Findings

Task 3 required students to prepare for an imaginary job interview that would be conducted in English. This task was language-related (ideally the subjects would spend some time preparing in English), but not only language focused (as students would ideally spend some time learning about the company, and thinking about the interview process). So it contained elements of domain-specificity (the subjects were language majors) and non-domain specificity (researching information about an unfamiliar field banking, and preparing for a job interview).

The following instruction was given:

> Job interview preparation. For this task you have to imagine that you will prepare for a job interview in English with Morgan Stanley tomorrow. Morgan Stanley is one of the worlds' largest corporate banks with offices all over the world including Japan. They often hire university graduates and people with no experience of banking. You have 90 minutes to prepare for your interview. Please use the time wisely and think about what you need to prepare for the interview.

Links to the company's English and Japanese websites were provided. On both websites there was a section discussing what was required of potential interviews and a list of typical interview questions, but this was not stated in the task instructions. No other information or instruction was given. This self-directed task was the most complex and unfamiliar of the three tasks the subjects undertook, and had the least instruction.

Five subjects undertook task 3 individually, with one pair of students and one group of four students also undertaking the task. Table 41 shows the numerical instances and percentage of instances of the 5 elements, and the breakdown of metacognition into it's three main categories; knowledge, monitoring and control.

Table 41. Task 3: Instances and Percentages of all Learning Elements

(100% = all processing that occurred during the learning task)

	P	**B**	**Q**	**F**	**N**	**Group**	**Pair**
Total Codes	113	64	120	74	203	179	146
Affective Processing	0 0%	1 1.6%	0 0%	10 13.5%	7 3.4%	7 3.9%	3 2%
Physical Processing	0 0%	0 0%	0 0%	1 1.3%	6 3%	1 0.5%	2 1.4%
Off-task Processing	3 2.7%	0 0%	2 1.7%	5 6.8%	24 11.8%	20 11.2%	7 4.8%
Cognitive Processing	39 34.5%	25 39%	40 33.3%	21 28.4%	58 28.6%	52 29.1%	48 32.9%
Metacognitive Processing	71 62.8%	38 59.4%	78 65%	37 50%	108 53.2%	99 55.3%	86 58.9%

Metacognition Breakdown:							
Knowledge	16 14.2%	4 6.3%	16 13.3%	3 4.1%	16 7.9%	20 11.2%	9 6.2%
Monitoring	30 26.5%	15 23.4%	28 23.4%	8 10.8%	51 25.1%	38 21.2%	34 23.3%
Control	25 22.1%	19 29.7%	34 28.3%	26 35.1%	41 20.2%	41 22.9%	43 29.4%

This data shows that, as in both previous tasks, the number of instances of metacognitive processing is high when compared to other processing occurring, ranging from 38-108 instances across learning episodes. Although there is a wide range of numeric instances, when looking at the metacognitive processing instances as a percentage of all processing per learning episode, we see the much tighter range of 50% - 65% of all processing activity. As in the previous tasks, the ratio of instances of cognition to metacognition is in the range of 1 to 1.5/2.

By looking at three main categories of metacognition, we see that metacognitive knowledge, as in the other tasks, has the lowest instances of occurrence. However, on this task there is more metacognitive knowledge activity than on other tasks. In terms of metacognitive monitoring and control, again there are much higher instances of these. However on this task, five of the seven learning episodes have more instances of metacognitive control behaviours than metacognitive monitoring behaviours (In Task 1, 7 out of 8 episodes showed more metacognitive monitoring behaviours than metacognitive control behaviours).

Breaking down the three categories of metacognition into sub-categories, we get the following data set.

Table 42. Types of metacognitive processing: Percentage and Numeric Frequency for Task 3

Participants	**P**	**B**	**Q**	**F**	**N**	**Group**	**Pair**
Metacognitive Knowledge							
Cognitive Knowledge	6 8.45%	2 5.26%	8 10.26%	1 2.7%	4 3.7%	10 10.1%	5 5.81%
Self Knowledge	4 5.63%	0 0%	2 2.56%	0 0%	3 2.77%	5 5.05%	1 1.16%
Task Knowledge	6 8.45%	2 5.26%	6 7.69%	2 5.4%	9 8.33%	5 5.05%	3 3.48%
Metacognitive Monitoring							
Ease of Learning	7 9.86%	5 13.16%	3 3.85%	0 0%	3 2.77%	4 4.04%	6 6.97%
Judgment of Learning	22 30.98%	9 23.68%	25 32.05%	8 21.62%	43 39.81%	31 31.31%	28 32.55%
Monitoring of Affective	0 0%	0 0%	0 0%	0 0%	2 1.85%	2 2.02%	0 0%

Processing							
Monitoring of Physical Processing	1 1.41%	0 0%	0 0%	0 0%	2 1.85%	0 0%	0 0%
Monitoring of Environment	0 0%	1 2.63%	0 0%	0 0%	1 0.92%	1 1.01%	0 0%
Metacognitive Control							
Control of Affective Processing	0 0%	0 0%	1 1.28%	6 16.21%	2 1.85%	1 1.01%	0 0%
Control of Physical Processing	0 0%	0 0%	0 0%	0	0 0%	1 1.01%	1 1.6%
Control of Behaviour	25 35.21%	19 49.99%	33 42.3%	18 48.65%	39 36.11%	39 39.39%	40 46.51%
Control of Environment	0 0%	0 0%	0 0%	2 5.4%	0 0%	0 0%	2 2.32%
Total Coded Instances	71	38	78	37	108	99	86

As in task 1 and 2, affective and physical processing were rarely monitored or controlled.

6.4.4 Metacognition and Task Performance

The learning performances of each of the 7 participants (or group of participants) who undertook task 3 were graded on an A, B, and C scale (very good, good, pass). The following grades were given.

Table 43. Graded Task Performance for Task 3

Participant/s	**P**	**B**	**Q**	**F**	**N**	**Group**	**Pair 1**
Grade	A	B	B	B	C	B	A

Participant N was deemed to have the worst performance on this task. She also had the highest number of instances of metacognitive activity on this task (108 instances). In this case, a high instance of metacognitive activity did not result in a highly graded performance. This was also the case for grades received by this participant for tasks 1 and 2 – there was no correlation between the frequency of metacognition (nor the frequency of a category or sub-element of metacognition) and the overall learning performance.

Alongside the high number of instances of metacognitive activity for participant N on task 3, who received the lowest grade of all participants, the other distinguishing factor about participant N's metacognitive behaviour is that, unlike all the other participants, she had a significantly higher occurrence of ‘judgments of learning’ when compared to ‘control of behaviour’. N made 43 separate judgments and 39 separate controls of behaviour (all other participants or participant groups made significantly less judgments of learning and always more control of behaviour actions than judgments of learning). In the case of participant N, an examination of these two categories shows that, in her case, over half of her judgments of learning indicate indecision, or lack of confidence in how to proceed, rather than understanding that learning was progressing in either an effective manner and should continue, or that learning was progressing in an ineffective manner and should be altered. While a high instance of control behaviours might seem to indicate that N was making alterations and decisions about how her learning was proceeding, a larger number of her control behaviours were simply trying to refocus herself on the task.

Participant P and Pair 1 were deemed to have the best performances on this task. The number of instances of metacognition for both is in the middle of the range for this task (71 for subject P and 86 for Pair 1). Unlike participant N, both learning episodes involved more ‘controls of behaviour’ than ‘judgments of learning’. Participant P demonstrated the highest occurrence of metacognitive knowledge on this task (14.2% of all metacognitive activity), though the same did not apply for Pair 1, whose use of cognitive knowledge was the second lowest on this task (6.2% of all metacognitive activity). On this task, higher occurrence of cognitive knowledge usage therefore cannot be deemed as a singular performance-deciding factor. In the case of Pair 1, they quickly made decisions about how the learning should be undertaken which were appropriate and successful, and continued with those decisions throughout the learning task. They were able to be successful with less use cognitive knowledge because their initial decisions were correct and learning progressed well, and did not require, for example, changes in strategy.

6.5 Intra-personal metacognitive activity across different tasks

Some of the participants involved in this study undertook all three tasks. This section contains a comparison of how 3 participants undertook both Task 1 and Task 3 individually. It is not possible to compare an individuals' performance on Task 2 in this way, as Task 2 was a group task and as such, provides us with a picture of socially shared metacognition, from which it is not possible to separate an individuals metacognitive activity, as was discussed in earlier chapters.

Participants B, F and P undertook both Task 1 and Task 3, and both their overall processing activity and their metacognitive activity are listed in the tables that follow.

Subject B

Table 44. Overall Processing Activity of Subject B

	Total Codes	Affective Processing	Physical Processing	Off-Task Processing	Cognitive Processing	Metacognitive Processing
Task 1	76	4 5.3%	1 1.3%	0 0%	27 35.5%	44 57.9%
Task 3	64	1 1.6%	0 0%	0 0%	25 39%	38 59.4%

Table 45. Metacognitive Processing Breakdown of Subject B

	Knowledge	Monitoring	Control
Task 1	3 4%	22 28.9%	28 21.7%
Task 3	4 6.3%	15 23.4%	19 29.7%

Subject F

Table 46. Overall Processing Activity of Subject F

	Total Codes	Affective Processing	Physical Processing	Off-Task Processing	Cognitive Processing	Metacognitive Processing
Task 1	141	9 6.4%	2 1.4%	8 5.6%	50 35.5%	72 51.1%
Task 3	74	10 13.5%	1 1.3%	5 6.8%	21 28.4%	37 50%

Table 47. Metacognitive Processing Breakdown of Subject F

	Knowledge	Monitoring	Control
Task 1	8 5.7%	36 25.5%	28 19.9%
Task 3	3 4.1%	8 10.8%	26 35.1%

Subject P

Table 48. Overall Processing Activity of Subject P

	Total Codes	Affective State	Physical State	Off Task	Cognition	Metacognition
Task 1	188	2 1.1%	4 2.1%	1 0.5%	65 35.65%	114 60.65%
Task 3	113	0 0%	0 0%	3 2.7%	39 34.5%	71 62.8%

Table 49. Metacognitive Processing Breakdown of Subject P

	Knowledge	Monitoring	Control
Task 1	12 6.4%	50 26.6%	52 27.6%
Task 3	16 14.2%	30 26.5%	25 22.1%

What these tables do show is the complexity of the processing occurring during independent learning. Apart from the high degree of switching between cognition and the categories and sub-elements of metacognition, and of the higher instances of metacognitive monitoring and control, when compared with metacognitive knowledge, there is no intra-personal pattern of processing, nor common frequency of processing. As for the directions in which the processing patterns move, these are also complex, and non-linear, and are discussed in detail in the following chapter.

6.6 Affective, Physical and Off-task Processing

Although they have been discussed in the presentation of the three tasks above, this section will look again at affective, physical and off-task processing. While the preceding discussion has shown the occurrence of these types of processing to be much lower than that of cognitive and metacognitive processing, no correlation has been made between the frequency of occurrence of processing and its impact on learning. All instances of these types of processing are shown in table 50.

Table 50. Numeric instances of Affective, Physical and Off-task Processing across all learning episodes examined

Learning Task	Number of Episodes	Affective Processing	Physical Processing	Off-task Processing
Task 1	8	33	25	31
Task 2	6	6	5	23
Task 3	7	28	10	61
Total	**21**	**67**	**40**	**115**

The 222 coded instances of affective, physical and off-task processing represent 9.64% of the final two thousand three hundred and three coded processing instances. While this is comparatively low when compared to cognitive and metacognitive processing, it is a significant amount of processing. Also, certain occurrences of processing may have more impact on the learning experience than others, and as such, lower occurrence of certain types of processing does not mean that they are a less important element of the learning experience. For example, a single particular control of learning processing decision, for example the amount of time to allocate to different task sections, if inappropriate, could strongly impact the learning outcome. Not controlling for 'negative affect' towards the learning task could strongly impact the learning experience, for example, causing the participant to undertake the learning in a very cursory manner. As will be seen below, in this study, some single instances of off-task processing seen in group-learning lasted substantially longer (some close to twenty minutes of a ninety minute learning episode), which very clearly impacted the length of time available for engagement with the learning content.

6.6.1 Affective Processing

The instances of affective processing were related to the following topics.

Table 51. Instances of Affective Processing

Type of Affective Processing	**Coded Example**	**Number of instances of occurrence across all learning tasks**
Negatively disposed to learning task (Dislike, Disinterest, Boredom, Frustration)	*Ah, this is troublesome, isn't it. I can't be bothered to go over there. I'm bored.*	29
Positively disposed to learning task	*Well, I think I'm kind of enjoying talking to myself (laughing). This is fun*	3
Worry about learning success	*I kind of regret I chose this course…cause it's so complicated for me, this seems so difficult to me. I'm not such an independent person, I'm not sure I can do it…huuh….*	6
Worry about general learning ability	*I feel I'm dumb…I'm stupid I can't understand anything*	4
Nervous	*Oooh no….I'm nervous now*	3
Unhappy working alone	*Uuuhhh..I feel lonely doing this by myself*	3
Happy working together	*(students regularly laughing together as they work)*	3
Conscious positive reinforcement	*Let's do our best when we give the presentation*	3
Concern about others perceptions	*Oh, she was looking at me at the same time when I was looking. Embarrassing! She must be wondering what I am doing..*	5
Upset	*I don't want to do anything, I just want to sleep. And I don't want to be fat (crying)….I am so sick*	2
Personal Issues interfering	*Everyone seems to be normal except for me…Even if I marry him, we couldn't be happy anyway. He doesn't love her, he doesn't love anyone*	5

While many of the coded examples given above would seem to have the potential to significant impact progress in the learning experience, they were mostly not consciously monitoring or controlled. Of the 67 occurrences, 11 were metacognitively monitored, and 15 were metacognitively controlled.

Accounting for almost half of the occurrences of affective processing were instances where participants disengaged from learning when they became negatively disposed to the learning task or learning experience due to dislike of the task or subject, boredom, disinterest or frustration. This type of processing is a significant element of the learning experiences examined. The other types of affective processing seen show how the learning experience can be impacted by factors such as learners' personal lives, learning styles, learning interests, self-perceptions and concern about the perception of others.

6.6.2 Physical Processing

The instances of physical processing were related to the following topics.

Table 52. Instances of Physical Processing

Topic of Physical Processing		**Number of instances of occurrence across all tasks**
Sleepiness (Note: 3 of these instances were classed as 'physical state' and not 'processing' as the participants were observed engaged in prolonged yawning, but did not react to it)		18
Hunger		9
Tiredness		7
Physical Discomfort:	Leg pain	3
	Tooth pain	2
	Eye pain	1
	Throat pain	1
	Runny nose	1
	Too hot	1

As mentioned in the early sections of this chapter, participants, more often that not, did not monitor or control for physical processing. Of the forty instances seen (forty three including the three instances of observable but non-verbalised sleepiness), only ten were metacognitively monitoring, and only four were metacognitively controlled for. Before undertaking the learning tasks in this study, participants were explicitly informed that they could engage in learning in any manner they chose, and were free to change locations, and use time as they chose. All learning decisions were their choice. As such, it would have been possible for students to sleep, take breaks, or eat during the process (although specific options such as these were not specifically provided). However, not only did students largely not choose such options (which would have been visible through metacognitive control of physical processing), they did not consider them (such 'consideration' would have been seen in metacognitive monitoring of physical processing).

6.6.3 Off-task Processing

One clear finding related to off-task processing was the difference in length of instances of occurrence between individual and group (or pair) learning. During individual learning, when learners engaged in off-task processing, it was typically short, often less than fifteen seconds, and no instances lasted longer than one minute. This was not the case with the group learning scenarios which showed both short instances of off-task processing, similar to the individual learning scenarios, and also much longer instances of occurrence. These, in some instances, lasted almost twenty minutes. As such, the amount of time spent by groups engaged in off-task processing is substantially higher than that of individuals.

Examples of individual and group off-task processing are given in the following table.

Table 53. Examples of Individual and Group Off-task Processing

Individual Off-task Processing	*Look at how much of this eraser I'm using to erase this! Wow! I may have to use the whole thing!*
	(After yawning) Yawn (said in Japanese)…I wonder what the English word for yawn is (looks it up in the dictionary)
	Actually, I'm gonna go drink after this class…hmmm…
	I like white paper…it is so clean, so pure…
Group Off-task Processing	*Oh, look at that teacher sitting over there. He looks bored. I think his name is David. I have never talked to him. Yesterday I saw him in Startbucks for the first time.*
	Oh, I haven't submitted my portfolio yet. (talking about unrelated assignment) *What? When is the due?* *Today.* *What's the portfolio??* *Folio. That, everything we've done so far.* *Oh, portfolio it is.* *I submitted it yesterday too.* *We gotta do it, don't we.* *You don't need to. Only those who are working on it need to submit it.* *What? We should print out our blogs and submit them, shouldn't we.* *What?* *We should print out our blogs and submit them, right?* *What? That wasn't written was it?.* *Well, I think we were told to do so.* *Oh, maybe we were. I haven't done it.* *What?! You're joking.* *It's alright coz we still have time.* *No, no, no.* *You haven't written it?* *Does it say that?* *No, no, no. I must write this again, right?* *No, because, then, you can't hand that in, can you.* *That, that blog.* *The things that we are talking which have nothing to do with this project will be heard too.* *Sorry.* *This will be heard. It's helpless because our brains are structured like this.* *It's helpless.* *Well, you are not joking. I just want to make sure about that.* *OK. I can quickly make sure about that. It's alright. That.* *It's OK, because I can't do it now anyway, not yet.* *Then, while you are doing it, let's just chat.* *It's not written.* *What do you mean.?* *I lost the handout.* *Silly.*

	Because? *Silly, you've got a mole there (pointing to face, laughing).* *You…what is that.* *See, it's not written.* *You've got a mole which you think is cute and charming.* *You only imagined you heard that.* *Broad beans. (Note: 'You only imagined you heard it' is 'sora mimi'in Japanese, and 'broad beans' is 'sora mame'in Japanese so the students are just playing with the similar sounds.)* *Broad beans.?* *What? Did you hear it?* *I did. I mean, I was thinking the same thing.* *Then, what if I didn't just imagine I heard it.* *Broad beans. (Laughing).* *I was just about to say the same, but I decided not to.* *Joking, joking.* *It was good for you that you didn't say anything.* *Broad beans.* *We have to say everything we are thinking.* *Even including a boring joke, everything.* *Just imagined you heard it. Just imagined you heard it. Broad beans* *Nonsense*

The degree of off-task processing also varied significantly across individuals. Of the thirteen individual learning episodes in this study, four episodes containing no instances of off-task processing, meaning that they were able to stay on-task in the learning experience for the entire 90 minute period.

6.7 Summary

This chapter has presented the findings resulting from the data collected, and provides information about all processing that occurred during the independent learning episodes examined in this thesis. The goal of this thesis is to uncover the reality of metacognitive processing and all other processing during independent learning. Although it is beyond the scope of this study to explain all the causal relationships between all processing pathways and interplays between types of processing, the findings in this study clarify how independent learning occurs with a level of clarity and depth not present in the current literature. The discussion chapter that follows takes the data presented in this chapter, and explains what it means for the independent learning experience.

Chapter 7: Discussion

7.1 Introduction

This chapter presents a discussion of the findings as a whole. The discussion is framed to explicate three inter-connected aspects of the overall findings, namely, the identification of five different types of processing that occur during learning, the model of processing pathways that occur during independent learning and the grounded theory of processing as it occurs during independent learning that has emerged from this study. It concludes with a summary of the specific findings of note from the research.

7.2 Processing categories impacting the independent learning experience

This study set out to explore the reality of metacognitive processing in independent learning. As the study progressed, it became clear that in order to understand metacognitive processing, it was necessary to examine all *conscious thought* processing that occurs during independent learning. Five distinct processing types occurring during independent learning have emerged from the data, namely, cognitive processing, metacognitive processing, affective processing, physical processing and off-task processing (see Figure 5 below).

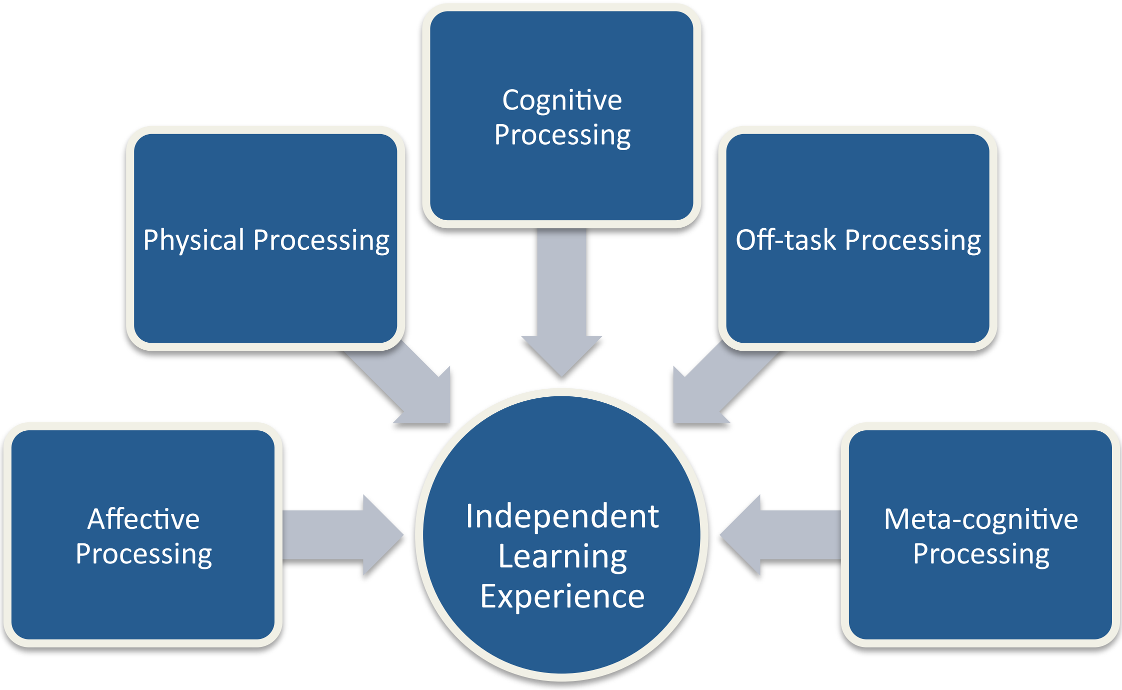

Figure 5. Processing categories impacting the Independent Learning experience

These five categories represent all processing that occurs during and that impact on the independent learning experience. At the core of any educational endeavour is the learning experience. The independent learning experience is defined in this thesis as the experience '*of learning without (or with decreasing amounts of) external direction, guidance and evaluation, in volitional and non-volitional contexts*'. Learning can be considered as a *process of becoming*, so learning experiences should in some way enable the learner to move forward. A learning experience is intended to result in the transformation of information into knowledge. It is important to note that learning experiences can be lower-order or higher-order, in that they may be concerned with simply cognizing information, or with understanding and managing complexity. In independent learning, the facilitation of the learning experience is the responsibility of the learner or learners, so necessarily involves learning at both lower and higher levels.

Before the impact of the various types of processing on the process of learning is explained, it is important to recap on each type of processing that occurs during learning -

- Cognitive processing is processing that occurs when learners are engaged with understanding the content of the task or doing the task, but not how to do the task.

- Metacognitive processing is processing that occurs when the learners are concerned with how learning is or should proceed

- Affective processing is processing that occurs when learning is interrupted or affected by the learners' emotions, moods and learning preferences (in terms of what to learn and how to learn)

- Physical processing is processing that occurs when learning is interrupted or affected by the learners' physical state, or by the physical environment

- Off-task processing is processing that occurs when learning is interrupted by learners becoming distracted by either external or internal factors

As the data analysis in this study progressed, it became clear that what was visible in the data was various types of processing in action, rather than static states of thought or feeling or being. This is a result of how and when the data was collected (verbal protocol analysis and discourse analysis of individuals and groups as they were engaged in learning). As a result of this, all thought activity seen and discussed is referred to as processing, rather than states of being (i.e. affective processing rather than affective state). There were occasional instances where states (affective and physical states) were visible (through observational data) and where processing did not consciously occur or was not verbalized (in a VPA collection context) or shared (by an individual in a group learning context). However, such data was minimal, and as such the focus of this thesis is on the analysis and understanding of processing as it occurred (though states of being have been noted and recorded within the findings).

As this study examined metacognitive processing in the context of learning, it was necessary to see how metacognition interacted will all types of processing occurring during learning. As was seen in the chapters five and six, alongside cognition and metacognition, learning also involves the learners' affective states and physical processing and states during learning. In this thesis, the word 'affect' is used rather than 'emotion', as it is widely used to cover a variety of experiences, such as emotion, mood and preferences (Eysenck & Keane, 2005, p. 1) . These two forms of processing (affective and physical) are categorized separately from cognition. There are two reasons for this distinction. Firstly, affective and physical processing are distinct from other types of processing occurring, in that they occur as a disruption to the constant flow of information. The grounded theory approach used in this thesis requires that all information emerging from the data be used to progress the research, and the data in this thesis showed that these categories emerged as clearly visible and distinct from cognitive processing, as it has been defined in this study.

Secondly, experts in the field of affect and cognition are as yet divided about how different or similar cognitive and affective processing are. Though some maintain the distinction while acknowledging interaction (Eysenck & Keane, 2005), others, looking at it from a neurobiological basis, argue that any distinction to be made between the two is purely phenomenological rather than ontological (Duncan & Feldman Barrett, 2007), while others yet have had success applying cognitive research approaches to emotional processing (Eder, Hommel, & De Houwer, 2007) or showing that cognition is often involved in emotion (Moors, 2007). While these advances in knowledge in this area might suggest that cognition and emotion are not distinct (or *as* distinct as previously understood), or perhaps work from the same underlying construct (Lavender & Hommel, 2007), this does not mean, for this thesis, that the categories should be combined and viewed as one. On the contrary (perhaps counter-intuitively), it means that we may need to look at metacognition differently. Given the name of the concept, metacognition is perceived to pertain to 'thinking about thinking', often interpreted as excluding affective state and affective processing. However, if affective processing is not as distinct or different from cognitive processing as was previously believed, then it follows that metacognition may have a more substantial interactional role with affective and physical processing than has previously been researched or discussed, and this has been one of the central findings of this study.

Recent research shows cognition and emotion during learning to be "*inextricably bound because learning inevitably involves failure and the learner experiences a host of affective responses*" (D'Mello & Graesser, 2011, pp. 1299 - 3000). This is shown to be even more the case when learners are involved in deeper learning, which the complexity of independent learning involves (Csikszentmihalyi, 1990; Immordino-Yang & Damasio, 2007; Mandler, 1999; Meyer & Turner, 2006; Pekrun, Elliot, & Maier, 2006). Whether or not this means that cognitive and affective processing are more or less distinct is not clear; however it does show the amount of emotional processing occurring during learning, that might be, or perhaps should be or needs to be, monitoring or controlled to allow learning to proceed as effectively and successfully as possible. In order to examine this in relation to metacognition, and to understand the breadth of metacognitive functioning, it is necessary to separate (whether an artificial separation or not) cognition from affective and physical processing.

Physical processing, as seen in the data in this study, and defined as processing that occurs '*when learning is interrupted or affected by the learners' physical state, or by the physical environment* ', is held as a distinct category of processing from affective processing (when learning is interrupted or affected by the learners' emotions, moods and preferences). There already exists an established distinct field of research pertaining to affect in learning, and this does not include either the learners' physical states or the physical environment, as defined by the definition above. As this definition was generated from the data, it therefore represents a form of processing that occurs during independent learning, and one that does not fit into the other existing categories of processing – cognitive, metacognitive, affective and off-task. Also, as this form of processing has the potential to positively or negatively impact the learning experience, it is important that it becomes a part of the discourse about metacognition and independent learning.

So while the debate about the separation of ‘cognitive processing‘ and ‘affective processing’ continues, for the purposes of understanding metacognition more deeply, these two types of processing have been separated, as is any processing related to the physical state of participants.

By using this separation, this study has shown how metacognition performs or interacts in the same manner with *affect* and *physicality* as it does with ‘cognition’ (using metacognitive knowledge, monitoring and control to manage and guide the processing), although this occurs to a comparably much lesser extent. This adds knowledge to the as yet minimal research on the area of metacognition and affect (Efklides, 2001; Efklides, 2006; Winkielman & Cacioppo, 2001). This clarifies that the term metacognition is a sometimes misunderstood or misinterpreted term (often not considered to interact with anything beyond cognition), or rather a reflection of the time in which it was coined, when cognition and affect were considered separable and very different types of processing.

By separating these types of processing, this study showed how metacognition interacts with each one, performing the same role, though the participants in this study did not have comparable knowledge, monitoring and control abilities over their cognitions and their affective and physical processing (either to manage such processing if it is negative, or harness it if it is positive). What this study showed was the participants did not optimally metacognitively manage affective, physical and off-task processing.

Just as researchers are now starting to look more at interdependencies (this can be seen in the growth of research on a variety of topics for the perspectives of complex systems and dynamic systems, and from the use of new research methods such as network analysis), such as in the case of cognition and emotion (Storbeck & Clore, 2007), by allowing them to be seen separately in this thesis, we learn more about their relational aspects through understanding the functionality of metacognition with respect to both.

The data analysis in this study led to the emergence of a category of processing that has not accounted for or subsumed by any of the other processing categories given, and which has been named *Off-Task processing*. This category of processing is visible in all learning and across all learners investigated in this thesis (in some of the learning examined, it is a highly prevalent form of processing), and has been defined in this thesis as processing that occurs when "*learning is interrupted by learners becoming distracted by either external or internal factors*". There is a body of research looking at similar concepts, which have been variously named - "mind wandering" (Smallwood & Schooler, 2006), task-unrelated thoughts (Smallwood, O'Connor, Sudberry, & Ballantyre, 2004), stimulus independent thought (Teasdale, Segal, & Williams, 1995), and zone-outs (Schooler, Reichle, & Halpern, 2005). What these concepts have in common is that they all refer to "a shift of attention away from a primary task towards internal information" (Smallwood & Schooler, 2006, p. 946). However, this definition does not accurately describe the processing seen in this study. In this study, the shift of attention away from the primary task (the learning task) is not always a shift to internal information (i.e. the learner may be attending to the external environment or external factors, or a group of learners may become involved in attending to a subject external to some or all of them). Also, the off-task processing in some cases leads or segues back into 'on-task types of processing' in a manner that suggests that the off-task processing may be performing a role related to the task. For these reasons, the extant terms have not been used to describe the type of processing uncovered and discussed.

There is no body of research that discusses the relationship between metacognitive processing and off-task processing (or task-unrelated thoughts) in learning. As such, the findings in this thesis pertaining to and illustrating this relationship are of considerable interest. This is an area of interest for future research, to explore the role and function of this type of processing to the learning experience.

7.3 Model of processing pathways in independent learning

The Model of Processing Pathways in Independent Learning illustrates *what* categories of processing are occurring during independent learning and how they impact on each other and ultimately the independent learning experience The complex interplay of processing is illustrated in figure 6 below. The model also gives an initial indication of the directionality of the interactions between all processing categories (accounting for all processing activity during independent learning).

Figure 6. Model of processing pathways occurring during independent learning

At the centre of the *Model of Processing Pathways in Independent Learning* is the Independent Learning Experience. Four of the aforementioned categories of processing directly impact or are impacted by the independent learning experience, as illustrated by the bi-directional arrows from the central Independent Learning Experience and the categories of Affective Processing, Cognitive Processing, Physical Processing and Metacognitive processing in Figure 6. In other words, the learning tasks being undertaken within independent learning can impact and trigger any of these types of processing – they could cause a cognitive or metacognitive response, or an affective or physical response. Conversely, each of these processing types can impact on how the learning experience proceeds. Any of the types of processing can impact how learning progresses – an inappropriate metacognitive control response can impede progress or negatively impact a learning outcome, while appropriate cognitive responses to information can move the learning experience towards a positive learning outcome.

All four types of processing illustrated in the inner ring of this Model can interact with one another in a bi-directional manner. Thus, metacognitive processing can trigger cognitive processing, affective processing and physical processing; cognitive processing can trigger metacognitive, affective and physical processing; physical processing can trigger metacognitive, cognitive and affective processing; and finally affective processing can trigger metacognitive, cognitive and physical processing.

The back and forth interplay between cognition and metacognition accounts for the majority of processing during most independent learning examined in this study. Furthermore, the pathway between these two forms of processing is bi-directional and bi-causal (cognition triggering metacognition, and metacognition triggering cognition). The degree of affective and physical processing is at a lower level (when compared to cognitive/ metacognitive interplay). Nonetheless, instances of affective and physical processing do impact on overall levels of processing.

The outer ring in the *Model of Processing Pathways in Independent Learning* represents the movement of Off-task Processing. This processing is represented as the outer circle, as a broken line, as it is when students are thinking about processing unrelated to the learning at hand. This however, does not mean that, in all cases, this is wasteful or un-meaningful processing, as will be discussed later. Although represented separately, off-task processing interacts with all other processing types, and ultimately, impacts on the independent learning experience.

Due to the complexity of the interactions, not all possible processing pathways are illustrated in the figure above. They are illustrated and discussed in the sections that follow, as are the multi-dimensions of each type of processing.

7.4 Grounded Theory: *A theory of multi-dimensional complexity within and between metacognition, cognition and other processing during independent learning*

The previous sections have outlined the five processing types that are present in independent learning and also explained the bi-directionality of movement between each type of processing. The data in this thesis was analysed and brought to the level of theoretical saturation that has resulted in the generation of a grounded theory that explains more fully *how* processing occurs during independent learning.

Table 54. The grounded theory

> This *grounded theory* posits that five different types of processing, namely, **metacognitive, cognitive, affective, physical and off-task processing,** interact to influence the learning experience in independent learning. It further postulates that each type of processing is **multi-dimensional** and that the i**nteractions within and between** these processes and the learning experience are **non-linear and complex**.

The first statement within this grounded theory posits that five different types of processing, namely, **metacognitive, cognitive, affective, physical and off-task processing,** interact to influence the learning experience in independent learning. This has been explained in section 7.2 of this chapter.

The second statement recognizes that these processing types are multi-dimensional, and the interactions within and between these processes and the learning experience are non-linear and complex. We now move forward to explain exactly what is meant by multi-dimensional in the context of each of the processing types, and in what sense can the interactions between each of the processes be considered non-linear and complex.

7.4.1 The multiple dimensions of each type of processing

There are different dimensions within each of the five types of processing – thus, metacognition, cognition, affective, physical and off-task processing are multi-dimensional. Figure 7 that follows summarises the multi-dimensionality of each of the five processing categories.

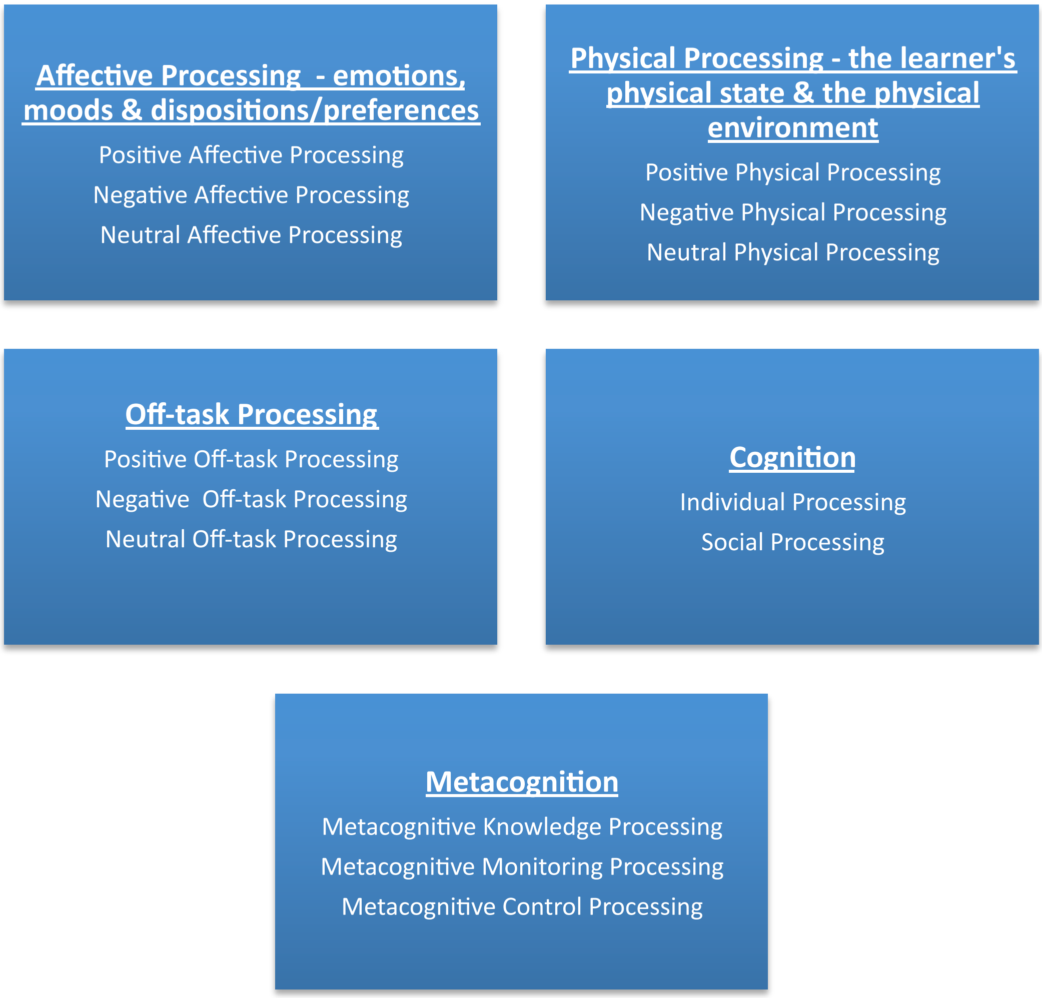

Figure 7. Multi-Dimensions of Processing Categories

7.4.1.1 The dimensions of cognitive processing

Cognitive processing can be divided into two dimensions: *Individual cognitive processing* and *Social cognitive processing*. The former – Individual processing - relates to processing where an individual engages in a cognitive act, such as reading or writing. The latter – Social processing – refers to processing undertaken in a group situation that results in a co-ordinated act by all members of the group, such as all members of the group reading or writing etc. Therefore, this study of independent learning, has identified two very distinct dimensions of cognition - individual processing (when a learner is working individually) and social processing (when learners are working together).

7.4.1.2 The dimensions of metacognitive processing

Metacognitive processing can be divided into three dimensions, namely, *Metacognitive Knowledge, Metacognitive Monitoring and Metacognitive Control*.

Metacognitive Knowledge is knowledge learners possess about how to learn that can be used to influence the learning process. This knowledge can be sub-divided into cognitive knowledge, self-knowledge or task knowledge. *Cognitive knowledge* is knowledge about cognition and cognitive strategies. *Self-knowledge* is what learners knows about themselves in relation to learning – their strengths and weaknesses, motivations and needs. *Task Knowledge* is what learners understand about specific tasks, and how each task should impact how learning proceeds.

Metacognitive Monitoring refers to any judgments or queries made by learners that concern how learning is progressing, or how learning should progress. It can be sub-divided into 'ease of learning, judgment of learning, monitoring of environment, monitoring of affective processing and monitoring of physical processing'. *Ease of learning* means making an assessment of how easy or difficult a learning task or element of the task will be to undertake. *Judgment of learning* refers to the monitoring of comprehension, progress and appropriacy of ongoing learning. *Monitoring of environment* involves monitoring how the environment is affecting the progress of learning. *Monitoring of affective processing* involves judging one's affective or emotional state and its impact on learning. *Monitoring of physical processing* involves judgments of positive or negative physical states, and the possible causes and/or impacts of this.

Metacognitive Control refers to any decisions or actions taken by learners that affect the progress of the learning task. It can be sub-divided into 'control of learning, control of environment, control of affective processing and control of physical processing'. *Control of learning* involves taking action to maintain or change the course of learning activity. *Control of environment* involves taking action to change or maintain environmental conditions affecting learning. *Control of Affective Processing* involves taking action to change or maintain affective or emotional state. *Control of Physical Processing* involves taking action to change or maintain physical state.

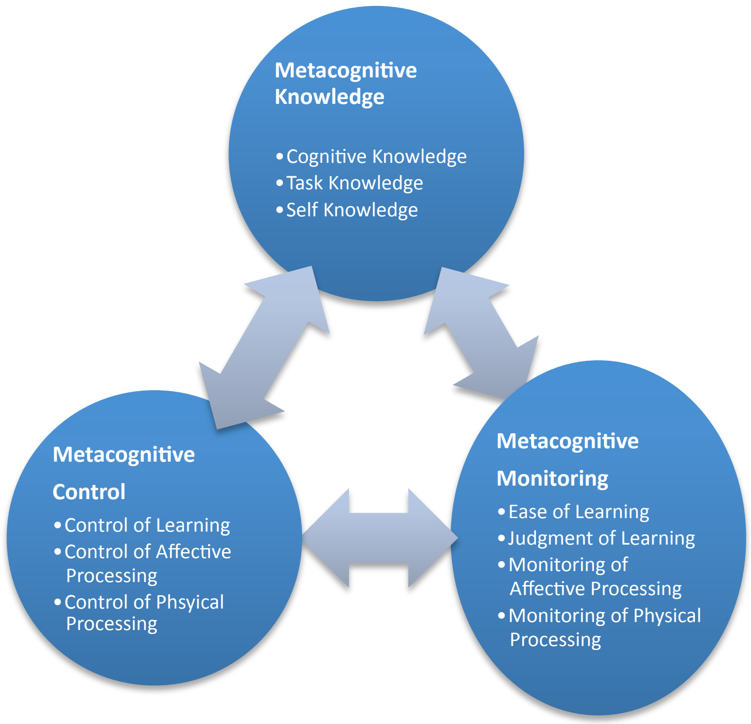

Figure 8. The multi-dimensions of Metacognition

Figure 8 above summarises the main dimensions and sub-elements of metacognition, and the processing pathways between them. While all learners necessarily engage in metacognitive processing during independent learning, this does not always follow a linear pathway, as indicated by the bi-directional arrows in the diagram above. Nor do all instances of learner metacognitive activity always involve *conscious* engagement with all three categories.

7.4.1.3 The dimensions of affective, physical and off-task processing

As illustrated in Figure 7, the multi-dimensions of processing categories, affective, physical and off-task processing can be positive, negative or neutral forms of processing in the learning experience. This means that their occurence can both positively and negatively impact the learning experience while at other times also occur without any discernible impact. As was discussed in shown in Figure 5, the Model of processing pathways occurring in independent learning, these processing categories and their dimensions have a bi-directional relationship with each other and with all dimensions of all processing occurring during the learning experience, in that they can impact and be impacted by each other.

7.4.2 Non-Linear and Complex Interactions

The interactions between each of the five types of processing, their corresponding dimensions and sub-elements, AND the learning experience can be considered as non-linear and complex. *Non-linear* in this context means that the pathways between the various types of processing, dimensions or sub-elements do not always move directly towards the enablement of a learning experience. *Complex Interactions* refer to the complexity of movement between the various types of processing, corresponding dimensions and/ or sub-elements.

7.4.2.1 Examples of Non-Linear and Complex Interactions

To give an indication of this complexity, below are two examples of non-linear and/ or complex interaction. The first example is of a single processing category triggering subsequent activity of all other processing categories in different instances. As the processing instances in this example shows, the pathways of processing are not linear - the learner doesn't always engage in processing that leads *directly* to the completion of the learning task.

Table 55. Non-linear complex interaction

Example 1: Non-linear complex interaction		
Cognitive Processing followed by Metacognitive Processing		
learner is reading a text	⇒	*learner starts to think that she is reading too slowly to complete the task in time*
Cognitive Processing followed by Affective Processing		
learner is reading a text	⇒	*Learner becomes upset and stressed about whether or not she can complete the learning task*
Cognitive Processing followed by Physical Processing		
learner is reading a text	⇒	*learner is in pain with a toothache*
Cognitive Processing followed by Off-task Processing		
learner is reading a text	⇒	*Learner starts to plan her (un-related) exercise routine for the week*

As processing continues and moves through more interactions, the potential for complexity increases. By examining the interaction in example 2 below, we can see the increased complexity that occurs during processing events.

Table 56. Complex Interactions

EXAMPLE 2: COMPLEX INTERACTIONS				
Affective Processing following by Metacognition followed by Cognition				
Group of learners laughing at their lack of progress with their learning	⇒	*One learner suggests they refocus on writing their presentation, and other learners agree*	⇒	*The group starts discussing the presentation content*
Affective Processing followed by Metacognition followed by Affective Processing				
Group of learners laughing at their lack of progress with their learning	⇒	*One learner suggests they refocus on writing their presentation*	⇒	*Other learners do not respond and continue laughing about their lack of progress*
Affective Processing followed by Metacognition followed by Off-task Processing				
Group of learners laughing at their lack of progress with their learning	⇒	*One learner suggests they refocus on writing their presentation*	⇒	*Some other learners begin to tell a joke, and all learners become involved*

7.5 Cognition and metacognition interactions

In examining how processing types interact with each other, we need to look first at the relationship and interactions between cognition (when the learner is focused on the content of their learning) and metacognition (when the learners is focused on how the learning is or should proceed). Looking at this processing first is important because the relationship between cognition and metacognition is the central processing activity within independent learning. It is between these forms of processing that learners move the most, and spend the most time (excluding instances where learners become very distracted and spend a long time off-task, or are seriously distracted by a negative affective concern). The figure that follows shows the movement between cognition and metacognition.

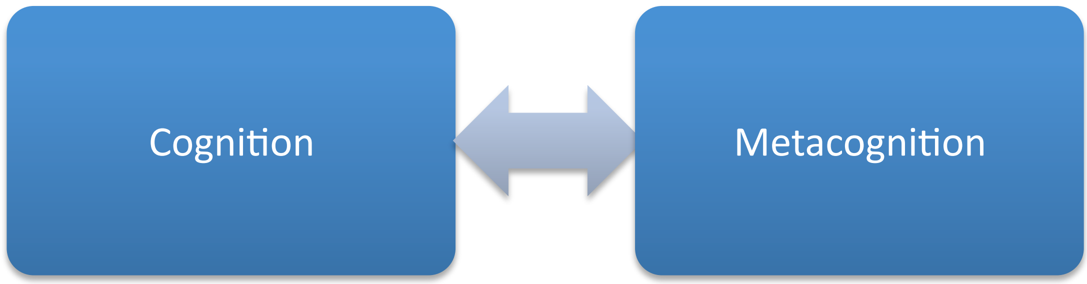

Figure 9. Cognitive and Metacognitive Interactions

It is a bi-causal relationship, in that both cause the occurrence of the other – cognition triggering metacognition and metacognition triggering cognition.

Because of the frequency of switching between these two forms of processing, their relationship is better visualised as a continuing loop, as shown in the following diagram.

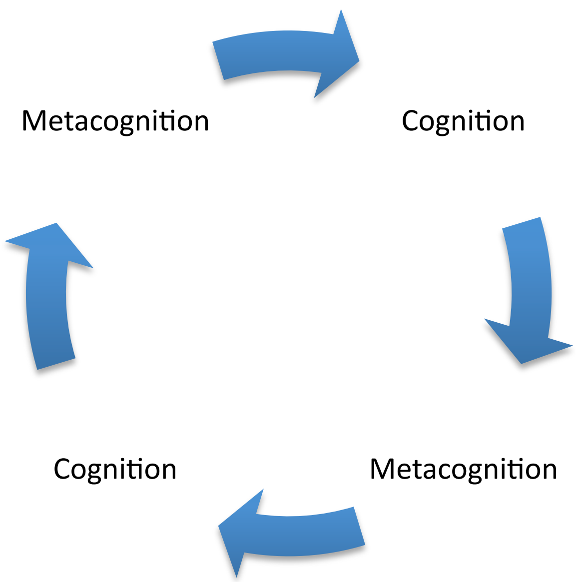

Figure 10. Looping of Cognition and Metacognition as Learning Progresses

Although there is not a pattern in the time spent engaged in cognitive processing or metacognitive processing, learners progress through the cycle with high frequency (though this frequency depends on both the learner(s) and the task content) throughout the independent learning experience. They may move back and forth very quickly at certain times during their learning, while at other times they may spend a long time within a single processing type. In terms of cognitive processing, if a learner was trying to understand a long text, and was able to concentrate well and understand the text, s/he might spend a long time engaged in this type of processing. Within metacognitive processing, a learner might spend a long time engaged in this way if there were trying to analyse a wide range of strategies they could use to complete a task. Movement between the two forms of processing can result in both good or poor progress in terms of completing the learning task.

7.6 Interactions between all categories of processing

As learners are learning, they do not simply think about the content of the learning task or how to best proceed with learning. They also engage in affective processing – either caused by the learning task, or external to the learning task, but impacting it, and physical processing – when their physical condition or the physical environment around impacts them and becomes the focus of their thinking. Again the occurrence and reaction to both these forms of processing is complex and non-linear.

Affective processing is used here to exemplify this. For example, affective processing- related to the learners' emotions, mood and preferences - can and does occur and interrupt any of the other forms of processing. Some occurrences are more predictable and indicative of a pattern of processing. For example, learners moving through a task with ease may experience positive emotions – predictably feeling positive about both the learning endeavour and themselves. However, affective processing can also be unpredictable, interrupting any category of processing at any time, for example, when a student is pre-occupied with a personal issue. In other words, it does not specifically occur after one or even two forms of processing, nor is its occurrence always related to the learning scenario. It does not always lead into a specific form of processing. Perhaps the most obviously effective pattern of processing including affective processing is shown in table 57.

Table 57. Pathway one of affective processing interactions

Cognitive Processing	*A Learner is working on a difficult mathematical problem*
⇓	⇓
Affective Processing	*Having difficult working out the problem, the learner starts to feel stressed and negative, not wanting to complete the task*
⇓	⇓
Metacognitive Monitoring of Affective Processing	*The learner becomes aware of his negative emotions, and the impact they are having on his learning*
⇓	⇓
Metacognitive Control of Affective Processing	*The learner decides to refocus and use some textbook examples to help him understand how to complete the problem*
⇓	⇓
Cognitive Processing	*The learner re-engages with the problem again, this time using the textbook*

While the above complex pathway of processing culminating in cognitive processing occurs frequently during independent learning (and also applies to effective control of physical and off-task processing), it does not occur in every case of processing. In fact, affective processing was often not responded to by participants in this study. In other words, rather than actively controlling negative affect, or indeed using positive affect, the users in this study regularly ignored or did not respond to affective processing, instead following the pathway as illustrated in the example below. In other cases, it may have been responded to through unconscious metacognition (this is discussed in the latter part of this chapter).

Table 58. Pathway 2 of affective processing interactions

Cognitive Processing	*A learner is working on a difficult mathematical problem*
⇓	⇓
Affective Processing	*Having difficulty working out the problem, the learner starts to feel stressed and negative, not wanting to complete the task*
⇓	⇓
Cognitive Processing	*The learners ignores his emotional state, and continues with the mathematical problem in the same manner*

In this study, there were some instances of learners, who ignored a negative affective state, and did not perform optimally in the learning activity. The negative emotional state persistently re-occurred and interrupted the other forms of processing of these students. However, in other cases, not responding to a negative emotional state or preference related to the learning task, did not hamper performance or lead to the re-occurrences or lack of concentration.

Affective processing can also move in other directions, as in the examples in table 59.

Table 59. Further examples of processing sequences involving affective processing

EXAMPLE 2	EXAMPLE 1
Metacognition *A learner, in the middle of writing an essay, realizes she has not enough reference information, which is weakening her essay argument*	Physical Processing *The learner feels tired, having gone to the gym before starting his report*
⇓	⇓
Affective Processing *She starts to get worried about the grade she will receive for the essay*	Affective Processing *He feels really positive about himself for having gone to the gym*
⇓	⇓
Metacognition *She realizes she needs to calm down, and decides to continue writing for a while, and then search for references*	Cognition *He continues writing his report*
⇓	⇓
Cognition *She engages with writing the essay again*	Affective Processing *He thinks about how he would be happier and feel better if he exercised everyday*
⇓	⇓
Affective Processing *She starts to worry again about her total grade for the year, if she gets a low grade for the essay*	Off-task Processing *He starts to plan a weekly exercise schedule*

The two examples above show how non-linear the occurrence of affective processing can be, and how processing complexity increases when we also look at the occurrence of both physical processing and off-task processing.

Although the pathway back to cognition from affective processing and also physical and off-task processing does not also pass through metacognitive processing (or may do so unconsciously – as in the movement from affective processing directly to cognitive processing in example 2 above), it does represent an underlying processing pattern – when learners return to cognitive processing from another form of processing, this return is usually controlled and effected by metacognitive processing.

7.7 Specific Findings of Note

As this thesis was conducted as exploratory research, and done so using a grounded theory methodology, it has resulted in the development of a grounded theory, but also in many singular findings, which both explain the grounded theory, and add to the existing body of knowledge about processing during independent learning, and metacognitive processing in particular. These findings are presented here.

7.7.1 Complex interplay within and between metacognition, cognition and other categories of processing

This finding has been largely explained in the previously section and discussion of the theory, highlighting the non-linear complex nature of the interactions between both the different forms of processing, and the dimensions within these forms of processing, and the enablement of the learning experience. While the central pattern of bi-directional interactions between cognition and metacognition is the most frequent of all processing in independent learning the frequency or density of these interactions is not linear or predictable, nor are the interactions with other forms of processing.

7.7.2 Metacognitive engagement (activity or frequency of activity) does not necessarily result in good performance

One of the findings of this thesis is the high density of metacognitive activity during the independent learning experience. What this finding shows for the participant population in this study, is that this metacognitive engagement during learning, does not necessarily result in good performance. All participants in this study performed metacognitively i.e. they made use of their metacognition while engaged with learning. While there were differences in the number of instances of metacognitive activity (though none of the participant can be described as having low metacognitive activity), this use of metacognition, or indeed when participants had more metacognitive activity was not a predictor of good or better performance. This refutes this position that 'metacognitive' learners will have better learning success, if we are looking at the context of independent learning.

In fact, in instances shown in this study, high metacognitive frequency is often indicative of the learner having difficulty with the learning task at hand. If a student is reading an academic text and having difficulty in understanding the text, or is unsure how to read the text or what elements of the text to focus attention on, their cognitive processing at this stage may be interrupted by metacognitive processing. While this is a useful interruption as it would not be effective for the student to continue to plough on without understanding, it will not necessarily result in better or good performance. This is because the student engaging in metacognitive processing may not use metacognitive knowledge, monitoring or control in a manner that will lead to good performance. Students can engage in these forms of metacognition without improving their academic performance, or they may engage in only one or two elements of metacognition, when two or three would be required in order to impact the learning experience in a manner that would most likely improve performance. Some examples are discussed below.

- When metacognitive knowledge is inaccurate or inappropriate to the learning context or learning

A learner, having difficultly concentrating on an essay assignment in a library may start to think about how they learn best in a noisy place, and based on this metacognitive self-knowledge, decide to move to a cafeteria to continue working on the assignment. However, if this metacognitive self-knowledge is incorrect (i.e. the learner in question is not able to concentrate well in noisy places), this knowledge and indeed the subsequent metacognitive control decision to move location will not improve performance, or might negatively affect performance. This could also be an example of inaccurate metacognitive task knowledge - the learner may have enjoyed useful group discussions in noisy environments, and not have understood his or her present task requirements (an essay assignment) enough to differentiate the two learning scenarios.

- When the learner does not have or does not use appropriate Metacognitive knowledge, despite engaging in other Metacognitive behaviours

A learner may monitor their essay writing progress and make a (metacognitive) *judgment of learning* that they have not written a logical argument. This could be because the learner is writing directly on to a computer, but works better writing first drafts on paper. However, despite appropriate metacognitive monitoring, the learner may not possess this self-knowledge.

- When the learner inaccurately metacognitively monitors learning

A learner preparing a presentation may decide that they have satisfactorily understood (metacognitive judgment of confidence) the content needed to write and present, and devote their remaining time to this. They may not however, have understood the content satisfactorily, and may either realize this later when it is too late to return to reading, or not realize it at all, and give an in-adequate presentation.

- When the learner metacognitively monitors learning, but does not make a necessary or performance improving control action based on that monitoring

A learner may be aware that they are not concentrating effectively on their learning task, or spending too long on a section of a task, but simply doesn't react or respond to this monitoring, and continues in the same manner. As the learner continues unsuccessfully, the learner may continue to Metacognitive monitor this lack of success or progress many times (engaging in many instances of Metacognition), but not respond to it.

- When the learner metacognitively monitors learning (correctly or incorrectly), and makes a control decision, causing an action that does not improve performance or worsens performance

  A learner may realize that the learning time available is limited, and decide not to prepare notes for a presentation, but to speak without notes, and as a result, does not remember to give all the salient points during the presentation.

All of the examples above show learners being metacognitive, but being so in a manner that either does not improve performance, and may worsen performance. So high levels of metacognition can indicate a high degree of difficulty with learning, or if the high levels of metacognition are inaccurate or inappropriate for the learning task they will not improve performance.

At the same time, high levels of metacognitive activity can indicate good performance – the learner may be spending a lot of time, or frequent instances, thinking about how to do the task most effectively, or dealing with the task difficulties or challenges by using metacognitive knowledge, monitoring or control in an accurate and appropriate manner (the ability to use the different dimensions or components of metacognition together at the optimal times).

In the same sense, lower (as opposed to low) levels of metacognitive activity are not necessarily indicative of worse performance or better performance. If a student is engaged in reading an academic text (cognitive processing), and understands the text well and continues to read, the student may not (and it may be unnecessary for them) move into metacognitive processing, as no adjustments are required to how the learning is proceeding. Equally, it is possible that a learner's lower levels of Metacognition may negatively impact performance, if they are unaware of and do not implement learning strategies that would, for example, improve retention of information.

However, despite the points illustrated here, a certain level of metacognition is required to complete complex independent learning as seen from this study (all learners in this thesis performed metacognitively, engaging in metacognitive activity regularly), and as discussed in the section below. What is of relevance for good and better performance is the quality and timing of metacognitive activity, not specifically ‘more’ metacognition. Although in some cases, ‘more’ metacognitive activity could lead to improvement in performance – the data did show some learners who completed learning tasks using metacognition regularly did not perform well. It was the quality of and timing of their metacognitive performance that impacted the learning outcome, and not the frequency or absence or presence of metacognition.

While good performance in independent learning requires using the different components of metacognition in tandem, this does not apply to every instance. For example, as a learner begins to engage in learning, they may make a correct *judgment of learning*, for example, that what they are doing or trying to learn is quite *difficult*. However, at this juncture, it may not be necessary to apply their metacognitive knowledge to the task and make metacognitive control decisions. It might be the case that, at this instance, they should simply metacognitively monitoring the task as *difficult* is enough, to make this awareness present in their mind, and spend some more time focused on the task, before making adjustments and decisions about how they will continue to proceed.

7.7.3 High frequency switching between metacognition and cognition

All of the data in this thesis shows high frequency switching between metacognitive processing and cognitive processing. This back and forth movement between these two forms of processing is the central underlying pattern in all of the independent learning episodes undertaken in this study. It is within and between these two forms of conscious thought processing that learners generally spend the majority of their learning experience.

If we are to create pedagogies, courses and instructional materials designed to help learners develop their metacognitive ability and independent learning ability, these must be based on an understanding that metacognition and cognition are high frequency forms of thought processing, and that there exists a high degree of switching between these forms of processing during independent learning. Educators should not seek to make 'un-metacognitive' learners into 'metacognitive' learners. Rather, they should seek to make learners aware of how (and how frequently) metacognition does occur as learners work by themselves, or with their peers and without a teacher, and of how the quality of this processing will impact learning progress and outcomes. They should seek to make learners aware of the amount of decisions they are likely to make during a single learning episode, and of the factors that they can bring to bear on how to make their decisions in the best way. The focus should not be on encouraging metacognition, but on improving metacognitive performance.

7.7.4 Lower frequency switching between metacognition and other forms of processing

The frequency of switching between metacognitive processing and affective processing, physical processing and off-task processing is much lower than between metacognitive processing and cognitive processing. This is unsurprising as engaging in learning requires that learners engage in mainly cognitive processing. There are much lower instances of affective, physical and off-task processing, when compared to cognitive processing.

However an important point to note is that even when taking lower instances of occurrence of affective processing, physical processing and off-task processing into account, affective and physical processing do not have the same degree of frequency of interplay with metacognition as does cognition. As was exemplified in previous chapters, learners often do not respond to affective processing with metacognitive activity. When cognitive processing is not going well, for example, there is a general pattern for the learner to be triggered into metacognitive activity, either monitoring this problem, or engaging in control to attempt to alleviate or solve the problem. However with affective processing, such as a negative emotional state or a negative emotional response to doing a task, the learner often does not respond to this in a metacognitive manner.

Yet the fact that metacognition does and can interact with affective, physical and off-task processing is a central finding of this thesis. Metacognition, by its name, seems to suggest a meta-level processing of cognition, and not for example, emotions. However the data in this study shows that metacognition can perform the same governing function for all types of processing as it does for cognitive processing. In this sense, it may be more appropriate and illuminating to think of metacognition as encompassing both 'meta-thinking and meta-feeling'. This conceptualization allows for the understanding that metacognition can and does provide a governing function over not simply what the learner is thinking about in relation to the learning task, but also what they are feeling and thinking in relation to their emotional selves, their physical conditions and the environmental factors that may be impacting both their thinking and feeling.

This is a central finding in terms of how we continue to research metacognition, and in how we apply metacognition research in educational contexts, both in terms of pedagogical and instructional design. The importance of this is clear. As was shown in the findings chapter, there are very high instances of learners not responding to negative affective processing with metacognitive control (or indeed, harnessing the potential of positive affective processing through a metacognitive response). In many of these cases, not responding to this processing negatively impacted on learners' concentration, and on their disposition towards the learning task at hand. This reduced the amount of time they were able to spend focused on the learning tasks, and the degree to which they could focus on the tasks. One could surmise, that given that affective processing is an embedded form of processing in independent learning, and that it can be controlled for using metacognition, that teaching learners more about this would result in more, and indeed better handling of emotions during learning. The absences of metacognition being used to manage affective processing (and physical processing) to the same degree as cognitive processing could be a reflection of teaching situations (where learners have learned about learning) where there is an absence of a focus on controlling affect during learning. This would not be surprising, even in teaching and learning situations designed to improve metacognitive activity, if the teachers and/or instructional designers have conceptualized metacognition as only interacting with and impacting cognition, which this thesis has shown not the be the case.

Re-conceptualising metacognition as a governing mechanism for not only cognition but also all processing should be a part of the educational applications of metacognition research. This may however, require that learning, as it is discussed with learners, be explicitly shown to involve and be impacted by (in terms of success) by the learners' affective and physical states, and the physical environment and learning context. While this is something that is a part of the general knowledge of the field of education, it may be the case that when it comes to actual day-to-day learners scenarios, these elements of the learning experience are largely ignored (or are not consistently included, or explicitly discussed). This would account for learners' lack of effective metacognitive responses to such factors, as seen in the data in this thesis.

7.7.5 In socially-shared metacognition, individuals contribute metacognitive prompts which in turn trigger further metacognitive /cognitive action within the broader group. Individual contributions can be both collaborative and cooperative.

In a group-learning situation (two or more participants), metacognition occurs as the result of both individual and social processing. Social processing in this thesis is deemed to be the processing that occurs as a result of interaction between two or more people. While individuals in this context do engage in individual processing (both what the verbalise to the group, and what they internally self-talk), this individual processing is impacted by the processing of others, and forms part of the dialogue of social processing. In a group-learning scenario, this social processing is what moves the learning experience of all members. In this context we see individual metacognitive processing, but we also see a different form of metacognitive processing not present in individual learning context – socially shared metacognition.

As discussed earlier, socially shared metacognition has been defined as "*emerging when a group member regulates a groups problem-solving process and the other group members react to the initiative*" (Hurme et al., 2009, p. 503). This is clearly seen in all the group learning scenarios examined in this thesis. What is most interesting and indeed important to note is how metacognition activity is co-constructed in this context. It is not a situation where one person engages in metacognitive activity and the others respond with cognitive processing. Rather there is joint, sequential engagement in metacognition. This can be seen in the example from the data set below –

Table 60. Example of Socially shared Metacognition

Learner 1: *"Hang on a minute. Shouldn't we research this first?"*	*Metacognitive Monitoring*: Student 1 realises or thinks the group may be moving on to quickly
Learner 2: *"We can do that by looking at this [websites] can't we?*	*Metacognitive Monitoring*: Student 2 also questioning the best way to proceed
Learner 3: *"Ah, this is too troublesome. I can't be bothered…"*	*Affective Processing*: Student 3 is negatively disposed to doing the task
Learner 1:	*Metacognitive Control of Affective Processing:* Learner 1 attempts to control Learner 3's

"We can do it! Do your best"	negative affective processing
All learners (4) start to look at website again	*Metacognitive Control of Learning:* Student silently cooperatively engage in metacognitive control of learning by agreeing
All learners (4) reading websites	*Cognition*: Learners all engaged with the task content

In this example we can see that the socially shared metacognitive activity is a collaborative activity, rather than a situation where one learner engages in metacognitive processing and the others in cognitive or other processing. While the metacognitive processing necessarily begins with one learner, this then triggers metacognition in other learners. In this example, we also see one learner controlling the affective processing of another learners, a collaboration that moves learning progress forward, positively managing affective processing that could potentially negatively impact learning and the learning outcome. Socially shared metacognition can occur in both collaborative and cooperative ways depending on the participants involved. The learning transcript excerpt in Table 20 shows instances of both. Learner one and learner two are collaborating to co-construct the metacognitive processing that will guide their learning, whereas the fourth learner is co-operating with the metacognitive processing (assuming a directed role).

7.7.6 In socially-shared metacognition, off-task processing is more sustained

In all the instances of individual learning in this thesis, when the learner went off-task, their metacognitive control processing was generally quickly triggered to guide them back into cognitive processing, and engagement with the learning task. However, this was not the case with the pair or group learning scenarios. In these cases, when learners went off task, they regularly spent a sustained amount of time off task. In other words, socially shared metacognition did not respond as quickly to off-task processing as did individual metacognitive processing.

7.7.7 Affective processing impacts / is impacted by metacognition and cognition

When affective processing occurs, it interrupts other forms of processing, and as such interrupts progress of learning. This might be the result of cognition or Metacognition (or even physical processing, for example: *I'm so hot, I really feel negatively disposed to doing this task),* and can have both a positive or negative impact on learning, when the learner cycles back to metacognitive or cognitive processing.

- *Affective processing* can be impacted by *cognition*, for example: When a learner is moving through a learning task with ease and speed, these can lead to expressions of positive emotions, about themselves and about the learning progress.
- *Affective processing* can be impacted by *metacognition*, for example: When a learner is feeling frustrated by learning task, metacognition processing can re-focus them on the learning task, or enable them to choose a different element of the learning task to continue with.
- *Affective processing* can impact *cognition*, for example: If a learner is experiencing a negative mood, it may impact negatively on cognition, through an inability to concentrate on the task under examination.
- *Affective processing* can impact *metacognition*, for example: If a learner has a positive disposition to a learning task, they may use their metacognitive processing capacity to focus on completing the task to the optimum of their ability, rather than to a lesser, passable degree.

7.7.8 Physical processing impacts / is impacted by metacognition and cognition

In the same manner as the discussion of affective processing above, physical processing impacts and is impacted by metacognition and cognition (and can be impacted by and impact affective processing and off-task processing). If a learner engaged in independent learning is sleepy, she or he has several options available, if this state is metacognitively monitored and deemed to be effecting concentration. The learner can metacognitively control the situation by deciding, for example, to take a break, to persevere, or to change focus to a different element of the learning task. If the learner can also use metacognitive knowledge (i.e. self-knowledge that they perform badly when tired, so taking a break, based on past learning experience, would be a good choice), they can have further control over and impact physical processing, and the learning experience, through the use of metacognitive processing.

7.7.9 The significance of off-task processing: the need for further examination

Off-task processing, when learners drift away from the learning at hand, and become distracted by another issue, was exhibited by most learners in this study. Perhaps more surprising than the presence of off-task processing was the one participant who sustained concentration without going off task at all during a 90 minute learning episode.

Off-task processing, in most cases seen in this study, shows students spending time thinking (in individual learning) or talking about (in group learning) a subject un-related to learning in general or the learning task at hand specifically. Examples of the off-task processing topics seen in the data in this study were part-time jobs, romance, health, other university courses, other homework, make-up and clothes, and homelessness. While such off-task processing may appear to be simply a distraction, decreasing the time available for learning and viewed as negatively impacting the learning experience, this may not always be the case.

The natural occurrence of off-task processing may perform certain functions. It may be the result of the waning ability to focus and process information after a prolonged period of concentration (which may have a different length for different individuals), or it may be a response to the difficulty the learner is having because of the degree of task difficulty.

Another form of off-task processing seen in the data in this thesis, is where off task processing on a seemingly un-related topic, brings the learner's or groups' thinking back to a topic that has relevance to learning. An interesting example of this was an off-task discussion seen during a group-learning task. The group, discussing their understandings of an academic article about self-regulation, segued into off-task but related processing. Moving from the content of the article, they began to discuss their understanding of the relationship of need between babies and mothers, and then homeless people. This discussion, although not named as such by any of the participants, was a representation of Maslow's hierarchy of needs.

The discussion then moved to the lives of homeless people, but was then refocused on the learning task, with one learner highlighting the importance of psychology in understanding learning. While the discussion as it continued did not explicitly make use of this off-task processing, the obvious relation between the learning task and some of the off-task processing, would suggest a link and possible benefit to learning of some forms of off-task processing. It may be the case, that in certain circumstances, by going off-task, and discussing or thinking about a separate topic may serve the function of interrupting learning, but then giving learners a different lens or perspective from which to think about, analyse or explain the learning problem under question.

While this discussion highlights possible benefits to off-task processing, there are also clear instances where it can negatively impact learning. In this thesis, examples of this included –

- learners going off task so frequently that it prevented optimal completion of learning
- learners going off-task for so prolonged a period that learning was not completed in the time allocated

This is an area that warrants greater research, and the use of different methodologies to analyse the purposes and outcomes of off-task processing.

7.7.10 Learners spend more time in sustained periods of cognition, when the task is less complex (where the task has less elements, not necessary lesser difficulty), and more time moving between cognition and metacognition when the task is more complex.

This was seen in this study where participants had to undertake different learning tasks. One of the tasks required groups of learners to read and understand an academic text, and then give a presentation of the tasks. While students were reading the text, they remained in cognitive processing for long periods when they were engaged in the less complex (though difficult) part of the task, reading and understanding the text. This pattern was also apparent in another individual task, where students had to read about a company in order to prepare for a job interview (they spend sustained periods in cognitive processing as they read). In both cases, as soon as the task became more complex, there was more movement between cognition and metacognition. For the group task, before and after reading, students were faced with many elements – who should read what, how long should be spent on reading and on discussion and on writing the presentation etc. In the individual task, after reading, students had to think about what questions to prepare to answer in the interview, which elements of the company information were most important to commit to memory, what personal attributes to discuss in relations to the company's needs etc.

The more complex the task, or part of task, the more movement between cognition and metacognition and the greater the time spent in metacognitive processing.

7.7.11 The complex manner in which processing occurs during independent learning highlights the individualized nature of learning, and the complexity of group dynamics and cultural context, and the impacts of these factors on processing during independent learning.

The data set in this study, although conducted with a very specific participant population, shows significant variations in the processing pathways during independent learning. Some learners were very focused, others less so. Some were concerned with excellence, others with adequate completion. Some were facing personal issues which affected their ability to learn, while others were not, or their issues did not affect their learning. Some were confident in their abilities, however, others were not. Each individual brought their 'unique self' to the learning tasks, and this created different pictures of learning processing pathways, and the degree of success of those pathways.

In the same way, independent group learning situations are made up of groups of 'unique selves', whose interactions are complex. The data in this study showed dominant learners controlling social processing, both with positive and negative outcomes. It showed more passive learners cooperating rather than collaborating in metacognitive activity. It showed how the affective state or mood of individual learners can impact the affective state of the group, and how this can be controlled for by the group (or members of the group).

The participants in this study were Japanese tertiary students, who, as discussed in the literature review chapter, have been shown to be negatively disposed towards taking control of their learning. This differs from, for example, Western tertiary students, who are motivated by the opportunity to take control of their learning. This cultural context, and the largely didactic mode of learning that the participants in this study has experienced in the past, was visible through both the degree of difficulty and discomfort they exhibited in their independent learning, even with regard to task elements it might be assumed would be unproblematic, such as choosing between textbooks.

7.7.12 Unconscious metacognition

In this study, the focus was on exploring *conscious thought processing* in independent learning. In recent years, there has been more discussion in metacognition research about the possible *unconscious* nature of metacognition, and also the difficulties this may cause in researching and measuring metacognition. Analysis of data emergent from this study points to the likely presence of *unconscious metacognitive thought* processing. With certain types of learning decisions, specifically, learning decisions that are likely to be habitualised in learners, such decisions do at times occur, without any visible or conscious metacognition on the part of the learner. Two examples of this seen in this study were of note-taking (or highlighting/marking important content) and re-reading sections of text. In many instances, learners moved from reading to re-reading without any verbalized thinking about why such a decision was needed. This change of cognition was visible in the data through the video-recordings of all learning episodes, so a metacognitive control of learning was visible in the movement back to re-read a section. While at times learners did verbalise metacognitive monitoring before engaging in re-reading (i.e. "Oh I don't understand that last section" or "I think this bit is really important), in some cases this element of metacognitive monitoring before making the metacognitive control decision was absent.

The same can be seen in many instances of participants deciding to take notes, highlight important parts of a text or write down discussion points or thoughts deemed important. Looking at the verbalized data, and the visual data, it would appear that metacognitive monitoring did not occur in these instances. We can interpret this in three ways:

- Metacognitive monitoring did not occur.

This is not the case, as there was a control decision to change the progress of learning, which does not occur without a trigger. This trigger is the awareness of the need to re-read or the benefit of re-reading (which is metacognitive monitoring, either because of lack of understanding, or the benefit of spending more time thinking about what had been read)

- The learners did metacognitively monitor but did not verbalise it.

  While this is indeed possible, and is a concern with the use of verbal protocol analysis (that learners will not necessarily verbalise all thinking), this situation was only *regularly* visible in the data for these forms of learning decisions – the more habitualised learning practices.

- Metacognitive monitoring occurred unconsciously.

  This would seem to be the case, and is perhaps best explained by the context that university learners (the participants in this project) would have regularly engaged in, and likely received explicit instruction at times in their education to date, about the importance of re-reading, and of making notes to condense the salient points of information in any learning activity.

There are other examples within the data set where unconscious metacognition may also be occurring. There are instances of learners moving from off-task processing, affective or physical processing directly to cognitive processing. Many instances show this pathway to be facilitated by metacognitive processing (i.e. consciously refocusing, or consciously controlling or using affect), but not all do. The data in this thesis cannot confirm if all instances of 'non-response' are indeed 'non-response' or in fact, may indicate *unconscious* metacognitive processing. This is an area that requires further study and examination. Stimulated recall, for example could be used with learners to elicit what they has been thinking at specific intervals when unconscious metacognition may have occurred.

7.8 Summary

This chapter has presented a detailed discussion of the findings of this study. The final chapter that follows makes definitive recommendations for both future research in this area, and for the practices of independent learning and teaching based on the findings and discussion.

Chapter 8: Conclusions

8.1 Introduction

This chapter revisits the grounded theory of processing during independent learning that has been developed through this study. It provides a summary of this theory, and discusses its significance – how it has advanced knowledge in the field and added to the body of literature. Following this, recommendations are made for both future research and educational practice in the fields of metacognition and independent learning.

8.2 Summary of the Grounded Theory

The research in this thesis has resulted in the emergence of a grounded theory.

Table 61. The grounded theory

This *grounded theory* posits that different types of processing, namely, **metacognitive, cognitive, affective, physical and off-task processing,** interact to influence the learning experience in independent learning. It further postulates that each type of processing is **multi-dimensional** and that the i**nteractions within and between** these processes and the learning experience are **non-linear and complex**.

This theory, which has emerged from the data, shows that the five different types of processing, namely, metacognitive, cognitive, affective, physical and off-task processing, interact to influence or to impact the learning experience in independent learning. These categories of processing (and their dimensions and sub-elements) can account for all *conscious thought* processing that occurs during independent learning in both individual and group learning contexts. It is the interactions within and between these processing categories that drives and ultimately controls and contributes to the effectiveness and success of the learning experience.

The second statement recognizes that these processing types are multi-dimensional, and the interactions within and between these processes and the learning experience are non-linear and complex. *Non-linear* in this context means that the pathways between the various types of processing, dimensions or sub-elements do not always move directly towards the enablement of a learning experience. In other words, the data in this study has shown that the natural learner movement between different forms of processing does not always move forward in a manner that is improving or enabling learning. *Complex interactions* refer to the complexity of movement between the various types of processing and their dimensions and sub-elements. While there are patterns of movement between processing categories (i.e. the frequent bi-directional movement between cognitive processing and metacognitive processing), interactions between processing types are not always predictable; the interactions show the complexity of learning processing, and that individuals and groups of individuals engaged in learning are an example of a complex system in action.

Figure 11. Model of Processing during the Independent Learning Experience

Learners' thought processes move with frequency between the categories of processing (and within the categories of processing) as they are engaged in independent learning. Much of this movement effectively moves the learning forward, but some does not. While the non-linear movement of processing is naturally occurring, this does not mean that these processing pathways are not amenable to change. This supports findings from the literature review on metacognition within training, where they have identified that the metacognitive form of processing is amenable to change (Adey & Shayer, 1994; Brown & Pressley, 1994; Hartman, 2002c; Nuckles et al., 2008). The fact that learners can and do move along processing pathways that enable and improve learning suggests that further investigation and development of this theory could have powerful applications for improving learning performance. The increased clarity of these processing categories, their dimensions and sub-elements that have been uncovered in this thesis, present a more comprehensive picture of conscious thought processing during independent learning.

8.3 Significance of the research

This study and the resulting grounded theory have advanced the body of knowledge about processing during independent learning, and most specifically, it has extended what we know about metacognitive processing during independent learning in a natural, real-world setting.

8.3.1 Grounded Theory Methodology & Qualitative Approach

This study has shown the integrated nature of all processing categories during independent learning, and how all categories impact upon the learning experience. Through the Grounded Theory methodology used, the study has provided a real-time, holistic view of processing during independent learning, something largely absent in the literature. In the past, GTM has been applied to specific areas of independent learning, such as in the use of reading strategies (Pressley & Afflerbach, 1995), but has not been applied to the totality of the independent learning experience, as was the case within this study. By moving away from very specific, quantitative studies of elements of processing or specific interactions, and engaging in an in-depth look at the whole learning experience, it has been possible to map the reality of processing in independent learning for the participants involved in this study. This process has also shown the interactional nature of all processing types, how, how often and when they occur. This provides a significant, grounded in data foundation from which to continue to explore and research how learning happens. It also provides exemplification of the power of exploratory qualitative research for concepts (such as metacognitions and cognition) resistant to definition and separation.

8.3.2 Separation of Cognition and Metacognition

As discussed in the literature review, understandings of the concepts of metacognition and cognition differ greatly and there has been inadequate clarification to-date on what the two constitute and how they differ. This study has emerged with *data driven* explanations of both concepts within real-world learning contexts, through an examination of *conscious thought* processing in action. Rather than viewing the difference between cognitive process and metacognitive processing at the meta-level as being second-order or higher order cognitions (Kuhn, 2000; Weinert, 1987), this study has developed the hopefully more distinct, useful and workable understandings of the two concepts, as defined below.

Table 62. Separating Cognitive Processing and Metacognitive Processing

Cognitive Processing	Processing when learners are engaged with understanding the content of the task or doing the task, but not with *how to* do the task
Metacognitive Processing	Processing occurring when learners are concerned with *how* learning is and should proceed.

These more concise distinctions of cognition and metacognition will assist researchers, and educational practitioners, to better understand learning behaviours and to explore more fully metacognitive-related issues within the learning process. This study has also shown that existing frameworks of metacognition that de-compose metacognition into the three distinct components (or dimensions) of knowledge, monitoring and control (Dunlosky & Metcalfe, 2009; Pintrich et al., 2000) to be more credible, than the two component model of metacognition as elucidated by Brown, (1987) and Schraw, (2002). This is an important finding, as there is much discussion in the field of metacognition research about the divergence between theories of metacognition generated from mainly clinical-based research studies and the realities and practice of metacognition in real-world settings (Pressley, 2000; Schraw & Impala, 2000).

8.3.3 Metacognition and its Interactions

While there is some emergent discussion in the literature about the possible relationships between metacognition and other types of processing beyond cognition, such as affective processing (Efklides, 2011; Zimmerman & Moylan, 2009), there is not a significant body of research in this area. This thesis has shown metacognition to interact not only with cognition, but also with other processing categories identified as *affective, physical and off-task processing*. This is of significance in terms of how we conceptualise metacognition; not as a form or level of cognition that informs and controls cognition, but as a form of cognition that can and does play the same role for all forms of processing – cognitive processing, affective processing, physical processing and off-task processing. This is significant in that it means that an accurate understanding of metacognition in learning must be inclusive of these ‘other’ forms of processing. As was noted in the literature, one of the main challenges for the researchers in the field of metacognition remains its conceptualization (Efklides & Misailidi, 2010). This study has been able to overcome this issue, both through the clear differentiation between all types of processing, and through the development of a transparent situated understanding of metacognition in context.

8.3.4 Independent learners are ‘Metacognitive’ Learners

This study has shown that all learners are naturally and necessarily metacognitively active within independent learning scenarios. Therefore, metacognitive processing is not something that individual independent learners may not do (although they may not explicitly know this form of thinking to be metacognitive processing) – it is something they all engage in with varying degrees of success. Thus, metacognitive activity may not always be beneficial – it can have a neutral or negative impact on the learner’s overall performance, and can be untimely. As such, the goal for the educator who wishes to enable the independent learner, becomes not the initiation or increase of metacognitive processing (its frequency of occurrence not being an indicator of best performance), but the improvement of it. This is not currently obvious in the literature available, and as such this study can provide a necessary shift of focus towards the fostering of existing metacognitive skills that result in better performance for the learner.

8.3.5 Domain-general Metacognition

The data in this study adds strength to the argument that metacognition is not domain-specific, but is domain-general (Pieschl, Stahl, & Bromme, 2008; Veenman et al., 1997; Winne, 1996). Analysis of student metacognitive processing across different learning tasks in this study showed students to be no more metacognitively competent within their 'domain' – in this case their specific field of language study – than when faced with other domain learning or ill-defined learning.

8.3.6 The construction of socially shared metacognition

Through the analysis of independent group learning experiences this study has been able to show that metacognitive processing is socially constructed in group-learning. It is not performed by a single group member (though a single participant can initiate it, and some participants may be more active in its co-construction than others), but is shared processing. It can be shared in an obvious sense, for example when participants are all involved in metacognitive monitoring of progress, or when different participants consecutively engage with different dimensions or sub-elements of metacogntion, resulting in a control action that directs the progress of learning. However it is also shared in less obvious exchanges, when it appears that some members are not contributing to the metacognitive dialogue. The act of silently or tacitly agreeing to follow another participant or participants' direction involves making a decision to do so (which may be based on a judgment of learning, or on metacognitive knowledge that is not vocalised), and then engaging in the new or continuing course of action. As such, all participants are part of this shared processing.

8.3.7 The centrality and functionality of 'other' processing.

Central to the independent learning experience is the occurrence of the 'other' forms of processing, namely, affective, physical and off-task processing, their interactions and impacts. Although this study has been able to uncover their centrality to the experience - the occurrences of these categories of processing, the degree to which they occur and how they interact - it is beyond the scope of this project to discuss the roles and functions that they perform in learning contexts.

8.4 Recommendations for Future Research and Practice

The development and emergence of a new grounded theory of *conscious thought* processing during independent learning provides us with new insights into the independent learning experience. This has implications for future research and educational practice, as outlined in the following sections. However, it is important to note, when discussing recommendations for future research and practice, that the exploratory nature of this research, the small participant sample size and the culturally specific context, do limit the applicability of the research findings to broader populations of learners. This also applies to claims for the domain-general nature of metacognition – further and wider studies that incorporate more domain-general learning tasks are required.

8.4.1 The value of qualitative research for examination of complexity

Dewey (1897, p. 77) noted -"*Without insight into the psychological structure and activities of the individual, the educative process will, therefore, be haphazard and arbitrary*''. This research study has shown the power of qualitative research, and CGT methodology specifically, in uncovering and understanding the complexities of learning, and specifically *thought* processing during learning. The use of quantitative methodologies is often perceived and promoted as adding rigour within research, particularly in exploring elements, aspects and types of learning. For researchers concerned specifically with independent forms of learning, the findings of this study suggest that the applicability of existing research findings and methodologies into metacognitive processing and other forms of learning processing that are based on laboratory-like or very controlled learning experiments, may be of limited use. The manner in which independent learning has been seen to occur in this study does not seem to align with findings from research conducted in laboratory type situations, (underpinned by positivist, quantitative research approaches) nor does the 'learning experience' seem comparable to the controlled learning experiences that have been examined in this way to-date. Rather, the identification of the individual, complex and interactional nature of *thought processing* in independent learning within this study, supports the use of in-depth exploratory qualitative methodologies (as opposed to quantitative methodologies) to examine metacognition in naturalistic contexts.

8.4.2 A data-driven holistic approach to understanding learning

Although the word 'holistic' when used in relation to learning and education and the researching of both, can inspire both mistrust and delight (depending on the audience), this study has shown it to be a valuable approach to the understanding of learning. The independent learning experiences researched using the data driven grounded theory methodology and discussed in this study are not explicable without reference to the 'whole' experience. At the same time, this study is an example of how learning can be examined in this way while remaining grounded in data, providing credible and resonant information and insights. Given the complexity of independent learning, it would be of value to all involved in the field (researcher, educators and learners) for this vein of research to be a more prevalent and visible voice in the literature. Within this field, this study and hopefully future studies can answer the call from within the literature for more exploratory qualitative research of 'fuzzy' phenomenon such as learning and *thought* processing (Nuckles et al., 2008; Pressley, Wharton-McDonald, Hampson, & Echevaria, 1998; Schraw, 2000).

8.4.3 Beyond the boundaries – expanding sample size & data collection tools

While the in-depth exploratory qualitative nature of this study is its strength, it also has limitations, the main one being the limited scope of the study in terms of participants. The fact that this study was a small, exploratory study with a very specific participant population (tertiary level Japanese students), means that the findings cannot be considered widely applicable to larger and more diverse populations of learners. As such, this researcher would hope that other educational practitioners and researchers would continue to build upon this initial study, either through replication studies, or through the use of other exploratory methodologies to both test the grounded theory in other settings, and to develop the knowledge and theory further.

While the choice of data collection tools used in this thesis have been discussed and defended, the use of other tools can only add to and deepen the knowledge gained in this project. One area of interest that was outside of the limits of the tools used was the area of *unconscious* metacognition processing. Although unconscious metacognitive processing was at times visible through visual recordings of actions (seen through unconscious movement into note taking, or decisions to re-read portions of texts) this only provided a small glimpse into this type of processing. Other tools, such as stimulated recall, or neuro-imaging devices might be better placed to examine this area of processing than those used in this study.

8.4.4 Implications for educational practice: Three streams

With regard to educational practice, the data, model of processing and grounded theory emergent in this thesis have three important implications. Firstly, the understanding of independent learning processing as non-linear and complex has implications for how educators design instruction and curricula, particularly in terms of preparing learners for successful independent learning and ultimately, lifelong learning. Secondly, educational practice and training that is specifically concerned with improving the metacognitive performance of learners may need to be re-conceptualised to accommodate the reality of *natural* metacognitive processing abilities. Finally, this thesis has shown the centrality of the learner(s) as individual(s) in the learning process. Any educational design, whether it be of environment, pedagogy, instruction or curricula, needs to take into account not simply learners abilities and proficiencies, but also their emotional, physical and contextualized selves.

8.4.4.1 Incorporating the non-linear and complex understanding of learning into educational design

Educational design generally follows a linear path towards the goal of learning enablement, and along the way, often decreases the complexity of learning by having educators fulfill or perform many of the essential forms and functions of metacognitive processing during learning. This occurs through the creation of learning materials or environments that ignore much of natural learning processing (affective, physical and off-task processing), and that removes much of the metacognitive load from the students (through direct instruction, or the breaking down of learning into artificial stand-alone segments). The reality is that students will, when the 'training wheels' come off, enter the world of non-linear complex learning.

As such, educators and educational designers need to prepare students for this experience, through, for example, a more deliberate but gradual shift over time towards the enablement of learning that recognizes and responds to the complexity of conscious thought processing in independent learning. The implication of not doing this is clear from the data in this study. If, as was the case with the participants in this study, learners have an educational experience that largely excludes (or does not explicitly address) certain types of conscious thought processing, focusing mainly or solely on cognitive processing, then the learners, when placed in the experience of non-linear complex learning, may not be able to optimally understand and manage the metacognitive process, and may have a less effective learning experience as a result.

8.4.4.2 Re-conceptualising and redesigning Metacognition Training

As was touched upon in the previous section, the new understandings of metacognitive processing in independent learning, as uncovered by this study, have implications for the design of educational programmes that hope to develop either learners independent learning ability, or their metacognitive ability specifically. Independent learners are not 'un-metacognitive' – they are 'metacognitive', whether they know what metacognition is or not. However they may not be 'positively metacognitive', in that their metacognitive activity may be incorrect, inaccurate or inappropriate for the learning experience at hand. As such, any metacognition training endeavour should be based on the understanding that although learners may not function well metacognitively in a classroom with a teacher, this is not because they cannot do so, but because the metacognitive role is either being performed by the teacher or the teaching materials, or that the segmented structure of learning delivery into discrete items requires little of it. Place these learners into an independent learning situation and they will engage in metacognitive processing, although they may not do it well. It would therefore seem essential that any educational metacognition-training programme place learners into independent learning experiences, with the understanding that the goal will be to make explicit to them their existing metacognitive processing, and engage in a process of learning and remediation to allow them to improve their existing capacity for metacognitive processing.

8.4.4.3 The 'whole' learning experience

The learning complexity seen in this study makes a case for learning environments and experiences that promote the development of learners who are aware of the whole learning experience, and whose educational practice and experience allow them to engage with this whole learning experience, reflect on and evaluate it, and improve it through practice. This means that reducing learning to something that it is not (i.e. a series of discrete tasks, content blocks, or the following of instruction), will not prepare learners for the reality of learning to be undertaken without a teacher, or some 'other' who will take on the metacognitive role in learning. In a practical sense, this may mean re-structuring learning tasks and activities so that less instruction is provided, in order to require learners to take on a more metacognitive role, and develop their ability in this role over time.

8.5 Conclusion

The development of metacognition or metacognitive skills is critical in the preparation of learners for positive engagement within lifelong learning, the knowledge economy and, indeed, the knowledge society. The goal of this study was to understand metacognitive and other forms of conscious thought processing that occur within independent learning at tertiary level. This study highlighted the value of a qualitative approach, and a constructivist grounded theory methodology, in the examination of metacognition and other forms of thought processing in real-world learning contexts. Five distinct types of conscious thought processing occurring during independent learning have been identified through this qualitative CGT research process, namely, cognitive processing, metacognitive processing, affective processing, physical processing and off-task processing. A grounded theory has also emerged, that recognizes the non-linear, multi-dimensional complexity within and between metacognition, cognition and other forms of processing during independent learning. Both of these outcomes contributed directly to the goal of this study, by providing a better understanding of metacognition and independent learning, and furthermore will help in the development of educational interventions that foster the type of metacognitive skills that enable learners to progress within real-world independent learning contexts.

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Appendices

Appendix A: Ethical Approval from Dublin City University

DCU

Dublin City University
Ollscoil Chathair Bhaile Átha Cliath

Offiice of the Vice-President for Research
Dublin 9, Ireland

Dr. Charlotte Holland
Education Studies

14th May 2008

REC Reference: DCUREC/2008/47

Proposal Title: **Metacognitive Thinking Processes**

Applicants: Dr. Charlotte Holland, Mr. Luke Carson

Dear Charlotte,

This research proposal qualifies under our Notification Procedure, as a low-risk social research project. Therefore, the DCU Research Ethics Committee approves this research proposal. Should substantial modifications to the research protocol be required at a later stage, a further submission should be made to the REC.

Yours sincerely,

pp. Fiona Brennan

Mr. Brian Trench
Chair
DCU Research Ethics Committee

DCU
Office of the Vice-President
for Research

Telephone 353 (0)1 700 8000
Facsimile 353 (0)1 700 8002
Email research@dcu.ie
Website www.dcu.ie

Appendix B: Ethical Approval from Dublin City University

KANDA UNIVERSITY
OF INTERNATIONAL STUDIES

1-4-1, Wakaba, Mihama-ku, Chiba-shi, Chiba-ken, 261-0014 Japan. Telephone: 043-273-1322 Fax: 043-273-2220
http://www.kuis.ac.jp

June 6, 2008

Project Title: Metacognitive Thinking Processes

Applicant: Luke Carson

Supervisor: Dr. Charlotte Holland (Dublin City University)

The proposed project, to be undertaken with students in the English Department at Kanda University of International Students, has been designated as a low risk social research project. The project involves creating a language course designed to improve student ability to learn and is in accord with the goals of this university. Therefore, Kanda University is happy to approve this research project. If at any stage the project is substantially modified, a re-submission for ethics approval will be required.

Sincerely

Michael J. Torpey

Dr. Michael J. Torpey
Director
English Language Institute
Kanda University of International Studies
1-4-1 Wakaba, Mihama-ku
Chiba-shi, Chiba-ken, Japan 261-0014
Email: torpey@kanda.kuis.ac.jp
Phone: 043-273-1412
Fax: 043-273-1412

Appendix C: Plain Language Statement

Plain Language Statement

Luke is now doing his PhD, and will be doing some research with your class.

This semester, Luke will be doing research about metacognition. Metacognition means thinking about thinking, and Luke will be researching how students think when they are learning.

If you agree to be a participant in this research, you will not have to do any extra work, but some of your class activities will be audio and video recorded, and some class group work will be filmed and recorded. Also, some of your homework will be used for the research.

The only people who will look at or listen to the recording are Luke and his PhD supervisor in Ireland. After they have looked at them, and finished the research, all the recordings will be destroyed.

Your name will not be written on any of the information that is shared or published, so it will all be confidential.

If you have any questions, please ask Luke.

Appendix D: Informed Consent Form

Informed Consent

1. <u>Title: Metacognition in Learning</u>

   This research will be undertaken by Luke Carson at the Kanda University of International Studies, Japan for his PhD in Education through the Department of Education Studies, Dublin City University, Ireland.

2. <u>Purpose of Research</u>

The purpose of this research is to examine metacognition as students engage in self-directed learning. It will also look at the impact of teacher interventions specifically designed to foster improved metacognition. It is hoped that this project can lead to improvements in both learning and teaching.

3. <u>Requirements</u>

As stated in the Plain Language Statement, your involvement may require undertaking learning tasks under observation (which will be audio-recorded), interviews and group work (which may be audio or video recorded), and that your learning diaries produced as course work will be used as data.

<u>*Participant – please complete the following (Circle Yes or No for each question)*</u>

Have you read or had read to you the Plain Language Statement
Yes/No
Do you understand the information provided?
Yes/No
Have you had an opportunity to ask questions and discuss this study?
Yes/No
Have you received satisfactory answers to all your questions?
Yes/No
Are you aware that your interview /learning tasks/group work may be recorded, and that your learning diaries will also be used as data?
Yes/No

4. <u>Voluntary nature of this project</u>.

Your participation in this project is completely voluntary. Not participating, or withdrawing at any stage is perfectly fine, and will not result in any negative repercussions.

If at any stage, you have queries or concerns about participation or non-participation in the project, you may speak directly with Luke Carson, or with Dr. Michael Torpey, Director of the English Language Institute, Kanda University of International Studies (email: torpey@kanda.kuis.ac.jp, ph: 043-273-1412)

5. Confidentiality

All of your data used in this project will be confidential. Your name and any identifying data (such as your student number) will be removed from all the data, and not included anywhere in the research project. Any audio or video data that could identify you will only be viewed by the researcher, Luke Carson, and his supervisor, Dr. Charlotte Holland, except under the circumstances of a legal requirement to show it in another forum. Once the project has been completed, all such data will be erased or destroyed.

6. Signature:

I have read and understood the information in this form. My questions and concerns have been answered by the researcher, and I have a copy of this consent form. Therefore, I consent to take part in this research project

Participants Signature:____

Name in Block Capitals: ____

Witness: ____

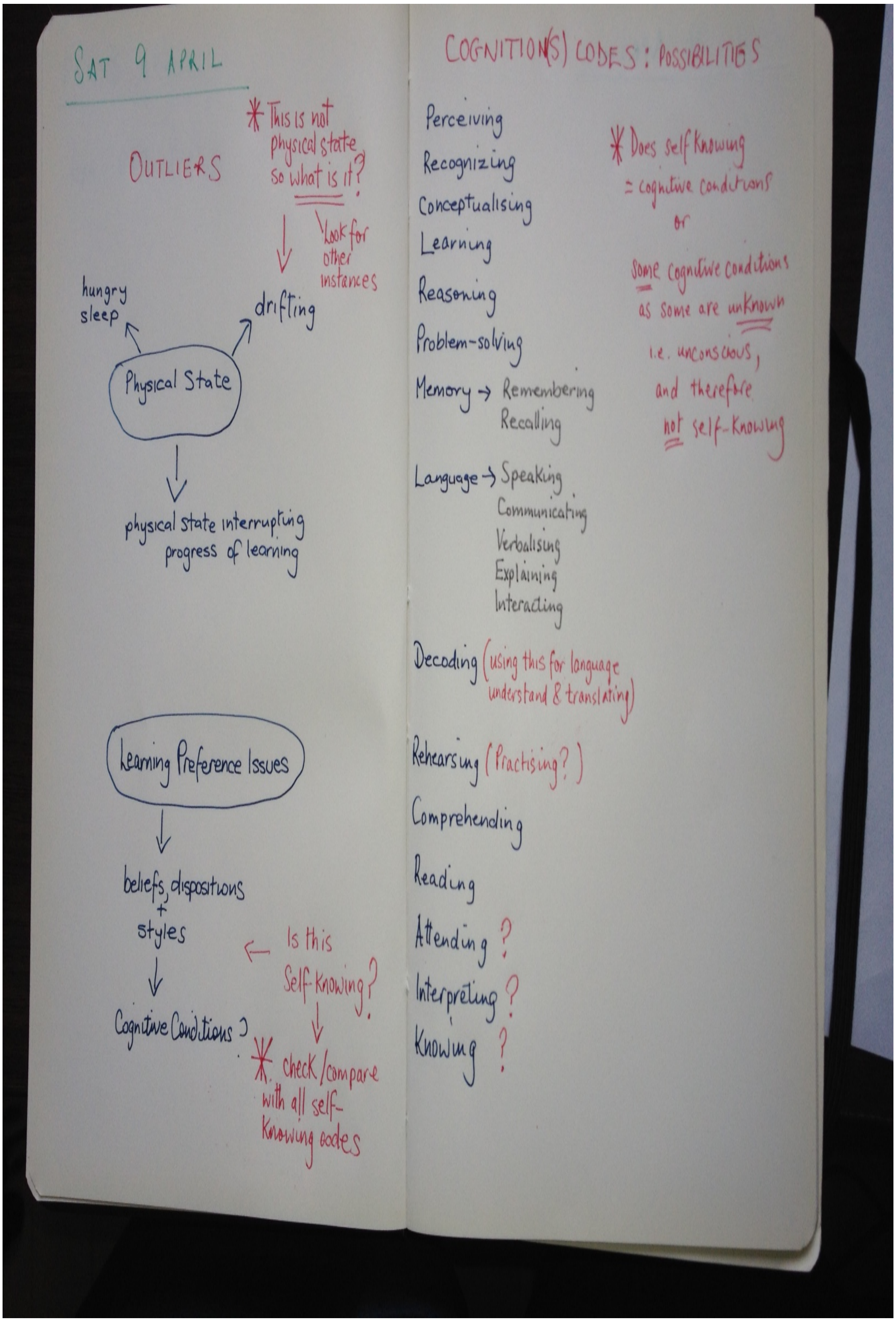
Date: ____

Appendix E: Learning Task 1

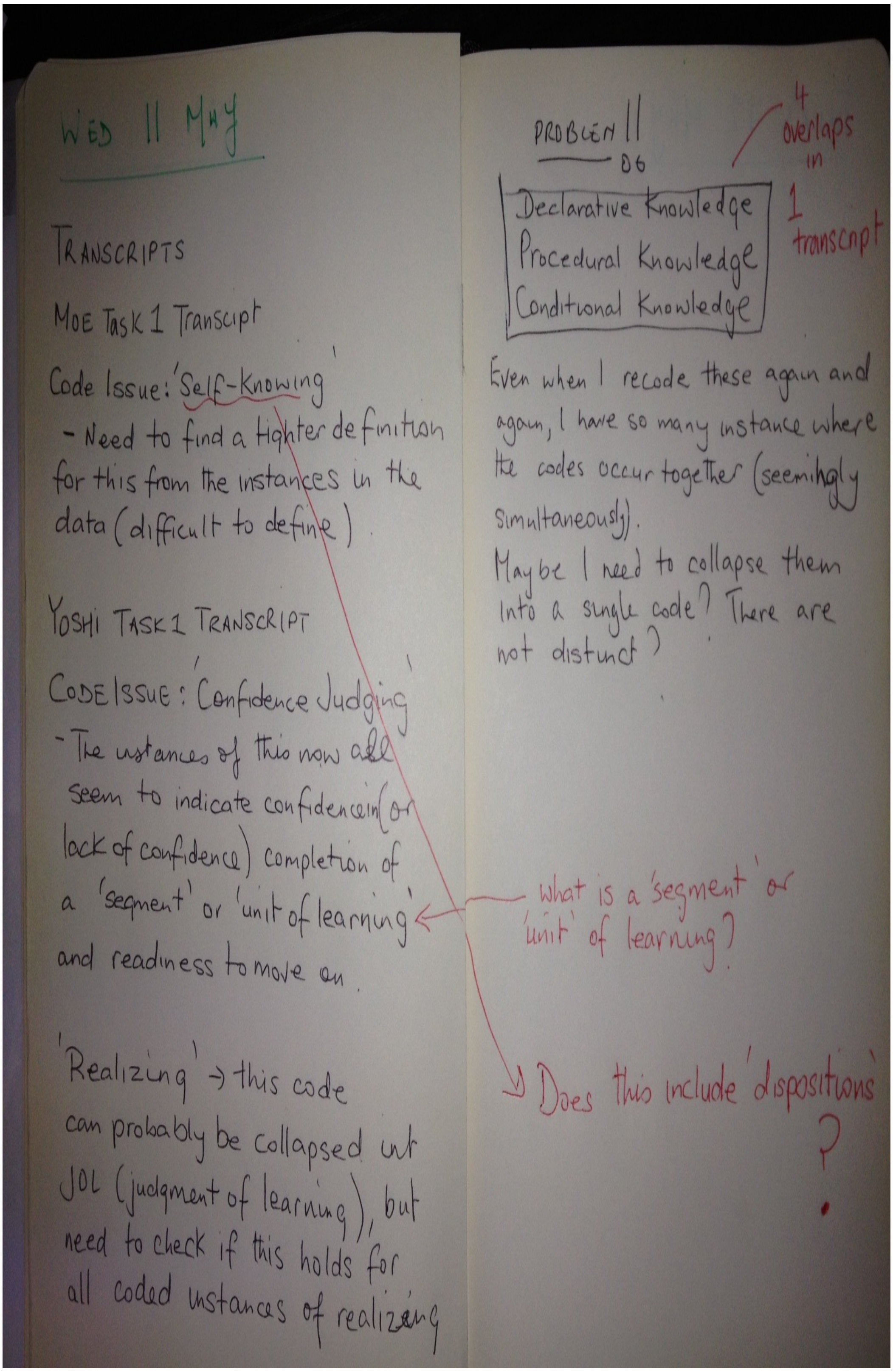
Create your independent learning plan	
Big Goal	What is the area or areas of English that you most want to improve? Why? If you have a clear goal, and a clear reason for this goal, it will be easier to plan and learn successfully.
Achievable Smaller Goal(s)	What specific things can you focus on to achieve your bigger goal? Choose one or more small goals. Remember, you will have 8 weeks to achieve them.
Interests and Motivation	Sometimes it can be difficult to stay motivated when you are doing independent study. One way is to use your interests in your study. Can you use any of your interests in your learning to help you achieve your goal? Or, do you have any other ideas to keep your motivation up?
Learning Styles	We are all individuals who learn best in different ways. What do you know about your learning styles, and how can you use your learning styles effectively in this plan?
Resources	Please list some resources you will use for the next 8 weeks for this learning plan. Resources can be books, websites, movies, people or places – anything you will use. Discuss why you chose them, and how you will use them to help you achieve your learning goals.
Learning	Successful language learning involves more than just trying to memorize new language. You also have to understand new language, think about and monitor your ways of learning, review language, use language and experience language. Please write here about how you will organize your learning. Remember, you will have two ninety-minute periods each week for this independent learning.
Evaluation	What can you do regularly during these 8 weeks to see if your learning is effective? What can you do at the end of 8 weeks to see if you have achieved your goal, or how much you have improved?
Anything else?	Is there any other information you would like to include in your plan?

Appendix F: Memoing Examples

Example A: Notebook Memoing



Example B: Notebook Memoing



WED 11 MAY

TRANSCRIPTS

MOE Task 1 Transcipt

Code Issue: 'Self-Knowing'

- Need to find a tighter definition for this from the instances in the data (difficult to define).

YOSHI TASK 1 TRANSCRIPT

CODE ISSUE: 'Confidence Judging'

- The instances of this now all seem to indicate confidence in (or lack of confidence) completion of a 'segment' or 'unit of learning' and readiness to move on.

'Realizing' → this code can probably be collapsed w/ JOL (judgment of learning), but need to check if this holds for all coded instances of realizing

PROBLEM !!
06

4 overlaps in 1 transcript

Declarative Knowledge
Procedural Knowledge
Conditional Knowledge

Even when I recode these again and again, I have so many instance where the codes occur together (seemingly simultaneously).
Maybe I need to collapse them into a single code? There are not distinct?

what is a 'segment' or 'unit' of learning?

Does this include 'dispositions'?

Appendix G: Coded Transcript of Learning Task 1 (individual task)

This task required students to create their own individual language learning plan. The student verbalizations and observations about the student as he was learning are provided in italics.

Cognitive Processing

(student reading)

Metacognitive Monitoring Judgment of Learning

I'm not sure about this..

Metacognitive Monitoring Ease of Learning

Ah English is difficult....

Metacognitive Monitoring Judgment of Learning

What should I do? Hmm

Metacognitive Control of Learning

(Begins to write on the paper)

Cognitive Processing

(writing on the paper)

Well, at the moment, what I want to do is increase my TOEIC score

(reading)

So this means that.....my big goal will be increasing my TOEIC score, and my small goal will be, if I look at the different TOEIC sections

Metacognitive Monitoring Judgment of Learning

OK

Cognitive Processing

860....860 points, 860 points would be ok...hmm

(writing)

to get 860 points, in English is....

(writing)

because...because I want to be a teacher, be a teacher. If I get 860 in TOEIC, I will pass......pass...test

Ah, its not pass, what is it...

Metacognitive Control of Learning

(takes out electronic dictionary)

Cognitive Processing

...to be exempt...exemption.....ah here it is

Metacognitive Control of Learning

(erasing, writing)

Cognitive Processing

(erasing, writing)

Affective Processing

Ah I feel a bit nervous

Cognitive Processing

Exempt, exempt, exempt..

(trying to correctly pronounce the word)

Exempt the first exam

Metacognitive Control of Learning / Cognitive Processing

(writing)

Metacognitive Monitoring Judgment of Learning

Is this ok? Is it ok?

Cognitive Processing

What were my separate scores for listening and reading

Metacognitive Knowledge Self Knowledge

I should know these..

Metacognitive Control of Learning

(starts to look through the paper plan)

Cognitive Processing

(looking through the paper plan)

Interests and motivation...resources....interests and motivation..

(reading)

(Reading aloud)

Sometimes it can be difficult to stay motivated when doing independent study. One way is to use your interest in your study. Can you think of any way to use your interest in your learning to help you achieve your goal, or do you have any other ideas to keep your motivation up?

How to increase my motivation for TOEIC study..

Metacognitive Monitoring Ease of Learning

that is a bit difficult...

Metacognitive Monitoring Judgment of Learning

What should I do, is there any interesting way to study TOEIC.......

Metacognitive Control of Learning

(starts to read again)

Cognitive Processing

(reading)

Learning style...we are all individuals...what do you know about your learning style and how can you use your learning style effectively in your plan?

Eh??

What do you know about your learning style...how can you use your learning style effectively in this plan

Resources...please list some...resources can be books, websites, movies, people, places - anything you will use. Discuss why you chose them, and how you will use them to help you achieve your goal, learning goals.

Metacognitive Monitoring Judgment of Learning

Right ok

Metacognitive Control of Learning

(goes back to the first page of the plan)

Cognitive Processing

Achievable smaller goals - what specific things can you focus on the achieve your big goal. Choose one or more small goals.

OK, small goal....vocabulary, vocabulary, grammar, reading.....and...listening.. there is no speaking in the test.

Thats it...hmm.....

Well, I have 8 weeks for this plan...so the time has come to start....

Off task processing

(looking out of the room)

I wonder what everyone else is doing now?

Metacognitive Monitoring Judgment of Learning

Well...my handwriting is not good...but it is probably ok...

Metacognitive Control of Learning

(reading again)

Cognitive Processing

(reading)

Well first,....vocabulary

Off task processing

(looking out of the room again)

Oh, there is Mai...I guess she is speaking English - amazing...is she thinking in English as well? I cant do that...

Metacognitive Knowledge Self Knowledge

Thinking in English is not possible for me..

Cognitive Processing

hmm...First is grammar, no vocabulary, vocabulary...

Metacognitive Monitoring Judgment of Learning

but I dont know if I really want to do it..

Metacognitive Monitoring of Affective Processing *actually I really just don't want to study at all*

Metacognitive Control of Learning

(sits back in seat.....looking at plan)

Cognitive Processing

Specific...specific....is there anything other than vocabulary?... 10 or 20....only 80? No......8 weeks....what about grammar? Nah, maybe I don't need to study grammar...

I know it alright and sometimes really well...

Grammar is ok so that leaves vocabulary and listening and reading....Specific.....specific....what am I supposed to write about specifically.

They said before that is was ok to think if anything food, or anything

Off task processing

Hmm..it is interesting to say everything you are thinking when you are just speaking by yourself....

Metacognitive Knowledge Task Knowledge

OK, time, I don't have time

Metacognitive Control of Learning

so focus...OK...

(writing)

Cognitive Processing

New vocabulary….is this spelling ok?

And..

Ah! maybe it is a good idea to read books too! Reading is useful....what if do that book.....ah maybe not, that is different.. I need business related stuff.....

Hmm what I can do is listening...how should I,,,listening,,,,,, business related listening..

Well to start with I will use a TOEIC textbook...maybe that is ok...

Metacognitive Control of Learning

(writing)

Metacognitive Monitoring Judgment of Learning

What else? Listening materials - can I use a TOEIC book for this? Not really..what should I do?.

Metacognitive Knowledge Cognitive Knowledge

Ah, if I could do talk with some about this it would be good - I would like to share ideas about this, as it would make it better...hmm

Metacognitive Control of Learning

I am just going to go out of the room for a bit and have a look

(leaves the room, and enters the Self Access Learning Centre)

Cognitive Processing

Ok this is an English space, so it is probably not a good idea to keep speaking Japanese. But I am thinking in Japanese so..

(looking for learning materials)

Affective Processing

Oh I really don't want anyone to hear me doing this- I hope there is no one around

Metacognitive Monitoring Judgment of Learning

What should I do?

Metacognitive Control of Learning

Listening

Cognitive Processing

Listening resources ...Ah watching movies is probably not a good choice...Ah here is something. Listening Master

(name of the book the student has picked up)

Reading Master

(another book name)

(Looking at the TOEIC materials sections)

Ah all the books here are old. This is too old- it is for the older version of the test. 860 level text....ah but I think this is also for the old version....

Metacognitive Monitoring Judgment of Learning

Actually I don't really now…..what should I do.....

Metacognitive Knowledge Cognitive Knowledge

Ah are there any of my classmates around - I want to get some other opinions about this.

Affective Processing

Ah look at that student there - she is wrting loads!! Uh oh, I'm in trouble. Everyone is probably doing that. Ah look, there is Ayaka and she is writing too - amazing!! There are all doing it....

Metacognitive Control of Learning

(student goes back to the room)

Affective processing

Everyone is working hard - uh oh.......I'm not good

Physical State

(yawning)

Metacognitive Control of Learning

OK. So now.

Cognitive Processing

.this is.......topic....goal.... if it is to become a good husband.. to do this I have learn how to cook well, or things like that, so I if think in this way if it is to get 860 in TOEIC, I need to be able to use vocabulary and then....eh...reading.....Ah!

Read, read, read what?

Read paragraph, paragraph

Metacognitive Control of Learning

(writing)

Cognitive Processing

Read paragraph quickly...Is quickly correct?

(*checks dictionary)*

Yes quickly..........and ...understand....understand clearly

What about listening...In order to get 860 points.....listening.. what should I do for listening...

Be able to read quickly and understand clearly.. that is necessary. Then for the listening side?...

How can I increase my listening ability?

Physical Processing

Ow, my tooth hurts.

Off task processing

I hope I can finish up with the dentist today...

Metacognitive Control of Learning

Eh...understanding clearly

Cognitive Processing

Ah listening...what am I supposed to do for listening....listening...I cant break this down...hmmm...So listening is...to listen is..... to improve my ears, I should.......

Ah not paragraph - it should be passage. Passage

(checking dictionary)

yeah Passage

Physical State

(yawning)

Metacognitive Monitoring of Physical Processing

I'm not really sleepy, but I am just yawning

Off task processing

Yawn, what is yawn in English?

(checking dictionary)

YAWN...

Hmmm....Luke does a lot of this research stuff....

Metacognitive Monitoring Judgment of Learning

Ah I have to think of something here.

Cognitive Processing

To improve my listening I must first....to improve my listening must first.....basically the only thing to do is, I just have to do a large amount of listening

Metacognitive Control of Learning

(writing)

Cognitive Processing

Interests and motivation....

Because it is independent study...to increase motivation...pair work would be good but...

an interesting way of learning....

an interesting way....

interesting...

making something not interesting interesting

if I have to read in English, there is not really any information or topic I want to read about

what is good? motivation....

vocabulary only, related vocabulary, like for business

reading more quickly - that is not specifically related to business though..

more vocabulary - maybe I should practice my English pronunciation - vocabulary

Metacognitive Monitoring Judgment of Learning

what should I do?

Cognitive Processing

Interesting business English...enjoyable way of study..business related..that's the way, is it?

Studying about business, making it enjoyable.

Metacognitive Monitoring Judgment of Learning

Ah now I am getting confused, I dont know what to do....

Cognitive Processing

mmmm...

How can learning business words be enjoyable? Even in Japanese, I don't really use them...English is difficult right?

Metacognitive Monitoring Judgment of Learning

Ah I really don't know what to do now..

I'm thinking about stuff I don't usually think about..ahh...what should I do?

Physical Processing

I'm sleepy now.....ahhhhh

Metacognitive Monitoring Judgment of Learning

this is not good.....

Metacognitive Control of Learning

(student sits up in his chair)

vocabulary is...

Cognitive Processing

vocabulary is.....even if vocabulary is not interesting I think I can continue to study. I just have to memorize them, that's all. Maybe it is ok if it is not interesting. Then maybe I can try and make listening and reading study interesting...

Maybe this will do - how do I say this in English? I am only speaking Japanese....

Affective Processing

Why do I have to keep talking...

Metacognitive Control of Learning

To use my interests...

Cognitive Processing

To use my interests.....interesting conversation topics...what about advertising?....watching tv is not connected, nor are using movies or music....

movies?

watching movies.. but how can I connect that to business?...maybe there are some about business, If so, and I watch them......this could work for listening and for vocabulary....

Movies -

Metacognitive Control of Learning

I will go and have a quick search...

(goes into the SALC)

Cognitive Processing

(at the movie section looking through the movies)

Working, working movie...not animation, adventure, biography...documentary...documentary..what is this movie?...documentary.....inside man

Off task processing

(talking to another student, S2)

S2: Hello. Are you speaking a lot?

S: Yes, but in Japanese, always in Japanese

S2: We are going to finish now

S: Finish?

S2: Yeah, she already finished

S3: Haha

S2: So I decided to finish now. I get to bored, so I just wanna talk to someone

S: Eh..I'm jealous

(other students move on)

Affective Processing

How are they finished already!! That's amazing..I am not enjoying this…

Cognitive Processing

.documentary..job, job....documentary..a job related documentary....Ah, a lot of bad movies.

Metacognitive Monitoring Judgment of Learning

Ah this is no good.

Cognitive Processing

I cant find any.... (continues looking)

Metacognitive Monitoring Ease of Learning

S: Oh this is sooo difficult.

Cognitive Processing

Oh this looks really interesting.....

this is really interesting..(referring to movie)...Highwayman...oscar...oscar....

this looks reallly really interesting, but is it any good for this purpose?

I would want everyone else did for big goals and small goals....

Metacognitive Control of Learning

(goes back into room)

Metacognitive Monitoring Ease of Learning

Too difficult....

Physical State

(yawning)

Metacognitive Monitoring of Affective Processing

Oh I feel bad, I am really starting to lose my concentration now

Metacognitive Monitoring Judgment of Learning

I really don't have any good ideas...no good ideas

Metacognitive Control of Learning

(starts to read plan)

Cognitive Processing

I have to improve my motivation again...

Yeah, I guess as I thought..listening is...

The only idea I have is watching a movie.

Metacognitive Monitoring Judgment of Learning

will this be ok I wonder?

Cognitive Processing

At least that should be a bit interesting

Works for listening and vocabulary......mmmm.....sometimes

Metacognitive Control of Learning

(writing)

Cognitive Processing

Sometimes watch business related movies... ah, not business but...maybe business is ok....

What else...

Read an English book

Metacognitive Control of Learning

(writing)

Cognitive Processing

What can I read - I don't like reading in Japanese never

mind in English.....I wonder will this have the opposite effect and lower my motivation?

Hmm, but there might be some interesting books...but reading is....

Metacognitive Monitoring Judgment of Learning

what should I do...

Metacognitive Control of Learning

Ok - I'll just do it

Metacognitive Monitoring Judgment of Learning

There is nothing else I can do

Cognitive Processing

Ehhh...learning style..

(reading...what do you know about your learning style...what do you know about your learning style......how can you use your learning style..

Learning Style..what is it?...my learning style....

--and how can you use ......

how do I use it in this plan.....

Metacognitive Monitoring Judgment of Learning

What do this mean? I don't understand what this means..

Metacognitive Monitoring of Physical Processing

Oh and I'm starting to feel sleepy....

I'm sleepy...

Affective Processing

I want to go home....

Oh I really want to discuss this with my friends now...

Metacognitive Monitoring Judgment of Learning

Well, I don't know what learning styles means

Metacognitive Control of Learning

so I am going to skip this.

(moves on to next page)

Cognitive Processing

(reading)

Please list some resources you will use in the next 8 weeks for this learning plan. Resources can be books, websites, movies, people, place - anything you will use. Discuss why you chose them and how you will use them to help you achieve your learning goals....

First, movie.....what movie...well.....I have 8 weeks so first I should just watch. or maybe actually I should use movie when I am bored of other kinds of study.....

Or maybe I should watch it every week,,,,,,

Or first do some difficult stuff, and then watch a movie......Ahhh, maybe that way I would be able to relax.......

Metacognitive Knowledge Task Knowledge

Ah..I should have written down my current score, and want improve I want.

Metacognitive Monitoring Judgment of Learning

Ah that was a mistake...

Ah I made a mistake....what should I do....

What else is there to do

Ah but does it really matter what kind of text - maybe just to improve my general listening and reading is ok...

is that ok? maybe ok?

vocabulary..what should I do?

Metacognitive Control of Leaing

OK......Specific, specific things

Cognitive Processing

... specific things.....grammar, no vocabulary..vocabulary is...mm, I need to memorize.... OK, for now I will memorize vocabulary, memorize new vocabulary

Physical Processing

I'm sleepy....

Appendix H: Coded Transcript of Learning Task 2 (group task)

Four students worked together on this task, and for the purposes of anonymity, are refered to as S1 (student 1), S2, S3 and S4. Where student speak in unison, it is indicated by Ss. This task occurred over two separate days, each time for a 90 minute period. The task involved working together to understand an English language academic text, and then preparing to give a short presentation in English about the text

Task 2 Part 1

Metacognitive Control of Learning

S3: OK so we have to read this (English article) so we well probably use some English.

Metacognitive Monitoring Ease of Learning

S2: Yeah cause it looks difficult...oh its so long it never ends!

Metacognitive Control of Learning

(reading)

Cognitive Processing

(all students looking through their individual copies of the article)

Metacognitive Knowledge Task Knowledge

S3: Well I don't think we need to look at all the references and stuff like that, so if we take that out it is not as long as it seems

Metacognitive Monitoring Ease of Learning

S2: yeah actually maybe not so bad

S3: I guess we just have to read it now..

Metacognitive Control of Learning

(students start taking out electronic dictionaries, pens and pencils)

Metacognitive Monitoring Judgment of Learning

S1: Should we just start reading individually?

Metacognitive Control of Learning

S3: Yeah, for now just read, and then, we can take it from there...

Metacognitive Control of Learning / Cognitive Processing

(students start to read individually. remaining seated around the table)

(students making notes/highlighting/underlining/using their individual texts while reading; also using electronic dictionaries)

Metacognitive Control of Environment

(S3 leaves the room)

Metacognitive Monitoring Judgment of Learning

S1: Don't you think we decided to just read to quickly?

S2: Yeah which part am I supposed to remember?

Metacognitive Monitoring of Physical Processing

S1: I think I feel asleep a little

Metacognitive Knowledge Self Knowledge

S1: Actually, when I an just reading like this, is just doesn't go into my head

S4: Yeah I can't understand it all

S1: If it was in Japanese I could probably remember it, but this just goes into my head and right out again

Ss: Haha

Metacognitive Knowledge Cognitive Knowledge

S1: Maybe what we should have been doing was stopping while we we reading and checking out understanding..but we just didn't think about that

Cognitive Processing

S2: Yeah, and actually that is the method we have been learning in this class right? Stopping while doing something to check on our progress and way of learning...it is even way this article is about

Metacognitive Monitoring Judgment of Learning

S1: Do you think so too? That is why, before we began reading I said what should we do first.... you know, make a goal and all that stuff

Metacognitive Knowledge Task Knowledge

S4: The time has gone really fast too

Cognitive Processing

S2: Yeah it so difficult, I haven't really been able to understand it. I was doing well and concentrating at first, but

S1: Yeah I have only read to here, and I still need to check all these words. But if I keep checking words, I can't read then.... I keep thinking this is a real pain, but actually I only have another page and a half to read

Metacognitive Knowledge Task Knowledge

S4: You know what, the presentation is only 5 minutes right?

Ss: mmm

Metacognitive Knowledge Cognitive Knowledge

S4: Well thinking about that, what we should really be doing is looking for the important parts

S2: maybe just the beginning and the end

S1: Picking out the main points, and what we found interesting.

Metacognitive Monitoring Judgment of Learning

S1: That is probably enough, right?

Metacognitive Monitoring Ease of Learning

Ss: mmm

S1: Doesn't sound so difficult, maybe

Metacognitive Control of Environment

(S3 returns to the room)

S3: It's hot isn't it? I'm just going to leave this door open...

Metacognitive Monitoring Judgment of Learning

S4: Don't you think we read this to quickly without thinking about what do to?

S3; Do you think so?

S2: Yeah I think so too

S3: Hmm

S1: The three of us were just here talking about that we jumped into reading too quickly

S3: Yeah it is difficult

S2: Yeah I can't process it all

S3: Yeah, I have to many weird explanations. I mean when I was checking vocabulary meanings and stuff - it didn't all make sense. I didn't understand the end section. I guess I kind of have forgotten a lot of what I read (glancing back through the article)

S2: Yeah, me too

Metacognitive Control of Learning

S3: Well I guess if we don't look at the instructions and figure out what kind of information we should be looking for first, we won't be able to remember anything. If we know this, we will be able to find information in the article more quickly

S2: Look at it by paragraph?

S3: OK (all start to look at text)

Cognitive Processing

(all students start looking at the first page of their individual copies of the article)

S2: So this first paragraph, or first few paragraphs, are trying to illustrate that students have different ways of learning, some that are bad, like the example given, of the student Tracy

S3: Um, yeah. so what happens after the example?

S2: Well I think the big questions is that if among students, there are students like this, what can teachers do about it?

Metacognitive Control of Learning

S3: So, then in terms of our introduction, for the presentation, we are saying that in this research is about self-regulation, and that we will explain about it. And that we will then talk about these specific points.

Cognitive Processing

S2: I think then that this next section goes on to take about what people have learnt in the 20century about learning, and then the actual real situation of what students do when they are learning.......

S3: Then it starts to take about metacognition here, saying it knowledge about thinking...hmm so it is thinking about thinking? maybe

S1: Luke explained about metacognition to us in class before right?

S3: Yeah he did

S4: Wasn't it about choosing goals

S2: Didn't he also take about it in terms of society or like, real life things

S3: Yeah but I think it is the same thing here, for learning. So it just means that, rather than discussing and comparing things with your friends or classmates or whatever, it is an internal, inside yourself type of thinking

S1: But it is taking here about social research, so is that different, that, you know, internal stuff

S3: Not necessarily, maybe just these types of researchers became interested in this topic..

S2: Ah right, and maybe they did this research in schools..

S3: Yeah, like in this earlier part here, it is talking about students...making decisions and choosing goals by themselves as being a very important part of learning

S4: And then it is talking about .....efficiency?...

Metacognitive Control of Learning / Cognitive Processing

(students reading)

Metacognitive Monitoring Judgment of Learning

S3: Maybe..I think this section here (pointing) is very important, but I don't understand it

Cognitive Processing

S2: What part..

S3: Here (pointing) from where it says "Of course....."

S2: Ah.. I think it is talking about the necessity of planning in learning..before actually beginning any study, thinking about your way of study, about yourself and stuff like that.......needing to plan and take these things into consideration before starting...

Metacognitive Monitoring Ease of Learning

S1:Oh this section is difficult

S3: Yeah the vocabulary is difficult..

Metacognitive Knowledge Cognitive Knowledge

S1: Hmmm (looking at watch) Eh we have only 5 minutes left now, so we have to figure out what we are doing, so for thursday maybe we need to divide this up

Metacognitive Control of Learning

S2: but we really need to understand it all

S1: Ok so we all individually read it, try to understand it

S2: And if we still don't understand it, we can talk again

S1: Ah but do we have time to do that?

S3: We have to do this by Friday?

S2:Wednesday

S1: We have to do the presentation on next Wednesday.So maybe on Friday (in class) we can get through it in an our, if we have read it already. then presentation preparation...

S3: Yeah, we should be able to do the presentation......

S2: You think?

S1:Ah well, yeah, it only has to be 5 minutes (students start reading)

Cognitive Processing

(students looking at the end of the article)

S3: Seems to be about how the teacher, through the way of teaching, can increase students self-regulation and those things

S1: Haha, this stuff is all like pyschology

(students laugh)

Metacognitive Knowledge Task Knowledge

S1: The vocabulary is the problem with understanding this..

Metacognitive Knowledge Cognitive Knowledge

S3: If I just read it in English and think in English, I feel I have a general understand of the main points. So if we tried to translate it all into Japanese, would it be easier to understand some of the more psychological concepts? then explain them, discuss them together in Japanese?

S2: But the presentation that we have to do is in English, so we should probably keep it all in English...

S3: Yeah you are right. So next week we will be ready to explain in English. If we did try to translate it into Japanese, I can see that being problematic....can you even imagine trying to translate some of this, like this sentence (points out a sentence)

Metacognitive Monitoring Judgment of Learning

S2: Do we have time left?

S1: I think we are finished now

Metacognitive Monitoring of Environment

S2: It was too hot

S3: It was really hot wasn't it?

Metacognitive Monitoring of Physical Processing

S2: My brain is tired - I can feel I used it

S1: I was sleepy

Physical Processing

S4: Yeah I'm sleepy now

Off task processing

S1: It is going to be cold outside now...

S3: There is Luke

Metacognitive Monitoring Judgment of Learning

S3: oh it's really long isn't it?

S4: What should we do...

Metacognitive Knowledge Cognitive Knowledge

S3: Should we divide it up

Metacogntiive Control of Learning / Cognitive Processing

(students start to read individually. remaining seated around the table)

(students making notes/highlighting/underlining/using their individual texts while reading; also using electronic dictionaries)

Cognitive Processing

I keep forgetting what I have just read or what the fundamental points are...

S1: are you checking everything?

S4: no, that is to much of a pain

S4: Do we have to make a powerpoint presentation

S1: No, just for Luke, in front of Luke. And is 5 minutes as a group too

S2: Ah 5 minutes for the group!

S1: I think so

S4: Yeah it is

S1: So..and we still have another class, so another 90 minutes to prepare..

S1: Do you understand this bit (said to S2)

S2: No

S1: Choices or the basic fundamental choices, if we have the ability to make them well or don't have the ability to do this, it affects our....individual...performance? Oh this is a bit muddled...

S2: haha

S3: yeah, what exactly does it mean?

S1: If we don't have basic or fundamental skills, we are not going to be able to personally...I think this bit is important, that we can or can't do it personally...

S2: What exactly is basic comprehension?

S1: No it's not comprehension, it means ability

S2: Basic skills

S1:Maybe there is another meaning for this, I will check (looking in dictionary)..is it like personal cognition?

S3: Well it definitely is talking about basic, fundamental...

S1: yeah ..the most significant but basic things

S2: ah...when you are learning, for example reading, and you just can't do it, it is because you don't have the basic ability, this is what we all usually think

S3: Ok, but I still don't get the next bit....is it sort of saying that by before beginning learning, but decided on the most important parts, and planning for them..we can be more successful?

S1:Even we have enough cognitive ability, knowledge...eh?

S3: Cognitive ability.....hmmm....needs to be connected, linked with this planning and thinking phase...

Metacognitive Monitoring Judgment of Learning

S2: I guess so

S1: Yeas so not so much preparation involved

S3: You know, it is difficult up until here (pointed out a section of the article), the content, but actually after that it is just explanation that is not so bad...

S4: Mm

S2:So it is basically the start and end of the article we need to worry about

S3: I haven't read the end yet

S1:Me either

Metacognitive Control of Learning

(students looking at the end of the article)

Cognitive Processing

(reading)

Task 2 Part 2 (part two was conducted 2 days after part 1)

Metacognitive Monitoring of Environment

S1: This room is hot

S4: It is hot

S3: It is

S1: Why is it so hot

S3: There is aircon here sometimes, but I think if you turn on one room, all the rooms turn on...

S1: Ahhh...

Metacognitive Control of Learning

(Students start to pick up their individual copies of the articles)

Cognitive Processing

S1: Did you read it? I...eh, if I am being really honest, I kind of just glanced through it..)

Ss: hahaha..

S3: Me too

S4: Me too

S2: Yeah, I didn't do it at all...

Ss: Haha

S3: Well I did go through this first page, but there are some bits I still don't get, that maybe we could tak about...

Metacognitive Control of Learning

S1: Well, thinking about doing the presentation, what should we be doing now?

S3: But shouldn't we got through the whole article together once, to make sure that everyone has a good understanding of it?

S2: Yeah yeah

S1: Ok, well I think this article can be split into 3 parts

S3: 3 parts...do we not have to split it into 4?

Metacognitive Monitoring Judgment of Learning

S3: we should have organised whose responsibility different parts were

S1: Ah well, but we didn't have any chance except for class time to get together. So we basically have to get it all done now

Metacognitive Control of Learning

S2: OK, let do it

Cognitive Processing

S1: (looking at her notes). So, have we decided everything we need to decide?

S3: Ahh - I forgot to bring the instructions handout

S1: Here is mine

(passes handout)

S3: Thank you

S1: So..... what are the main points....

S3: (reading) What do you think the main points of the article are.. anything you found interesting... what is most important for students to become self-regulated learners...

S2: This bit here (pointed to the handout)

this we can clearly find in the article....

Metacognitive Knowledge Cognitive Knowledge

S3: This, I think this can be done individually, A and C....but B is...definitely to be done individual, so perhaps that could , although it seems kind of counter-intuitive, be done in pairs?

Cognitive Processing

S1: Hmm, but that part looks like it might be quite long

S3: Yeah, so it if is done by two people

S1: but to answer that part, you would need to have read the whole article, right?

S3: Oh...yeah (reading) anything you found interesting...whoever answers this part will have to read it all

S1: Maybe not-if we do this last, we could all contribute, like, one point of interest to that section

S4: mm yeah

Metacognitive Knowledge Cognitive Knowledge

S2: If we all just start together by agreeing the main point, and then segment it up, and individually provide the detail

S1: but they will we have to keep going back and forth

Metacognitive Monitoring Judgment of Learning

S2: No

S3: Yeah, it is probably best if we don't do that

Metacognitive Control of Learning

S2: So we decide the main points and they indivdually take responsibility for the detailed explanation of that point

S3: Or, we have three main section A, B and C. If we say that we are going to all do B together, then A and C or two halves and we can do it in two pairs

S1: Yeah, it is just B that is different.

S3: Yeah so we could all take, like 30 seconds after each other to insert our point about B

S1: Yeah if we right down what it is we want to say, it should be fairly easy to explain

Cognitive Processing

S2: Yeah and don't you think the A and C sections are sort of similar

Ss: mmm....

(all looking at the article together)

S3: So this part is the conclusion,,,what is important

And this bit, the main points are probably that there are these ways of learning

Metacognitive Control of Learning

S1: Yeah that is linked to what is in the introduction. So let's do that, two of us do A, and two do C

Ss: Ok Rock,, Scissors Paper......

(students doing rock scissors paper to decide which pairs will deal with which section). OK pairs decided

Metacognitive Knowledge Self Knowledge

S3: Ok, which part do people feel is better for them to do..I don't mind which we (her and her partner) do...

Metacognitive Control of Learning

S2:Eh, I don't really mind either....

S3: OK then, can do this section about the main parts of the article.

S4: yeah

S3; Ok...maybe for you guys be careful, or think most about the concluding points..

S1: So for now, thing about our part's main points, read through it and prepare that part of the presentation

S2: Separate Points

S3: And B, that can just be for homework, right?

Metacognitive Monitoring Judgment of Learning

S1: Yeah, if we all read it we will definitely come across interesting points

S3: Yeah I think so. We all we have different opinions, and spot different things. These is no correct answer for that part, so that should be good.

S1: Mm

Off task processing

(off-topic for two minutes, discussing the English word "and)

Metacognitive Control of Learning

S2; so right now maybe, in our pairs if we spend 30 minutes on our section. that should be enough- as the entire presentation is just a brief 5 minute explanation

S4: yeah it is short

S3: Well how many minutes should we allocated for A

S1: yeah I don't think A will take us (the pair) too long. But A is kind of the main section, so

S3: You could talk for ages!

S1: No I don't think so

S3: Well I guess if you just focus on the main parts - this beginning introduction, and an example..

S1: We will be able to keep it short...we might not even need an example

Metacognitive Knowledge Cognitive Knowledge

S3: But I thibk this example here might be neccessary to include

S1: OK- maybe an example from the beginning of the article and the end, which would show current knowledge

Cognitive Processing

S2: (looking at her notes) which section is this from..the idea about deciding on goals...

S3: (looking at her article) I think it is on this page somewhere.... ah look here it is.."teaching students to become self-regulated learners", so it is talking about how to teach learners to become self-regulated...

...but this part here (pointing to a section of text) looks really difficult

S4: yeah it does

(S1 and S2 start talking together as a pair, as do S3 and S4: both pairs are talking separately about their articles sections)

Metacognitive Monitoring Ease of Learning

S1:but this part here (pointing to a section of text) looks really difficult

S4: yeah it does

Metacognitive Monitoring of Environment

S1: It is too hot in here isn't it?

Metacognitive Control of Environment

S3: Yeah I am going to ask Luke (the teacher) if we can turn on the aircon

Metacognitive Control of Learning

(S3 leaves the room, other students looking at their texts individually, or checking dictionaries)

Cognitive Processing

(students reading)

Metacognitive Monitoring of Environment

(*S3 returns)*

S3: We can't use it.

S1: No way!

S4: You are joking!

S3:Apparently it is not airconditioner season, so the university will not let us used the it yet

S4: Yeah but is hot now..

S3: It is a bit cooler outside of this room

Metacognitive Control of Learning

(students position themselves as pairs again)

Cognitive Processing

(S1and S2 reading quietly and making notes)

S4: That bit we were looking at before

S3: Oh yeah that bit I said I didn't understand (reading aloud quietly)

I think what this is talking about is, giving an example of one person, who, even though they may not have all the fundamental skills, can be self -aware and use this self-awareness when they need to...

but this is not the same for everyone. That is how I would translate this bit anyway....

S4: Mm mm

S3: (reading) the learner without fundamental skill..but has self-awareness..

S4: So they have self-awareness

S3: and can still produce with readiness

S4; So if you yourself know that you don't have the basic skills needed to do something, *S3: yeah, because you are aware of that*

S4: you can do something about it

Metacognitive Monitoring Judgment of Learning

S3: yeah I think that is what this means

S4: yeah I get it now

Cognitive Processing

S3: it took me thirty minutes to read and understand this bit!

S4: Haha

S3: This seems to me to maybe be an important point

S4: Yeah I can see that

S3: Also I think it is maybe suggesting that since Tracy, the example in the text, has grown up using, you know being busy using mobile phones, TV, computers etc, there is no real need or chance for her to develop self-awareness. Like Tracy is addicted to MTV - and she listens to music while she studies for her math test

S4: Mm

S3: The reason she does this is to relax herself, but she doesn't set any goals for her study, just sort of doing whatever she can do. She also doesn't use any strategies, or know any good ways of studying. So nothing is decided or planned. So basically there is no connection between her study and her self-awareness

S4: Yeah, that is right.

Metacognitive Control of Learning

S3: That is about as far as I have read and understood, I didn't have time...maybe we should read through the rest of it now

S4: Yeah

Cognitive Processing

(all four reading and making notes/or highlighting/using dictionaries)

Metacognitive Knowledge Task Knowledge

S4 to S3: Are we doing the part about Tracy?

Cognitive Processing

S3: Yeah, but we know what that is about clearly already....

S4: But ultimately, we are going to use this example of Tracy in the presentation, right?

S3: Yeah but we need to know what are the other main points in this part too

Metacognitive Control of Learning

S4: Yeah. Well I think I might start actually writing out sentences to explain this part

Metacognitive Knowledge Cognitive Knowledge

S4: Yeah. Well I think I might start actually writing out sentences to explain this part

Cognitive Processing

S3: Ah sorry, I have only been making points

S4: Do you think we will not be allowed to look at our notes when we give the presentation?

S3: I think it will probably be ok to look...but, as you said, should we write out sentences? What should we do - I don't know..

S4: I would make them

Metacognitive Knowledge Self Knowledge

S3: When I give a presentation, I don't write out a script...

S4: Really?

S3: Yeah, because if you write it all out, you end up looking down at your paper and reading it out. If it was in Japanese , I might just be able to pick out bits, but if it is in English, I cant help just reading it out, and then I cant look at the powerpoint and I get confused. So I just write down points and look at the powerpoint screen, and then explain naturally

S4: Wow

S3: Yeah, but it might not be very good, as I don't practice

Cognitive Processing

(all reading)

Metacognitive Control of Physical Processing

(S1 has a drink)

Metacognitive Monitoring Judgment of Learning

S2: Are you finished?

Cognitive Processing

S1; I am just finished making a list of all the difficult vocabulary

S2: I am having trouble understanding all the contents

S1: Yeah there is just so much difficult vocabulary that I cant get the main message

S2: Like I really don't get this bit here about being adaptive

Metacognitive Knowledge Cognitive Knowledge

S1: Let me add that to my list - can I borrow a pen, I want to write in a different colour

Metacognitive Control of Learning

S1: Let me add that to my list - can I borrow a pen, I want to write in a different colour

Metacognitive Knowledge Self Knowledge

S2: yeah go ahead .I really don't like diagrams

Metacognitive Monitoring Ease of Learning

S1: Yeah this one is difficult

Metacognitive Control of Learning

S1 to S2: I need to go and what this means. What about you?

S2: Ah, I'm ok.

S1: Ok, I will be back in a sec. It is alright to go out of the room right??

(S1 leaves the room)

Cognitive Processing

(Other students reading in silence)

Metacognitive Monitoring Judgment of Learning

S3 to S4: You see this bit here, with the historical background, do you think this is important?

Metacognitive Control of Learning

S4: No I don't think we need that bit

S3: Cool

Cognitive Processing

(reading in silence)

(S1 comes back to the room)

S2: Did you find out what it means

S1: Yeah, not all of it though. But I do understand the whole idea of regulation..

When I went to ask him (the teacher) I brought this word list I made to show it off haha!!

S2: Haha!

S1: Have you got through some more of it?

S2: Some....actually all of it, and made notes in Japanese, but it doesn't all make sense in Japanese

S1: That is ok

(41.00-42.10 all reading quietly)

S4 to S3: I think I am starting to get this..or to know what the main points are - like this- what is it

S3: this bit here? 'this enhances their self-regulation and motivation to continue to improve'

S4: yeah that part. so it is talking about if you don't have the mental capacity, but if you can control... we can put this in and explain it as the main point. And then we can start to talk about what is needed in order to become a self-regulated learner

S3: Yeah yeah this is good. And what about this bit here 'the relationshi of self-reliance to success in life has been widely recognised. Most students struggle to attain self-discipline in their method of study today'...ah maybe this part is not necessary...

S4: Mm

Metacognitive Control of Learning

(Students stop discussing and start making notes)

Metacognitive Monitoring Judgment of Learning

S3 to S4 : Can I ask you about this bit, I didn't really understand it, or maybe we don't really need it?

Metacognitive Control of Learning

S4: I think we can leave it out, as we will only have about 2 minutes to explain this whole section

Metacognitive Knowledge Task Knowledge

S4: I think we can leave it out, as we will only have about 2 minutes to explain this whole section

Cognitive Processing

S3: OK. So maybe after explaining about the important of self-regulation, we can then start to say there are 3 stages involved...and by working through the three stages in a continuing cyclical fashion, things will work out well

S4: Mm

S3: The explain how the cycle works..

S1 to S2: You know we really have to decide which is the central point to all of this

Metacognitive Control of Learning

S3 to S4: I'm going to ask about this bit here

(S3 leaves the room to ask the teacher)

Cognitive Processing

S2 to S1: He (the teacher) will hopefully give her an easy to understand explanation. Anyway, self-regulated people have to interact with other people, so it is not simply something that you do as an individual..

S1;Wow, where did you find that. I didn't get that bit, maybe I was just to focused on understanding individual words...

Metacognitive Monitoring Ease of Learning

S2: Well I don't understand it all...

S1: Do you think we should ask Luke about it?

Cognitive Processing

S1: You know what is or are the most important elements? But he will probably answer first with ' well, what do you think?' that is how he always answers. Ah, I don't want to ask him hahaha

S2: What is most important..

S1: Well he might say, for you, for us, what are the most important or useable elements...ah but I guess that is what has been getting at all along right?

S4: Yeah

S1: This idea of finding a way of learning and adapting it to yourself, your situation

(S3 returns)

S3: He is not there

S1: Maybe he is in his office - it is just down there....

Metacognitive Control of Learning

S3: ok, I will go and look again

Cognitive Processing

S1: Ah this bit here, where it is saying that although self-regulated learning might appear asocial

S2: yeah that bit

S1: yeah maybe this is try

S2: is it sort of saying that we don't actually really do things by ourselves?

Metacognitive Knowledge Self Knowledge

S2: Ah I don't think I will be able to explain this in English

Cognitive Processing

S1: So it is talking about that we are all dependent in some way

Metacognitive Knowledge Cognitive Knowledge

(reading aloud to herself)

S1: If I say this aloud I think I will understand it more - maybe 10 times though, and it will go into my brain..

Cognitive Processing

S2: 5 minutes for the presentation

(takes out a blank sheet of paper)

Ok, so this has to be in English...

The title of this article is teaching students to becoming self-regulated learners right?

S1: yeah

S2: so that means how to teach it.....but where is that written about?

S1: yeah rather than explaining that it seems just to be giving statements of facts about what self-regulated learners are

S2: yeah what the title says does not seem to be written about in any great detail

Metacognitive Control of Learning

S1: well if it is not written about, then we don't need to worry about it

S2: yeah and we don't have time anyway

(S2 starting to write out her plan/script/points for the presentation)

S2: So the question is......you know we only have 30 minutes left?

Cognitive Processing

S1: Yeah I was just thinking about that

S1: Just looking back of this first section, I don't think we need to discuss it at all, as it is just about recent research into the area.

S2: Uh......yeah maybe we don't need it

(students reading or making notes)

Metacognitive Control of Learning /Cognitive Processing

(S1 looking at the notes S2 is making)

Metacognitive Monitoring Judgment of Learning

S1: Hmm..my feeling is that what we have to say is, not exactly just what is in the article, but after understanding it, what we think about it

S2: Mm...but even with that, I think this (her written notes/plan) will be ok

S1: Yeah I think so, just we will have to add our thoughts to it

S2: OK

Cognitive Processing

S1: I understand the vocabulary in this section now - activate, sustain

(students discussing possible translations of the words)

S1: there is one bit I don't understand, this bit here, what does it mean?

(S2 opens dictionary and looks at section again)

S2; does context mean content?

(checks dictionary)

S2: ah context!

Metacognitive Control of Physical Processing

(S1 has a drink. S4 start to yawn and then stretches)

Off task processing

S1 to S4: Are you from here Mayu

S4: No Ibaraki

S1: Ah so you life on your own now?

S4: No

S2: You dont go home each day do you?

S1: All the way to Ibaraki????

S4: Yeah

S1: How long does it take

S4: Just under a hour and a half. ..I live on Tsukuba

S1: Is that near the sea

S4: No, kind of near the mountains, about 20 minutes from Kashiwa

S1: Ah that is not so far

S4: Yeah there is the Tsukuba express train so it is quick

S1: Mmm

S2: One of my friends here commutes from Shizuoka everyday, everyday on the bullet train

S1: Wow, is she rich?

S2: Eh I don't know. She tried living on her on near the university for a year, but said living alone didn't suit her, and then she moved back home

S1: I suppose if you think about the cost of living alone, it might work out the same maybe..

S2: I don't know, the bullet train in really expensive

S4: That is amazing. The express train I use is express too. A three month ticket costs 80,000yen

S2: 80,000??

S1: But you would spend more than that living alone

S2: Did you think about a university closer to home

S4: No because I transferred here from the 2 year college that is attached to this university

S1: Oh. Is that in Kanda, in okyo

S4: yeah

S2: Are the two very different

S4: Really different

S2: In what way?

S4: Ah well to be honest, I prefer the two year college

S1: No way haha! Why?

S4: It wins lots of awards....

S2: Cause it is kind of a technical college, is it different

S4: Yeah, so for English it is all separated, like for translation, interpreting, speaking..different classes

S1: Why is it different do you think? I guess here at first we are all streamed into classes based on a placement test, so we have the same language level as our classmates right

S2: I didn't really notice anything

S1: I do, and I think it makes discussion happen much more

S4: Yeah I noticed that in my first term. I was really surprised at how fluent a lot of students here are

S2: I suppose so, there is a big level difference among some classes

S1: Are they many students who have transferred in

S4: Yeah like Hiedyaki in this class did too, and Akane (S4)

S1: Ah really!

S4: Actually there are quite a lot of transfer students in this class

S1: Actually now that you say that, there are a lot of students in this class that I did not recognise at first. About how many in this class do you think? Actually are we the same age?

S4: Yeah the same age

S1: What about thay guy, Mitsunori, I heard he is older

S2: Yeah I think he was working at a company for a long time before coming to this university

S1: He doesn't look that much older. What else is different about the two places?

S4: Well, in Kanda it is just a big building, so there isn't a campus as such like here. But there are loads of shops all around it, you can get to Shinjuku in 10 minutes

Metacognitive Control of Learning

S2: Ok lets do it! And stop chatting haha

Cognitive Processing

S1: So what did you find out?

S3: well (looking through her notes). For this part here 'Of course self-awareness is often insufficient when a learner lacks' well, to think about this....before people use to think about people as just having a sort of natural ability to, for example remember words, or succeed in work, but more recently, lots of researchers.....have found that actually self-regulation may actually be a more important thing than this idea of ability

S1: So results in tests and stuff may be because of regulation not just ability?

S3: Yeah exactly, but also that like test results, for example your score on the TOEIC English test is of course important, but, now what some researchers and educators feel is more important that these test scores, are like this ability to control yourself. Why? Because it is not limited to one area, it is something that is useful for basically everything that we have to do

S1: So what we are talking about it not final results or scores but this process

S3: Yeah I think so....we he told me was this here (hold up a sheet with some notes). So for example, there is a person here who has really high English test scores, but he doesnt have any self-regulation ability. Now he wants o become a scientist. Can he become a scientist? Well maybe not because his English ability is not necessary or helpful. and he hasnt developed his self-regulation ability.

If we take another person, who doesnt really have high English scores, but has high self-regulation ability, this person will know well how to study and learn no matter what the content, so will be able to move and be successful across different things

S1: Mm

S3: So if you have the ability to know how to work, study or learn, and are aare of your weak points...you will be able not only to learn English successfully, but beyond that be a successful farmer or whatever..

S1: I think that is this - adaptive skill-

S3: Yeah

S1: But I though this was different to self-regulation. I guess it is an included part of it

S3: I asked about this bit too (pointed to the article) - inner elements - and the absence of it. basically it is just saying that for some students this ability to self-regulate is absent......

Metacognitive Knowledge Cognitive Knowledge

Does this link up with want you guys have been doing?

Cognitive Processing

S1: It doesn't answer our part but maybe links...actually what 'in an era' mean?

S3: Like a generation or a period of time

S1: So not like 'when'

S3; No not exactly - like how things change from generation to generation....

S2: yeah but anyway what we will be talking about is not what happened before but recent research, recent thinking.

Off task processing

(Another student enters the room looking for contact info for an absent student. Student talk about this student for a few minutes, and how to get in contact with him).

Metacognitive Control of Learning

(S1 picks up the instruction sheet and leaves the room)

(S1 comes back into the room after talking with the teacher)

Metacognitive Knowledge Task Knowledge

S1: Bascially he said that it is up to us what we feel is most important from the article to discuss. So that means it does not have to be every single part, if we feel it is not important. Just what we feel is related to us

Metacognitive Control of Learning

S4: So we (her and S4) will discuss this part, and then these two guys will pick out the important parts

S3: We will meet up or do we have time> How about just before the class

S1: Yeah and before then we can all have chosen one important point from the article, which we will then present.

Metacognitive Monitoring Judgment of Learning

S3: Ok. I think if we each know and take care of what we will say, that should be ok. If we each just have the detail for our own part, that should work

S1: If we do our best it will be fine.

Metacognitive Control of Learning

(Time is up and students start to pack up their bags, and leave the room.)

Appendix I: Coded Transcript of Learning Task 3 (pair learning example)

(This task was also undertaken by other participants individually, and by others in groups of 4).

In this learning task, students had to prepare for an imaginary job interview with an international bank. They were provided with details of the bank's website (a website in English and Japanese) which had detailed information about the type of candidates they seek to hire, the company and about their interview process. Students had to prepare to do the interview in English. The two participants are referred to as S1 (student 1) and S2 (student 2).

S1: ok…what does it mean?... (reading) for this task you have to prepare for an interview with Morgan Stanley…Morgan Stanley is one of the worlds largest	Cognitive Processing
corporate banks with offices all over the world. They often hire university graduates and people with no experience of banking. You have 80 minutes to	
prepare for your interview. Please use the time wisely, and think about what you need to prepare for the interview. Plan, monitor, control and evaluate what you are doing.	
S1:Naaaaaaaa…(student indicating displeasure)	Affective Processing
S1: after this class you must write a 400 word reflection about your preparation on your blog about how you did it. Write about what you did, how you did it, what was successful and what was not so successful.	Cognitive Processing
S1: H mm..... So is it possible to speak Japanese	Metacognitive Monitoring

here?	Judgment of Learning
S2 : Yes	
S1: Are you sure	
S2 : Yeah I'm sure	
S1: Why why? I'm just curious	
S2: What do you mean? He said we could speak whatever we want.	
S1: He just said that?	
S2: Yeah!! He said	
S1: Oh.. I didn't listen to that	
S2: Huuuuh! That's why you asked me	
S1: *So….what should we do now…go to these sites?*	Metacognitive Control of Learning
S2: Yeah	
S1: Plan..what do we need for this interview….we need to know why	
S2: Why?	
S1: We wanna work here	Cognitive Processing
S2: Oh, what kind of person do they need..	
S1: Hmmm..person, people?	
S2: Person..uhhh…not sure…..	
S1: What kind of job do they have for us.	
S1: (starts to read) OK.	Metacognitive Control of Learning

S1: We have to plan, monitor and control .. what does that mean? *Plan, monitor, control, evaluate* *S2: That's just like what we always have to do in class. So we decide how we are* *going to do this task today. And then while we are doing it, we stop and thing* *about what we are doing, you know, like, is it successful, or useful, and think* *about it, maybe make some changes to what we doing….*	Metacognitive Knowledge Task Knowledge
S1: Ok, so first of all we have to plan. *S2: Plan. Yes, start thinking.*	Metacognitive Control of Learning
S1: Plan..job interview..uhh what kind of clothes should we wear haha.. I don't know what I am going to wear tomorrow yet	Off-task processing
S2: C'mon, not that *S1: Haha, I know I was just kidding, forget about it.* *S2: Well, first, let's check the web.*	Metacognitive Control of Learning
S1: Mm. Is everyone (other students in the class) doing the same? *S2: I'm not sure.*	Metacognitive Monitoring Judgment of Learning
S2:Next, find….these answers?	Metacognitive Control of

S1: Uhm, I think we have to make some notes or a list because we have to	Learning
evaluate later.	
S2: Mm	
S1: But I am not sure what is going to be on the notes	Cognitive Processing
S2: What do you think?	
S1: But some notes for sure….Oh yes yes! I think we can get some magazine	
from over there (in the Self-access learning centre - students are undertaking the	
task in a glass-fronted room in the centre)	
S2: What about?	
S1: Books or magazines about job hunting	
S2: Hmm could be	
S1: Yes or somebody?	
S1: Oh that's going be so easy	Metacognitive Monitoring Ease of Learning
S2: Check…and what else? Check and decide the answers? I think finally we can	Metacognitive Control of Learning
do like a role-playing….if you want to I mean	

S1: Ah, you mean like practice? Yes we could do, can do *(silence*)	
S2: Haha..I don't know what can we do *S1: I don't know we have so much time*	Metacognitive Judgment of Learning
S2: And what this? (looking at unrelated books on the table) What this books *S1: So old books* *S2: Morito Mizumi no Matsuri (book title)* *S1: How was the test?* *S2: Which test?* *S1: Uhh Takako-san (teachers name)* *S2: Haha..she said we had to answer with the author and the title and what the* *author wanted to say, something like that. It was hard though*	Off-task Processing
(S2 is turning on the computer)	Metacognitive Control of Learning
S1: Mmm.. You are gonna try to use the computer right? *S2: Mm - yeah (reading the media instructions for the computer - note - actually difficult to turn on the computer in this room as linked to other devices)*	Cognitive Processing

S1: Will we just use one of the computers out there?	Metacognitive Control of Environment
S2: What? *(S1 is Reading handout again)* *S1: I don't know, there are three websites here right? How about I will look at one* *or two, and they we can talk about it* *S2: ok which one will you look at ?* *S1: for now, the last one.*	Cognitive Processing
S1: Ok I'm going (S1 is leaving the room to use another computer)	Metacognitive Control of Learning
S1: Oh, can I leave the room? *S2: That is what I was just wondering* *S1: But I think both of us can do anything by ourselves.....my mike! I'm not gonna* *bring it or should I?* *S2: Bring it!* *S1: Really?* *S2: Bring it* *S1: I don't think so* *S2: Why, why not? You will* *S1: No I don't think so. No worries, I'm not gonna speak. Later (S1 leaves the room*	Metacognitive Control of Environment

to use another computer outside)	
(S2 is using the computer in the room - looking online at websites listed on the handout)	Cognitive Processing
(S2 gets paper from her bag - reading the site and making written notes)	Metacognitive Control of Learning
(S2 looking at notes and typing)	Cognitive Processing
(S1 returns)	
S1: So much information ... but I think these 3 websites are the same *S2: I guess so*	Metacognitive Monitoring Judgment of Learning
S1: So, I didn't know....this is the actual company (meaning - this is a real company) *S2: Ahh...its the real world! (pointing at the website on the computer)* *S1: Wait a minute (looking through some print out papers she brought back).......ah ha* *S2: (looking at papers) Finance* *S1: Ah I have a question finance, financial or fiiinancial (different pronunciations)* *...I think people use both*	Cognitive Processing

S2: I think both are ok, I would go for 'financial'..it's British or American

S1: Maybe, I dunno....we definitely would have to say it though...in Japanese it is finance (still taking about the pronunciation of the word. Note - actual Japanese

word for finance is finance and pronunciation closer to British pronunciation than American). Financial Financial financial not sure not sure (skimming through

papers)

S1: Ah! listen listen...oh in the interview we should here something like this *(reading from paper - Japanese printout from company website)*	Metacognitive Control of Learning
S1: Please introduce yourself. Please discuss your strengths and weaknesses. What *do you think you friends views about you are? Do you possess an* *entrepreneurial spirit? In work what do feel is the most important thing?.........* *how about this, how about now if we go through each questions with each other* *one at a time, taking turns?* *S2: Well yeah....*	Cognitive Processing
S1: Ok I'll start..	Metacognitive Control of Learning
S1: please introduce youself	Cognitive Processing

S2: I am #########, a third year American Studies student at Kanda *University of International Studies....what else should I say here?*	
S1: That's all a self-introduction is right?	Metacognitive Monitoring Judgment of Learning
S1: Moving on.....next..	Metacognitive Control of Learning
S2: OK, please tell me about your strengths and weaknesses *S1: If you were suddenly asked that you would be in trouble....you have to prepare for something like that...eh......strengths...my strengths are, if I am interested* *interested in something, I will become very involved in it, what to progress in it, find out about it, and use all my ability for it. My weakness is...when it comes to things I am not interested in.....it is difficult for me to get interest or motivated about it. That's actually my real weakness!* *S2: But that weakness, it's important how you say it* *S1: Yeah I guess so, but basically a weakness is a weakness.*	Cognitive Processing
S1: Ok, next..	Metacognitive Control of Learning
S1: what do you think your friends views about	Cognitive Processing

you are? *S2: I think my friend view me as sort of motherly, helpful person haha..*	
S2: Is that a good thing to say?	Metacognitive Monitoring Judgment of Learning
S1: This is nerve-wracking isn't it?	Affective Processing
S1: And difficult..if I went to an interview, I wouldn't be able to answer these questions properly.	Metacognitive Monitoring Judgment of Ease of Learning
S1: Ok next..	Metacognitive Control of Learning
S2: Do you possess an entrepreneurial spirit or desire? *S1: Well,.. I don't believe that I am the type of person who constantly comes up with original ideas. But I would say that I am someone who when given something original can develop ideas from it, so I think I would partner well with someone with lots of original ideas*.	Cognitive Processing
S1: Ok next hahaha!.	Metacognitive Control of Learning
S1: What do you think is the *most important thing in work?* *S2: For me, I believe that the most important*	Cognitive Processing

element in work is teamwork *S1: (not a question from the website/printout) Why do you think that?* *S2: In work, lots of things are happening, and while there are many things that I or someone can do by themselves, But ultimately, even with your own ideas, taking* *on board others peoples opinions and thoughts, will be the best way to do your job, or be successful in your job.*	
S1: Oh, that's a great answer	Metacognitive Monitoring Judgment of Learning
(S2 reading next question from list)	Metacognitive Control of Learning
S2: Can you talk about exhibiting leadership? *S1: Hmmmmm........................ah I know. Eh, until I was a second year university student I was in my local drumming band. From my final year at high school, I* *was one if the oldest and became one of the leaders of the group, in charge of my friends, taking care of the younger members, organising the practice* *sessions. I think this was a time when I clearly showed leadership*.	Cognitive Processing
S2: Ok next. Oh not me, you.	Metacognitive Control of Learning

S1: Can you give some examples of working with a team? *S2: Working with a team,....if I think about the most recent example, during a university class, preparing for a group. That time, in a team of four, we only had* *the really short time of ten minutes. But we were still able to think of the contents, put it all together and enjoy doing it.* *S1: (not a question from the website printout) Well, from that experience what element of teamwork do you think was very important?* *S2: I think it that case is was really important to clearly divide what each person would do individually and what we would do together.* *(from printout) Do you think you are creative? Can you give any concrete examples of this?* *S1: Referring back to what I said earlier, I am not the most creative person but, thinking about fashion and design creation, I am really interested. Since I was* *young, I have been going to art galleries and museums a lot. So I think I might be more creative than the average person.*	Cognitive Processing
S1: Ok next,,,,	Metacognitive Control of Learning
S2: the time.... *S1: No way! have we already used that much??* *S2: Well we have about another 50 minutes...* *S1: But that's ok.......is it not?* *S2: No of course not! We still have loads to do*	Metacognitive Monitoring Judgment of Learning

S2: (reading from sheet) what do you want to do if you can be employed?	Metacognitive Control of Learning
S2: Is it ok not to do it in English?	Metacognitive Monitoring Judgment of Learning
S1: Will we try it in English. I'm gonna be so challenging (meaning 'it is' gonna be so challenging).	Metacognitive Control of Learning
S2: But this is all about an English interview ultimately	Metacognitive Knowledge Task Knowledge
S1: Ok then lets do it from here (meaning- continue in English) as we are a bit *used to it now ...ok your turn*	Metacognitive Control of Learning
S1: Yes thats true..it's ok, it's ok from here ok? are you ready? *S2: Yes* *S1: Ok why you are interested in this work?* *S2: (whispering)* *S1: In this financial work? Why?* *S2: I check the website, and I saw it, the economic financial things are...financial things effects..effect so many things haha* *S1: For example* *S2: We have to use money whenever....*	Cognitive Processing
S2: eh, I don't know, I don't understand this	Metacognitive Monitoring

S1: In any situation *S2: In any situation* *S1: Even if you are interested in it at all, you have to make up something* *S2: I know I know*	Judgment of Learning
S1: C'mon!	Metacognitive Control of Learning
S2: financial right? *S1: Mmm* *S2: Now we have a problem about,,,economic crisis, and we..if people want to want to..how do you say invest?* *S1: I don't know* *S2: Put money into....* *S1: This, this is all business English isn't it?*	Cognitive Processing
S1: this is not easy	Metacognitive Monitoring Ease of Learning
S2: (looking in dictionary) invest investment? *(writing invest, investment on the whiteboard)*	Metacognitive Control of Learning
S2: people invest, wanna invest their own money to the another company....so I thought I wanted to help them Hahaha	Cognitive Processing

S1: I guess that'll do..	Metacognitive Monitoring Judgment of Learning
S1: this is difficult right..	Metacognitive Monitoring Ease of Learning
S1: as basically we are not interested in it.	Metacognitive Knowledge Self Knowledge
S1: Ok next	Metacognitive Control of Learning
S2: Why do you apply for this company? *S1: Because...this company is so globalised and....since I studied in America, I'm interested in anything about worldwide, and I think this company is gonna have a* *lot of chance to use our English. Then I can even improve my English here, I mean more and more, so I chose this company.*	Cognitive Processing
S2: That was good.	Metacognitive Monitoring Judgment of Learning
S2: Ok next.	Metacognitive Control of Learning
S1: Ah, have you ever seen anyone from this company and what did you learn from her or him? This is really difficult, is this what they would really ask you? *S2: It's possible... I met.....*	Cognitive Processing

S1: How do you say a H.R person?	
S2: (checking dictionary)	Metacognitive Control of Learning
S2: It's not in here...ah, personnel department section of *S1: That is personnel management....ah,* *personnel department is here to, or also, company recruit..recruiter*	Cognitive Processing
S1: I don't understand this, which is it? *S2: Yeah this is a problem isn't it* *S1: Yeah but this type of study is the only right kind isn't it* *S2: Yeah it is interesting but I wouldn't go that far.....*	Metacognitive Judgment of Learning
S2: I met the company recruiter...recruiter Mr whoever, and he told me about his job and he enjoys his job because he can..he can help people? or not? And he is really satisfied about his work, his job *S1: I think you should say he is very* *S2: Very?* *S1: Very satisfied....like for emphasis.*	Cognitive Processing
S1: This is actually really hard isn't it? An	Metacognitive Monitoring

interview like this in English would be really hard - I have never really thought about answering these kind of questions....it would be really hard even in *Japanese...* *S2: Anyway...*	Ease of Learning
S1: How about if we do it together - both answer the same questions..comparing would be good…	Metacognitive Knowledge – Knowledge of Cognition
S1: .At this company, what kind of job do you feel you would like to try?....Ah, as I said I was *studying English in America, so possibly I wanna have a chance to ...use English and also....I'm interested in worldwide things, so...* *S2: What do you mean worldwide things? For example?* *S1: For example, ahm.....what do I mean? ah..I'm actually not really interested in financial, finance, so uhm,.. I wanna what do I wanna?*	Cognitive Processing
S2: This topic is difficult....haha	Metacognitive Monitoring Ease of Learning
S1: What should I say? What kind of job would I like to try and do? Ah, I know..So I am interested in volunteering, which your company is doing now. It said *something about this on the website - this company does a lot of things, they have like an education section as well* *(both students looking through their website printouts)*	Cognitive Processing

Yeah, look here..there are using money to help peoples education and for cultural things....	
S2: Uhmm I want to have a class for the beginner, beginners	
S1: Beginners of what?	
S2: Beginners of...people who are interested in..investment, and they don't know	
how to do it, or how to study it. So I want to support them to..	
S1; But now we don't really understand this topic, like our majors our different,	
mine is American Studies. So they probably know this, so maybe we can say not	
I have been studying this hard, but I will study hard from now on.....even if	
japanese we would say the same thing, we would talk about what we know, but	
also about what we want to learn from now.	
S1: Maybe saying it this way is the best way to make up for what we don't know....we are showing that we have motivation too.....	Metacognitive Knowledge – Knowledge of Cognition
S1: To be successful in business, what kind of disposition do you think is important?	Cognitive Processing
S2: Disposition..	
S1: I think people who are successful in business world have always some risk, so	
they should have some courage to recover that	

S2: Hmm that's true

S1: recover? ah not recover cover

S2: ....

S1: Next..do you have any reasons for feeling that you would be cut out for this

job?

S2: I like mathematics haha...that's definitely not related.....

S1: Ah how about...calculators, or calculating I mean....how about says that you are confident that you can be coolheaded when dealing with large amounts of

money

S2: Yeah yeah...i was thinking about that but I don't know how to say it

S1: How do you say coolheaded?

S2: Hold on (checking electronic dictionary)

S1: I can be always cool even if I have lots of money probably so, ...is it not cool?

S2:.....calm....

S1: Calm..that sounds s bit to warm or something doesn't it? (checking phone

dictionary) ah here is another word compose

S2: composed

S1: Ok next.	Metacognitive Control of Learning
S1: when you were choosing your university, what reasons helped you to	Cognitive Processing

choose? Why did you choose your college?

S2: I chose my college because I wanted to study English more..more in a good

situation..situation, environment?

S1: Ah, environment is fine I think....

S2: My speech? Score has..

S1: What score?

S2: University, college, which word, this is a university right?

S1: University yes it is, but people use college for university too

S2: I heard like, ah, college has only one major.....

S1: No, I think college can be more like vocational or technical

S2: But there are lots of colleges that have only one department, maybe that is the

difference

S1: Well in Japan I think that all four year places are universities... I don't know

though, it could be different over there. Anyway...

S2: Uh, my university has a lot of opportunity to speak, write, read, and listen

English and....there are so many teachers who came from other countries and

stuff haha

S1: Ok? Next..	Metacognitive Control of Learning
S1: what classes did you like or dislike and for	Cognitive Processing

what reasons? Uhhh.. I really don't like being at one place, so I really don't like the class I had to in class entirely *S2: Yeah but almost all classes...* *S1: Actually my college is so interesting...I could have lots of chances to speak English and use English and communicate with my teachers and...*	
S1: saying it like this might be ok right? don't you think?	Metacognitive Monitoring Judgment of Learning
S1: And you?	Metacognitive Control of Learning
S2: Eh.....there wasn't really any class I hate.....a class I hate....I like most of them.....I love volleyball class haha *S1: Well that is actually very positive - you enjoy being physically active.....sports involves using language and communicating with others and....* *S2: The classes where there were international students where the ones where you could talk the most, yeah..........sports, for communication* *S1: But if you can discuss or explain sports in terms of communication and human* *Relations…*	Cognitive Processing
S1: that would be a cool answer.	Metacognitive Monitoring Judgment of Learning
S1: But difficult to say that in English.	Metacognitive Monitoring

	Ease of Learning
S1: Ok next.	Metacognitive Control of Learning
S1: Have you made any efforts, or engaged in any study to help you with your *ambition to work in a foreign investment bank?* *S2: I tried to get some quantity ah not quantity what is it? Qualification....* *S1: Quality* *S2: No not that, ah what is it? i forget...qualification* *S1: Are you going to say something like TOEIC? is that relevant?* *S2: Well it is something useful..qualification* *S1: Qualification..thats how you say it* *S2: Eh...bookkeeping, how do you say that (writing on the board)* *S1: Bookkeeping...*	Cognitive Processing
S1: is that necessary? Well I guess if you have it its good..	Metacognitive Monitoring Judgment of Learning
S2: Well maybe just office work *S1: Yeah, I suppose it is economy related....bookkeeping (looking at dictionary)* *it's like other words with keep, like... housekeep, housekeeping* *S2: (writing bookkeeping on the board)*	Cognitive Processing

S1: So I think you can say I am trying to get bookkeeping qualification *S2: Try to...I'm trying to...*	
S1: OK next	Metacognitive Control of Learning
S1: what do you usually do during the vacations or holidays? *S2: I usually go to the work* *S1: Go to work (correcting S2's English error)* *S2: Part-time job but...I worked at the supermarket as a cashier* *S1: Hmm....do you like it?* *S2: Yes I love it* *S1: You don't have anything other to do?* *S2: Or I hang out with my friends....* *S1: Ok you now this, it is about part-time jobs but* *S2: Yeah but not really* *S1: Yeah it's gotta be about showing some skill that you use there, or showing* *your interests or something that makes you appealing to them* *S2: Or some general skills? But for a foreign company like this what to say, I just* *don't know. . Do they want to hear about buying stocks and shares or* *something?*	Cognitive Processing

S1: Yeah what is it? How do you talk about just relaxing and doing nothing

S2: Maybe talking about turning on and off, and clearly dividing the two, doing just

things that you like

S1: Going to eat with friends...

S2: Or talking about it like, scheduling everything. So that, you know , on

weekdays, I go the university and study, and focus on , you know getting

qualifications, studying for these extra qualifications, but on the weekend, I play

S1: Or even that outside of studying you have two days, one day for part-time

work and one day for doing what you want, meeting friends...

S2: Like self-control maybe?

S1: Well they are asking how you spend your time...

S2: But what we have to do is appeal to them...	Metacognitive Knowledge Task Knowledge
S1: Yeah you're right	Metacognitive Monitoring Judgment of Learning
S2: Here, if we can say something interesting about ourselves	Metacognitive Control of Learning
S1: Something like that must be important for our self-introduction too right? These are the kind of things I'm into, this is what I do in school	Cognitive Processing

etc...this is

necessary for the self-introduction. Ah but look at the next question.....Thinking about what is not included in your CV, what can you tell us about yourself that is

important? How do I say this is English...Do you want to say anything else not in your resume?

S2: What can I say to make myself appealing?

S1: But not on your resume

S2: Motivation...

S1: Motivation! haha

S2: But that's..

S1: Thinking about myself, in a real situation, if this was some kind of fashion company, something that I was really into, I might not be able to write about how

motivated I am, so I really would want to explain how motivated I was

S2: How would you do that?

S1: Since I was an elementary school students I have always loved clothes, I have been reading fashion magazines the minute they come out, and making files

about the fashions I like

S2: You should probably actually bring the file with you

S1: Yeah I think I actually would! The other day I was looking at my file and thinking exactly that

S2: That's a pretty good thing I think

S1: (mimes holding up a file) Look at how motivated I am! haha

S2: Showing what you can't show on your CV,

like showing how much you love *something, look at what I have done haha*	
S2: Eh, what should we do? what should we do from now? *S1: Well, we've done all this right (referring to the interview questions on the companies Japanese website). What's left is this..the company information. About Morgan Stanley...* *S1: For now..from now let's look at all the information there is about the company* *S2: But we also need to review what we have gone through already* *S1: Uh, we're already done with that* *S2: Ok*	Metacognitive Monitoring Judgment of Learning
S1: (reading aloud - in japanese - the company information from a printout from *the website)* *S2: (starts to continue on reading aloud - in japanese - the company information* *from a printout from the website)*	Metacognitive Control of Learning / Cognitive Processing
S1: Oh, how cool is this, they have offices on Broadway and New York! *S2: Yeah but not only there* *S1: Wow this is quite cool...* *S2: They are actually really global* *S1: (distracted, looking outside the room) Look at*	Off-task Processing

Mika - she's got a lot of make *(meaning – make up) on* *S2: Yeah, she said she would show me it later (starts reading aloud again from* *the printout about the company's philanthropic arm)* *S1: What's philanthropy?* *S2: I don't know ...philanthropy....they are also using the word Inspire with it....*	
S1: Reading all of this is a pain, right? *S2: Yeah*	Affective Processing
S1: We should just look for the suitable contents *S2: (starts reading aloud content headings from the various web printouts)*	Metacognitive Control of Learning
S1: This type of stuff yeah, thinking about financial companies, I had thought that the only motive was money and making money. But in relation to your company, ah how to you say it, a lot of profits are used for social contribution and such purposes, and for this reason, I became very interested in your company *S2: Yeah that might be good...can we use the word donation?*	Cognitive Processing
S1: Oh I have had enough of this	Affective Processing
S2: I'm tired (stands up, looking out the window).	Physical Processing

S1Ah there's Megumi, ah she has run away haha *S2: That's her style* *S1: Ah this is all recording....*	Off-task Processing
S1: eh donation social contribution *S2: Volunteer* *S1: (checking dictionary)* *S2: (checking dictionary) Contribution........social contribution maybe?* *S1: Wow, very good!* *S2: Haha* *S1: Contribution might be right (checking dictionary)..service looks like it might be ok too* *S2: Contributing?* *S1: To I think....or for, actually maybe to* *S2: This company...contributed to....something......or also give something to....*	Cognitive Processing
S2: Ok 8 minutes, 8 minutes *S1: What can you do for 8 minutes?* *S2: Uhhh* *S1: I think we did a pretty good job.*	Metacognitive Monitoring Judgment of Learning
S1: I'm so sleepy..	Physical Processing

(yawning)	Physical State
S2: maybe think about the points we have	Metacognitive Control of Learning
S1: (reading printouts again) looks like there are also involved in helping the environment a lot *S2: What exactly do that mean?* *S1: Ah I don't know.... they should give more concrete information. There is some information here about decreasing Co2 stuff, and recycling plastic bottles and* *caps and stuff..not so important perhaps (looking at different pages) there is information as well about the different areas of the company, like stocks section,* *asset management, operations management*	Cognitive Processing
S2: It is difficult to now what to do here *S1: yeah there are all these different areas*	Metacognitive Monitoring Ease of Learning
S2: and there is the question, what do you want to do when you enter this company, right? *S1: mm, but a company that is looking to hire graduates internationally must be a huge company* *S2: Wasn't it originally a Japanese company?* *S1: No it says New York* *S2: But there is the Japan office, the Tokyo office* *S1: Yeah but the company over there is going to be way bigger than the Japanese one*	Cognitive Processing

S2: I guess, and it is in 37 countries

S1: Yeah and Japanese land in so expensive.........

S2 : Oh time is up!