

**Learning in a foreign environment:  
The perception and use of concept mapping strategy by Saudi  
International students in Higher Education**

by

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## **Abstract**

Learning in higher education demands the assimilation of a wide range of complex information. One way in which learners are able to represent complex information in a meaningful way is through concept mapping. This multiple case study aims to provide an in-depth picture of how six Saudi women students, who use concept mapping to support their learning, view concept maps; and what factors that constrain or enhance their use of this strategy within university study in New Zealand .Through think alouds, one-to-one interviews and a focus group discussion, these students revealed their use and understanding of concept maps. The findings of this study indicate that concept mapping is a useful tool for learning and can be used effectively by international students to support their learning. However while concept mapping was found to support the development of critical and creative thinking skills, this study suggests that concept mapping by itself does not teach these skills. This research concludes that Saudi women at university in New Zealand need support to develop their own academic voice and to become confident in their ability to study independently and think critically and creatively. One of the ways in which this support can be provided is through participating in the collaborative development of concept maps.

## Acknowledgements



In the name of Allah, the Most Gracious, the Most Merciful  
*Praise be to Allah, to Who belong all things in the heavens and on  
earth: to Him be Praise in the Hereafter: and He is Full of Wisdom,  
acquainted with all things*

Holy Quran (34:1)

I thank Allah Almighty for giving me the patience, time and strength to accomplish this thesis and for blessing me with all the good things and all the wonderful people in my life. Prophet Mohammed (Peace be upon him) said: “He will not be thankful to Allah, he who would not be thankful to people”.

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# CHAPTER 1 INTRODUCTION

*The secret of getting ahead is getting started. The secret of getting started is breaking your complex overwhelming tasks into small manageable tasks, and then starting on the first one.*

Mark Twain (1835-1910)

## **1.1 Learning in a foreign environment**

Internationally higher education has become a multi-million dollar business. Universities throughout the world compete to attract international students originating mostly from developing and non-western countries. The aim of these students is to benefit from educational opportunities not yet widely available in their own countries. New Zealand is internationally respected for its provision of high quality education and its extensive range of study options. Since 2005 New Zealand has been the preferred educational destination of many Saudi Arabian students. In 2010 Saudi Arabia was the 5th largest source country of students for New Zealand providers (Ministry of Education, 2011). For this mutually beneficial relationship to continue it is important to understand both the factors that motivate students to choose New Zealand as a study destination and the factors that may affect their satisfaction with their choice. Studies on this topic often focus on issues of social engagement rather than issues related to learning (for example, Egan, 2012; Ward & Masgoret, 2004). However it is for learning that most international students come to New Zealand. New Zealand attracts international students from a wide variety of educational backgrounds. Experiential evidence suggests that this can pose challenges for international students confronted by unfamiliar teaching and learning methods. This study looks at the experiences of six Saudi women scholarship students studying at Victoria University of Wellington in New Zealand and specifically it

examines their experience and perception of using concept mapping as a learning strategy. This chapter identifies the theoretical framework adopted by the researcher; the context and background to the study; and its purpose and significance. It also provides an outline of future chapters.

## **1.2 Theoretical Framework**

The theoretical framework adopted for any research provides direction for the researcher and identifies the conceptual lens through which the research is to be understood. To address the research aims, this study is informed by a social constructivist view of reality. Social constructivism is a theory of knowledge which emphasises the role of social interaction in knowledge construction. It is based on educational psychologist Lev Vygotsky's theories of cognitive development. These are also referred to as sociocultural theories because Vygotsky emphasises both the role of social interaction in students' learning and also that learning is situated in the learners' culture (Moreno, 2010). In this study there are two distinct social contexts: the New Zealand higher education environment and the Saudi Arabian cultural background of the participants. These contexts are discussed further in 1.3.2 and 1.3.2. Within a social constructivist framework, learning is seen as a process of constructing knowledge and understanding through social interaction and emphasises the contribution of teachers and peers (Santrock, 2008). It is closely linked with constructivist views of learning.

In education, constructivism is based on the idea that new conceptual frameworks are constructed by the learner or group of learners based on their existing knowledge or mental schema (Novak & Cañas, 2004). This view of learning is strongly represented in modern educational practice in New Zealand. Concept maps are one of a number of modern constructivist learning strategies used in higher education in New Zealand to

assist students to cope with the growing complexity of knowledge needed to succeed at university level.

### **1.2.1 Concept mapping**

Concept mapping is an increasingly popular teaching and learning tool at all levels of education. Concept maps are graphical tools used for organizing and representing knowledge (Novak & Cañas, 2008). Concept mapping was first explored by Joseph Novak and his research team at Cornell University in the 1970s, as a graphic means of expressing scientific concepts to young children. Since then, concept maps have been employed in a wide variety of settings and contexts, particularly but not exclusively in education. Through concept mapping learners are able to externalize their existing knowledge and combine it with new knowledge rearranging and internalizing both the old and new knowledge in a graphic form (Schaal, 2010; Wu, Hwang, Milrad, Ke, & Huang, 2012). The primary features of a concept map are its hierarchical structure which identifies specific concepts, usually enclosed in circles or boxes, and the connecting lines between these concepts which indicate how knowledge of a specific concept or domain is linked to the other concepts or domains. The most general and inclusive concepts are placed at the top of map, while the secondary concepts are placed below with the cross linkages and relationships between concepts indicated by lines (Wang, Lee, & Chu, 2010). Originally produced using pen and paper or chalk on a blackboard, concept maps are now a visualised cognitive tool supported by computer systems (Hwang, Shi, & Chu, 2010; Yen, Lee, & Chen, 2012). It has been suggested that “digital concept mapping may increase the capacity of the human brain in managing knowledge when coping in a self-regulated manner with complex cognitive processing tasks” (Tergan, 2005, p. 198). It has been argued that the combination of the concept map’s basic ability to enhance understanding combined with the efficiency of using computer-based resources and the

power of interaction should provide great promise for developing new highly effective electronic learning resources (Vural & Zellner, 2010).

### **1.3 Context and background of the study**

As a Saudi student studying in New Zealand, I became interested in the influence of cultural background and prior educational experiences on the learning process and how it might affect learning. My own experience as a post graduate student suggested that New Zealand higher educational practices presented students from Saudi Arabia with more challenges than learning in a second language. Specifically, they demand of the students to think and learn in ways that were unfamiliar to them. Yet it is precisely to prepare and qualify Saudi students to compete on an international level in the labour market and in different areas of scientific research that the King Abdullah Scholarships Program which is funded by the Saudi government was established (Ministry of Higher Education, 2010). Before detailing the education in Saudi Arabia and the challenges posed by the New Zealand higher educational environment to Saudi students (see 1.3.1 and 1.3.2) it is perhaps relevant to consider the advantages that New Zealand offers as a study destination.

#### **1.3.1 New Zealand as study destination**

New Zealand is attractive to international students for a number of reasons: it has an internationally recognised western educational system; its main language of instruction is English; and, as a multicultural country it is considered to offer a safe environment for international students. In a survey of international students in New Zealand, 62% said that New Zealand was their first choice as a study destination. The most important factors in selecting New Zealand were: the English-speaking environment; the international recognition of New Zealand qualifications, the quality and cost of education; and personal

safety. Moderately important were factors relating to the “Kiwi experience,” such as New Zealand’s natural beauty and scenery, its lifestyle and culture and the opportunity for travel and adventure (Ward & Masgoret, 2004).

New Zealand has a long history of providing education for international students from developing countries that goes back to the Colombo Plan in the 1950s which brought students from Asia, the Pacific and Pakistan to New Zealand (McLintock, William Hosking Oliver, & Taonga, n.d.). There are eight government-funded universities which offer international students undergraduate and postgraduate degree courses in a wide variety of disciplines. There are also a number of technical colleges offering professional and vocational training. There are currently over 120,000 international students studying at educational institutions in New Zealand (Ministry of Education, 2011). Many of these institutions offer foundation programmes specifically designed to prepare international students for university study in New Zealand.

### **1.3.2 Education in Saudi Arabia**

Some knowledge of Saudi Arabia’s education system is crucial to understanding the educational context of Saudi Arabian students in New Zealand. The Arab world has a rich tradition of scholarship, however, public education is relatively new in the Kingdom of Saudi Arabia. Prior to 1925 public education was non-existent and a national secular school system was set in place only in the 1930’s. Presently the education in Saudi Arabia is divided into three separately administered systems: general education for boys, general education for girls and traditional Islamic education. In the general schools both sexes follow the same curriculum and take the same annual national examinations. However, in all schools Islam remains the guiding principle.

In Saudi Arabia religion and culture not only shape people's attitudes, practices, and behaviours, but they also form the construction of the reality of their lives (Ageel, 2011). Al-Banyan (1980) argues that all Saudis share some basic characteristics that impact their lives and educational experiences: religion, language, cultural traits, and centrality of the family. A study of education in Saudi Arabia conducted by Yamani (2002) reveals that for many Saudis the sources for rules of social conduct and for religious observance are one and the same (p. 12). Although significantly, Yamani reports that these elements are assumed to be constantly changing over time.

The country's first University, King Saud University was founded in 1957. Since then there have been many other universities established in every major population centre. In 1975 the Ministry of Higher Education (MOHE) was established to implement the Saudi Arabian government's higher education policies. The majority of Saudi women are educated up to secondary school level, though the Saudi government provides opportunities to young Saudi women to enrol at all levels of higher education, with incentives in the form of allowances. Since 2000 there has been a drive to employ modern information and communication technologies (ICT) at universities hence providing greater access to a wider variety of educational opportunities. However these technologies are neither sufficient to meet the demands for higher education, particularly post graduate education, nor to provide the range of educational opportunities offered overseas. The Ministry of Higher Education therefore provides scholarships to both Saudi men and women to further their studies abroad to satisfy the demands for academics and technocrats required to address the challenges facing the country and for the advancement of the kingdom into the new world.

### **1.3.3 Culture and learning**

Samovar, Porter, and McDaniel (2009) suggest that a strong link can be made between culture and learning that is reflected in “how people prefer to learn and how they tend to process information” (p. 338). Song and Oh (2011) identify this as learning style preferences and maintain that culturally diverse learners may employ a variety of learning strategies and behaviour patterns that they have developed over time and as a result approach learning tasks in a culturally conditioned manner. Independent learning and critical thinking are highly valued learner characteristics throughout tertiary education in New Zealand. Although different disciplines make different demands of students there is a universal expectation in New Zealand that students at university level should be able to engage in critical thinking and that much of their learning will be self-directed and independent of authority. This is an important factor to consider in relation to Saudi students in New Zealand. In a review of the literature about Saudi women’s experience within academia, Al Lily (2011) argues that the key values of Saudi culture affect not only standards of social behaviour but they also influence views of the nature of knowledge and how it should be transmitted in the education system. In addition these values influence the way the curriculum is organized, and how instruction and assessments are carried out. While the ability of Saudi students to learn is not in question, it is of importance to bear in mind that they have a totally different educational background and experience as compared to their New Zealand counterparts.

Most of the Arab universities adopt traditional education based on rote memorization of material without enabling students to be either innovative or to mix scientific knowledge with practical application. Students are not encouraged to take a critical, analytical approach towards numerous problems in society, creating a spirit of student submissiveness and fear to voice their opinion (Al-Rashdan, 2009, p. 38).

In their study of the role that culture plays in the way individuals learn, Joy and Kolb (2009) discovered that culture has “a significant effect in deciding a person’s preference for abstract conceptualization versus concrete experience” (p.83). They suggested that individuals may have a more reflective learning style in countries that are “high in in-group collectivism, uncertainty avoidance and assertiveness” (p.84). Joy and Kolb also suggest that educators need to be aware that conditioning by certain cultures may clash with the learning style requirements of certain areas of specialization. They emphasized that this is particularly true in the first years of higher education stating that “where discipline specific conditioning is yet to take root, the culture-based differences may be even more pronounced” (2009, p. 83). Although no Arab culture was included in their study it is reasonable to argue that their general findings may also apply to Arab learners.

#### **1.4 Purpose and significance of the research**

The purpose of this study is to gain a better understanding of how students from Saudi Arabian educational backgrounds respond to the use of modern educational strategies such as concept mapping based on a multiple case study of six Saudi women students. This study explores the factors that may hinder or support their use of concept maps as a learning strategy. It does not aim to make any generalizations about the experience of all Saudi women students in New Zealand, however, it is hoped that by examining how the students in this study use concept maps in their university study that this study will contribute to a better understanding of the experiences and needs of second language learners in New Zealand and also of the use of concept maps, and in particular computer assisted concept maps, as a learning strategy in a higher educational context. Thereby, adding to the existing literature on the impact of learning culture and ICT use on knowledge sharing in general; and in Saudi Arabia in particular. To the best of my



knowledge, this will be the first study to explore the perceptions of Saudi women students towards concept mapping as a learning strategy and the factors that affect their views including previous educational experience and cultural expectations.

## **1.5 Thesis Outline**

**Chapter 1** identifies the background and theoretical framework for this research, beginning with a description of my journey in starting this inquiry and followed by a brief examination of the Saudi education system and the challenges faced by Saudi students in New Zealand. The purpose and significance of this study is also explained.

**Chapter 2** examines some of the background literature on the use of concept maps as an instructional tool and learning strategy. Relevant studies on concept map use, including computer assisted concept maps (CACM) are reviewed.

**Chapter 3** describes the research methodology adopted in the study, identifies the research questions and the research procedures followed. This chapter also presents the underlying assumptions of the research approach used.

**Chapter 4** presents the research findings thematically based on data gathered through think alouds and semi-structured interviews with six Saudi women students. The themes that emerged from the case studies are presented followed by a cross case analysis of the data. The data from the focus group discussion is also presented in this chapter.

**Chapter 5** discusses the themes that emerged from Chapter 4 and relates these themes to the existing scholastic knowledge identified in Chapter 2.

**Chapter 6** identifies the inferences of this research and concludes with recommendations for further research.

## CHAPTER 2. LITERATURE REVIEW

*Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information upon it.*

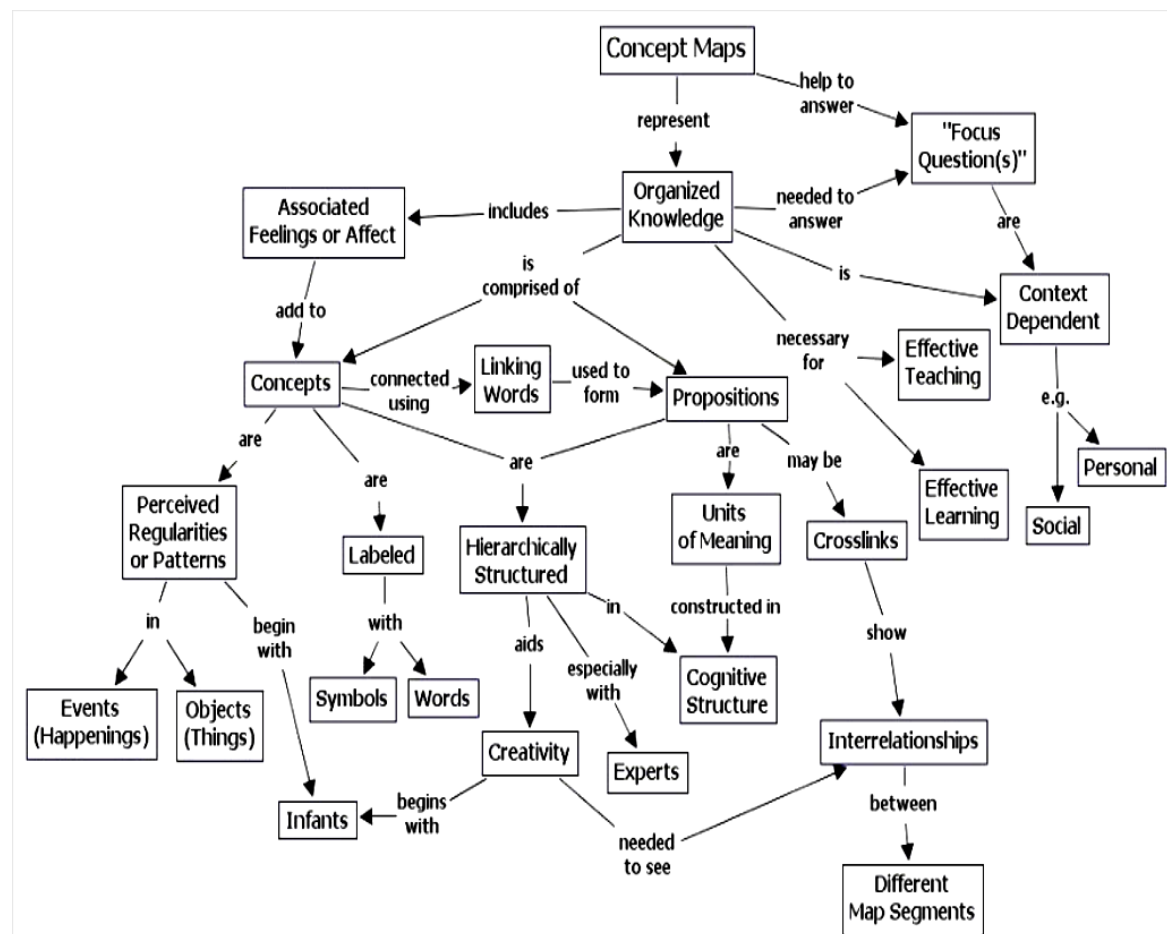
Samuel Johnson (1709 – 1784)

Concept maps are increasingly used in education as a teaching and learning strategy. This chapter reviews some of the literature on concept mapping and provides a background to the issues discussed in this work. It specifically addresses the various uses and applications of concept maps in educational contexts and research conducted on concept mapping, including their impact on learning and motivation; and the development of computer–assisted concept maps.

### 2.1 Concept maps

There is no single definition of concept maps. An earlier report defines a concept map as a schematic device to present a set of concepts embedded in a system (Novak & Gowin, 1984). Concept maps have been described as a “visual way of representing knowledge in which concepts, relationships (between concepts) and propositions exist” (Rueda, Arruarte, Elorriaga, & Herran, 2009, p. 461). A concept map is a graphical tool for organizing and representing knowledge (Novak & Cañas, 2006). The concepts are not considered as isolated entities but as a network of relationship, the concept map is a tool to represent the interconnections among concepts in an integrated, hierarchical way (Chularut & DeBacker, 2004). Novak’s concept map about concept mapping (see **Figure 1**) demonstrates how a concept map can be used to show the multiple relationships between concepts.

**Figure 1 Novak's Concept Map about Concept Maps (Novak & Cañas, 2008, p. 2)**

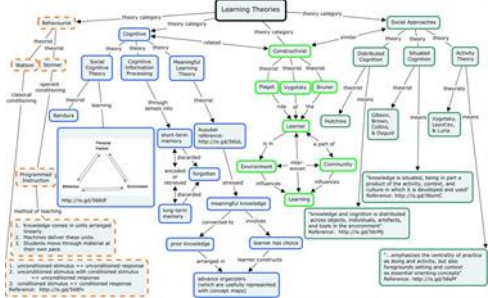



### 2.1.1 Similar but not the same as mind maps

Åhlberg (2004) points out that while many researchers cite Novak and his research group they mix concept maps with other forms of graphic representation such as: mind maps, cognitive maps, and conceptual diagrams. Concept maps are often confused with ‘mind maps’ a technique popularised by Tony Buzan to promote creative thinking (Buzan, 1974). Mind maps are highly personal association diagrams usually produced to explore a single idea. They have gained widespread use as a personal learning tool but they are not concept maps which are used to explain conceptual relationships as well as identify concepts. To show the differences between different forms of visual representation, Eppler (2006) compared Novak's concept maps to Buzan's mind maps (see

Table 1.) conceptual diagrams, visual metaphors. Eppler maintains that visual representations including mind maps and concept maps can be used in complimentary ways to enhance attention, understanding, recall and motivation.

**Table 1 Concept maps and mind maps** (adapted from Eppler's (2006) comparison of concept maps, mind maps, conceptual diagrams, and visual metaphors pp.203-204

Format Parameters	Concept map (J.D Novak)	Mind map (T. Buzan)
Sample thumbnail representation		
Definition	A concept map is a top-down diagram showing the relationships between concepts, including cross connections among concepts, and their manifestations (examples)	A mind map is a multi coloured and image-centred, radial diagram that represents semantic or other connections between portions of learned material hierarchically
Main function or benefit	Shows systematic relationships among sub-concepts relating to one main concept	Shows sub-topics of a domain in a creative and seamless manner
Typical application context	Classroom teaching, self-study and revision	Personal note taking and reviewing
Application guidelines	Use it as a learning support tool for students, that is, to summarize key course topics or clarify the elements and examples of an abstract concept	Use it for pre analytic idea jostles or rapid note-taking, or to structure the main contents of a course or topic hierarchically
Graphic elements employed	Boxes/bubbles containing text connected by lines or arrows with labels	Central topic bubble and coloured (sub-branches with text above branches), pictograms
Reading direction	Top-down	Centre-out
Core design rules or guidelines	Starts with the main concept at the top and ends with examples at the bottom, (shown without circles); boxes/bubbles designate concepts, arrows represent relationships and include cross-links among elements	Starts with main topic in the centre and branches out to sub-topics, using pictograms and colours to add additional meaning. Text written above the branches
Macro structure adaptability	Flexible, but always branching out	Somewhat flexible, but always radial
Level of difficulty	Medium to high	Low
Extensibility	Limited	Open
Memorability	Low	Medium to high
Understandability by others	High	Low

It is clear that concept maps and mind maps share similar features but they are not the same, nor are they used for the same purposes.

In educational contexts concept maps are used as tools to facilitate students' understanding of conceptual knowledge by creating a graphical map of that knowledge which helps the learner to make a deep systematic analysis of a learning topic (Vural & Zellner, 2010). The information in a concept map is easily accessed by looking at how each word or concept relates to each other. This makes concept maps useful for visual learners who memorize information more easily from images and pictures (Cicognani, 2000). The presentation of information in a graphical manner is thought by many educational theorists to help learners understand and retain conceptual knowledge in a more meaningful way than rote learning.

### **2.1.2 Support meaningful learning**

Meaningful learning refers to the integration of new knowledge and understanding into the learners' existing conceptual frameworks and not simply the repetition of information (Novak, 2010). Unlike rote learning which relies on the memorization and repetition of information, concept maps build on existing knowledge to create new knowledge and understanding. Moreira (2011) suggests that concept mapping is a useful strategy to help learners progressively move from rote learning to meaningful learning. Concept maps can be used to facilitate meaningful learning in a two ways: they can be used both to display students' prior knowledge about a given topic and they can be used to summarize what has been learned. Concept maps have been shown to contribute to more meaningful learning in other ways. For example, in a study of 82 high-ability year ten students in biology, Trifone (2006) found that concept mapping contributed to a more meaningful approach to learning biology. This was demonstrated by the students'

performance tests where Trifone found that the students' learning motivation and use of critical learning strategies could be profiled in direct relationship to the level of students' mapping proficiency. These findings are supported by another study by Khiabani and Nafissi(2010) who investigated the reading comprehension and academic motivation of undergraduate students majoring in English in Iran. Their study concluded that the use of concept maps benefited students both in their reading comprehension and in enhancing their motivation.

Rueda et al. (2009) qualitative study of concept mapping agreed that concept maps are a widely accepted technique to promote meaningful learning. Jones, Ruff, Snyder, Petrich and Koonce (2012) who conducted a mixed method study of concept map use confirmed that concept mapping had an effect on students' motivation-related beliefs and provided important advantages in the teaching and evaluation process. Their study, comprising of 40 education psychology students at a US university, supported the theory that when students are familiar with the various mapping strategies, they are able to apply them in their own learning outside the classroom as one of their supported learning strategies. Owning the skills of mapping strategies empowers the students to become more autonomous and motivated learners.

### **2.1.3 Encourage creative and critical thinking**

Adler (1978) argues that "the goal of education, should not be to provide information, but rather to enable students to question, examine, and reflect upon ideas and values presented to them"(cited in Gul & Boman, 2006, p. 200). Higher order thinking skills are identified as a key competency in the New Zealand curriculum. It is generally accepted that "[p]edagogies that feature collaboration and problem-solving tend to involve students in higher order thinking, and support them to retain learning long after

they first meet new content and concepts” (Wright, 2010). Cicognani (2000) correlates the type of learning encouraged by concept mapping to the higher learning objective of synthesis identified in Bloom’s taxonomy. Bloom’s taxonomy which identifies six categories of learning within the cognitive domain, from the simple recall or recognition of facts through to more complex and abstract levels of analysis is still considered relevant in education today (Forehand, 2010). It can be argued that creating a concept map involves all six of Bloom’s stages of intellectual behaviour: knowledge, comprehension, application, analysis, synthesis and evaluation.

Concept mapping has been found to assist in the development of critical thinking skills in the field of nursing (Kostovich, Poradzisz, Wood, & O’Brien, 2007). Kostovich et al.'s (2007) study of 120 undergraduate nursing students investigated the relationship between the students’ learning preferences and their aptitude for concept maps. While the authors concluded that there was no significant difference between learning preference and concept mapping aptitude, they found that requiring students to concept map improved their critical thinking skills. This observation is supported in a similar study by Akinsanya and Williams' (2004) who reported that while students in their study found concept mapping to be challenging, it stimulated inquiry-based learning (IBL) in the nursing education programme. In their study of how children may be helped to conceptually represent the world for themselves (Cañas, Novak, González, & Conceição, 2004) suggest that not only do concept maps support meaningful learning and the construction of knowledge, the ability to concept map can be used to demonstrate learners’ creative and critical thinking skills.

There is some debate about the extent to which concept mapping as opposed to mind mapping encourages creative thinking (Wang et al., 2010), however a study of the

impact of a computer assisted concept mapping system (ICMap) on users' conceptual self-awareness suggest that ICMap viewing frequency exerted a positive impact on the participants level of conceptual self-awareness and their ability to create new understandings (Kao, Lin, & Sun, 2008). Novak and Cañas (2007) argue that the act of mapping is essentially a creative activity because the learner must exert effort to clarify meanings, by identifying important concepts, relationships, and structure within a specified domain of knowledge. Concept maps also facilitate creative thinking because they enable users to develop new ideas about the subject in question by looking at the subject in new and different ways. Afamasaga-Fuata'i (2009) suggests that the ability to search for and characterize new cross-links within the hierarchical structure represented in a good concept map helps learners to find unseen connections between ideas and thereby create new knowledge and understandings which can clarify their thinking and enhance their understanding of the conceptual structure of selected topics.

## **2.2 Concept maps in practice**

Concept mapping has been proven to be a valuable cognitive tool in a variety of learning and instructional settings (Hsu & Chang, 2009). Concept maps are used to communicate complex ideas and summarise information, for collaborative learning and for assessment and evaluation. Concept maps have been shown to help learners learn, researchers create new knowledge, administrators to better structure and manage organizations, writers to write, and evaluators to assess learning (Novak & Cañas, 2008). Concept maps have also been used as advance organisers and as a curriculum development tool (Stoica, Morarum, & Mironm, 2011).



### **2.2.1 Advance organiser**

Ausubel (1978) advocated the use of concept maps as advance organizers to foster meaningful learning. Advance organizers can be constructed by teachers or other experts for use by learners or they can be constructed by learners. For example, a concept map provided to the student can be a useful tool to communicate course content, while a concept map created by a student can assist them to organize and plan their own learning. Constructing concept maps allows the lesson designer to identify the key concepts in the planned lesson and the relationship between them. Novak (2010) suggests that using concept maps in planning curriculum or instruction on a specific topic helps to make the instruction conceptually transparent to students.

### **2.2.2 Instructional tool**

As an instructional tool, concept maps can be used to identify and clarify content. Concept maps are commonly generated from general concepts to more specific concepts; the most general concepts are placed at the top of the map, followed by the more specific, sub-concepts and the most specific ones in the form of examples (Carnot, Feltovich, Hoffman, Feltovich, & Novak, 2003). As an explanatory device the main goal of concept mapping is not to produce a beautiful concept but to create a map to represent a lesson in a clearer and more understandable way (Cicognani, 2000). Constructing concept maps allows the lesson designer to identify the key concepts and the relationship between them (Stoica et al., 2011; Yen, Lee, & Chen, 2012). A global 'macro map', which shows the main topics and their interrelationships together with a more detailed 'micro maps', which show more specific details for a particular portion of the instructional material, can be used to present and explain complex concepts (Cañas, Novak, & González, 2004).

Stoica et al. (2011) suggest that by visualizing the concepts to be learnt, concept mapping can help teacher to arrange difficult learning concepts in order and allow students to revise the learning topic more easily. Using the example of ‘Harmonic Oscillation Motion’, a relatively complex concept in physics, Stoica et al.(2011) show how presenting information in the form of concept maps may make it is easier for students to understand and even reinforce students’ understanding of the topic. They suggest that collaborative concept mapping may be used as a tool for problem solving phases in the learning process and that concept maps drawn by students can show how far they understand the learning concepts. The students’ concept maps enable the teacher to check the students’ understanding of the topic and to identify any misconceptions. Concept mapping may also help teacher to evaluate students’ learning. In their study of the influence of concept mapping on the learning achievements of students of English as a second language, Chularut and DeBacker (2004) found that concept maps may enhance students’ self-efficacy by helping the students to comprehend difficult concepts and to assist their learning outcomes by improving their self-monitoring skills.

### **2.2.3 Assessment and evaluation**

When used as assessment and evaluation tools, concept maps can help measure the growth of a student’s learning and to alert the teacher as to what the student does not understand by exposing inaccuracies or incorrect links when the student reiterate ideas using their own words (Jankowska, 2010). In their review of literature of manual and automatic concept map analysis techniques, Keppens and Hay (2008) reported that instructors used concept maps to judge the depth of their students’ learning and understanding.

#### **2.2.4 Collaborative learning**

It is a human tendency to think “within concept boundaries constrained by personal backgrounds, educations, living environments, etc. Working with other individuals from diverse backgrounds can help ameliorate the effects of these constraints” (Kao et al., 2008, p. 1719). To create a collaborative concept map, subjects who may be either experts, novices or group of users at the same level, work together especially in the preliminary phase of collecting keywords regarding a particular issue or subject. Each subject identifies key words in a map and discusses these with the other members of the group. By comparing opinions, the subjects can modify the collaborative map and gain a more comprehensive and thorough understanding of the topic. In an experimental study involving 16 pairs of students in a simulated business communication exercise to test the efficacy of concept maps, Freeman and Jessup (2004) were in agreement with prior research which concluded that “concept maps (1) are appropriate tools to assist with communication, (2) are easy to use, and (3) are seen as beneficial by their users” (p.151). In addition to validating the claim that concept maps are easy to use, assist communication and are believed by users to be beneficial, there was evidence that concept maps supported collaborative learning. This conclusion was based on measures of usefulness, ease of use, and satisfaction by both parties in their subject pairs. Freeman and Jessup reported that the collaborative mapping process led to the students developing a joint understanding of the topic.

There is some evidence that collaborative concept mapping may be more effective than individual concept mapping as a learning strategy. In a comparative study of high school biology students, Brown (2003) found that those students who collaboratively constructed concept maps outperformed students who individually constructed concept maps on a high school biology test. However, they also observed that the test scores for

students who individually constructed concept maps were no higher than those of students who did not construct concept maps in contradiction to general trend. Stoyanova and Kommers (2002) suggest that collaborative concept mapping facilitates the process of group negotiation of meaning and promotes a deeper mutual understanding between peers. However this may be related to the level of communication skills of the participants as in their comparative study of collaborative and individual concept mapping by middle school students, Kwon and Cifuentes (2007) found that the collaborative group did not score significantly higher than the control group on achievement. This was attributed to the fact that the students were inexperienced collaborators and working in an environment which did not support collaboration. In respect of the benefit of concept mapping in general, they noted that individually constructing concept maps on computers during study time, positively influenced science concept learning more than independent use of study time.

Collaborative learning may also enhance the development of critical thinking (Gokhale, 1995). Comparing the effectiveness of individual learning versus collaborative learning with respect to memory tasks and critical thinking skills in a group of undergraduate students at a technical school, Gokhale observed that students who participated in collaborative learning significantly outperformed students who studied individually in the critical thinking tests. Among university students, the social nature of collaborative concept mapping may be an important factor. In a study comprising of 26 university students by De Simone, Schmid, and McEwen (2001), the students reported that they liked sharing their concept maps and discussing them with their peers. Enjoyment has long been recognised as a motivational factor.

### **2.2.5 Learning and Motivation**

From an educators point of view the value of concept maps lies in their ability to facilitate learning. Cicognani (2000) suggests that concept mapping can make a tangible difference at the beginning of the learning experience when the learner “not only needs to set her parameters for the organisation of information , but also needs to lay out in a structured framework the subsequent steps of the learning process” (p.152). Concept maps can also be used to track changes in the course of learning. In a study of learning outcomes, Hay (2007) reported that concept maps could be used to measure deep, surface and non-learning outcomes by comparing maps produced at different stages of learning.

Creating concept maps requires students to engage in complex, intentional learning. However the effort required to concept map is balanced by the fact that the activity of concept mapping has been found to increase the learners’ intrinsic motivation. The study by Trifone (2006) found that not only did concept mapping contribute to the students meaningful understanding, but that it also increased students’ motivation to learn biology. This observation is supported a later study by Schaal (2010) of student science teachers who were encouraged to use computer assisted concept maps (CACM) to reinforce their learning of domain knowledge. When he assessed the influence of concept mapping on achievement and motivation, he found that high achievement levels correlated with the more frequent use of CACM. The frequency of use of this technique could be correlated with interest and enjoyment, perceived value and usefulness as well as competence in CACM, while also noting that the combined motivational factors correlated well with the highest achievement. The outcome of this study suggests that competence in concept mapping contributes to both positive learning outcomes and the learners’ motivation.

### **2.3 Computer assisted concept maps (CACM)**

The traditional concept map is drawn by hand using pen and paper or on a black or white board. Increasingly concept maps are being constructed using computer software. Computer assisted concept mapping was made possible since the 1980s using basic word processing software. However since the 1990s a number of specific computer applications have been developed to provide resources for creating interactive concept maps. Some of these applications such as *Inspiration<sup>TM</sup>* and *Microsoft Visio* are proprietary products while other programs such as *Bubbl.US<sup>TM</sup>*, and *CMap Tool* are free. *Bubbl.US<sup>TM</sup>* is only available online. These applications enable users to draw 3D objects and to combine graphics with multimedia, such as words, sound effects, videos and hyperlinks to create models on ideas.

In their study of teacher value beliefs associated with using technology, Ottenbreit-Leftwich, Glazewski, Newby and Ertmer, (2010) noted that educators sometimes prefer the use of digital tools simply because they believe that they increase learner motivation and engagement with the activity. This belief is often shared by students. In their study of the use of *Inspiration<sup>TM</sup>* and other visual learning software by undergraduates at a Kuwait university, Safar, Alqudsi-Ghabra, and Qabazard (2012) noted that most of the participants had positive attitudes towards *Inspiration<sup>TM</sup>* and believed that it has the potential to enhance teaching, learning and students' knowledge despite the fact that only 21 per cent of the participants were aware of this type of application software beforehand. The students were satisfied with the software used and reported no difficulties using and manipulating the software. However Vural and Zellner's (2010) study of using concept mapping in video based learning observed that while computer software can enhance the student's ability to effectively visualize complex content there was no correlation between students learning success and the time they

spent interacting with the learning tool. This anomalous observation may be related to the software they used during the study. In their review of instructional technology use in higher education at selected universities in the Niger Delta Ololube, Eke, Uzorka, and Ekpenyong (2009) reported that “using the right application software can have a remarkably positive influence on students' attitudes toward learning as well as their abilities to comprehend and affect the world around them” but also noted that “ICT tools are not magical” (p.11).

Computer assisted concept mapping can benefit students in its ability to provide templates that can ‘scaffold’ the learners’ concept mapping practices. In an experimental study comparing the effectiveness of concept maps constructed by pen and paper and CACM using the additional variables of concept maps constructed by learners themselves and using a computer scaffold, Chang, Sung, and Chen (2001) found that both types of computer based procedure helped learners with their learning outcomes. Coincidentally the study found that more ‘construct-by-self’ students expressed interest in using concept maps in the future. This observation suggests that it is the act of concept mapping that contributes most to the development of self-learning skills and not the medium used.

The main advantages of computer assisted concept maps are the ease of making corrections and modifications; flexibility of presenting content; and the ease of sharing maps. This ease of sharing can promote interactions among teachers and students. It also has a direct impact on the use of concept maps as an assessment and evaluation tool. Kim and Olaciregui (2008) argue that ‘paper-and-pencil’ concept mapping is not an efficient tool for evaluation when compared to computer generated concept mapping because of the difficulty in making comparisons as a result of greater individual variation in pen and paper concept maps.

Computer assisted concept mapping allows students to incorporate visual images into their concept maps easily which may have the benefit of providing them with greater visual stimulus for their understanding of concepts and their recall of information. In a study of the effect of text based and image based concept maps on learning outcomes, Yen et al., (2012) reported that while there was no significant difference in learning outcome, the group using image based CACM showed a higher level of understanding of concept maps and the concept mapping process than those using only a text based CACM strategy. This is supported by a study comparing the use of paper/pencil and computer tools for creating concept/mind maps in two combined ninth and tenth-grade biology classes taught by the same teacher (Royer & Royer, 2004). The teacher observed that the group using computer assisted concept mapping software was more motivated to develop concept/mind maps and spent more time on the task. The students were more engaged and more focused on their own learning rather than completing the assignments. The findings also indicated a significant difference in the quality and complexity of the concept/mind maps created by the group using paper/pencil and the group using computer tools with the latter being more complex.

There seems to be a correlation between ease of use of a concept mapping application and the learners' satisfaction. In a study of Canadian undergraduate students, MacKinnon (2006) found that students were significantly positive about using *Inspiration*<sup>TM</sup> software to concept map. They reported that the software was moderately simple to use, that the drawing features were easy to learn and apply while also appreciating its hyperlink features. The students agreed that CACM provided a framework to their understanding of science education and that using *Inspiration*<sup>TM</sup> allowed them to articulate their understandings. However, in spite of the clear advantages of CACM, there may be some benefits to traditional pen and paper concept mapping,



specifically in the relationship of physical movement to memory. In a study comparing the retention of new information using handwriting and typing, Longcamp, Boucard, Gilhodes, and Velay (2006) argued that the stability of character representation in memory was greater when handwriting formed part of the learning process. There is some evidence that different parts of the brain are activated when we read letters we have learned by handwriting (The University of Stavanger, 2011). This may not be an issue in the future as technological convergence continues to close the gap between handwriting and typing through the development of more versatile applications.

## **2.4 Concept maps, culture and approaches to learning**

Educational research suggests that learning outcomes are positively affected when teaching strategies are matched to individual learning preferences (Kostovich et al., 2007). For this reason it is relevant to consider culture and approaches to learning in relation to concept mapping. The idea that there are cultural differences in the ability to learn is highly controversial. However it is widely accepted that: “the values of a person's culture affect both the expectations and the processes of learning” (Guild & Garger, 1998 p.28). Vita (2001) suggests that learners’ cultural backgrounds affect their learning preferences for cognitive processing, relating to others, and particular types of classroom experiences. In their examination of cultural variation in approaches to learning Gutierrez and Rogoff (2003) concluded that there are ‘repertoires of practice’ associated with different cultures. These repertoires do not eliminate individual learning preferences but they may influence the learners’ approach to new knowledge and learning style. They suggest that using a cultural-historic approach and examining cultural variation in terms of “familiarity with different practices in dynamic communities organized in distinct manners” avoids the stereotyping of learners but “recognizes the circumstances relevant to an individual’s likelihood of acting in certain ways” (p.22).

There is some evidence that culture has an influence on learners' liking for abstract conceptualization. In their study of the influence of culture dimensions in shaping the learning style preferences, Joy and Kolb (2009) found that "a significant portion of the variance in the preference for abstract conceptualization was explained by culture, gender, level of education and area of specialization" (p.69). In particular they found that "in the first years of higher education, say before graduation, where discipline specific conditioning is yet to take root, the culture-based differences may be even more pronounced" (p.83). This is relevant when considering the introduction of unfamiliar learning strategies such as concept maps.

In their study of the usability of e-learning tools, Ardito et al., (2004) argue that before any new educational method can reach its predicted level or goal, such methods must be suitable for individual students' learning styles; only when the educational methods applied focus on the users' needs, that there can be an improvement in the learners' knowledge construction and hence producing the desired results. In relation to concept maps, Laight's (2004) study of students' perception of the usefulness of concept mapping found that individual learning preferences had no significant influence on the students' opinions about the usefulness of concept maps. Laight concluded that "concept mapping might be a useful strategy for students with a variety of learning styles and thereby facilitate teaching to all types" (p.229). Concept maps have been found to be useful in a number of cross-cultural learning contexts and particularly in foreign language teaching and learning.

#### **2.4.1 Second language learning with concept maps**

Concept maps have proved useful in the context of cross cultural teaching and learning; concept maps have been used across a range of levels of English proficiency in

ESL (English as a second language) and ESOL (English for speakers of other languages) teaching (Chularut & DeBacker, 2004). For example, in reading comprehension tasks where students need to refine their language and vocabulary, concept maps can be used to identify and organise the main issues of a reading text. This technique was shown to make students more confident to retell the content of a reading text. An experimental study investigating the effects of using CACM of 192 first year EFL (English as a foreign language) learners at university level, found that concept mapping was more valuable than traditional reading teaching strategies (Liu, 2011; Moreira & Moreira, 2011). Concept maps have also been used as a prewriting strategy for EFL learners. In a study of 23 advanced level EFL students from Iran, Mahnam and Nejadansari (2012) found that students using concept maps out performed and controlled their learning better than students in the control group who did not use concept maps. These studies suggest that concept map use is a valuable learning strategy for international students from other than English language backgrounds at university level. However, in the context of second language, research about the benefits of concept mapping as a learning strategy remains limited (Cañas & Novak, 2006).

## **2.5 Limitations of concept maps**

Studies have shown the advantages of using concept mapping in learning, in particular the way that they can help students to understand the links between the information and knowledge they are learning. However, while concept maps have been shown to have positive effects on learning in a range of teaching situations, there are some inherent limitations with the use of concept maps as a learning strategy especially in relation to novice and non-academics learners. Confronted by complex concept maps, learners may feel overwhelmed or de-motivated by the complex web of relations they portray. Eppler (2006) suggests that the formal rules involved in concept map creation

and the stress on identifying concepts and their various relationships can represent a difficulty for novice learners. He argues that in order to create meaningful concept maps, students' need extensive training and frequent feedback from teachers, Moon, Hoffman, and Novak (2011) argue that concept mapping is most beneficial to learners when it is integrated into the full educational experience. Carnot et al.(2003) and Vural and Zellner (2010) suggest that concept mapping should not be used as an isolated strategy but as a taught skill to support learning.

## **2.6 Gaps in the literature and future considerations**

There have been many studies, both qualitative and quantitative, which show the benefits of concept maps as a teaching and learning strategy (Carnot et al., 2003; Hsu & Chang, 2009; Jones et al., 2012; Ruffini, 2008; Rueda et al., 2009; Stoica et al., 2011; Vural & Zellner, 2010). Freeman and Jessup (2004) maintain that the power and benefits of concept mapping rest in: “enabling shared understanding, including affect, balancing power, and involving the client” (p.151). Akinsanya and Williams (2004) found there were advantages in students applying concept mapping to help in their learning, even when it was challenging for the students, because the act of concept mapping appears to stimulate learning. As more applications for concept maps are found and concept map use becomes more prevalent, it seems likely that concept map research will continue to evolve. As already noted research about the benefits of concept mapping as a learning strategy in the context of second language remains limited (Cañas & Novak, 2006).

With any learning strategy, students' acceptance is an important factor in determining whether the strategy will be successful. Equally important is the students' ability to use the strategy in question effectively. The learners understanding and experience of a learning strategy underpin their acceptance and ability to benefit from that

strategy. Given the potential learning benefits to international student of concept mapping as a teaching and learning strategy it is therefore important to understand how international students, in this case Saudi women students, use and understand concept maps.

## CHAPTER 3 METHODOLOGY

*[A]ll researchers interpret the world through some sort of conceptual lens formed by their beliefs, previous experiences, existing knowledge, assumptions about the world, and theories about knowledge and how it is accrued. The researcher's conceptual lens acts as a filter: the importance placed on the huge range of observations made in the field (choosing to record or note some observations and not others, for example) is partly determined by this filter.*

Carroll and Swatman (2000)

This chapter describes the methods of investigation used in this study. It sets out the research paradigm and explains the research design and research methods adopted the research procedure, and other relevant ethical consideration including my role as the researcher.

### **3.1 Research Paradigm**

It is generally accepted that all research is guided by the research paradigm adopted by the researcher (Creswell, 2008) which in turn influences the research approach. Research approaches are generally identified as quantitative or qualitative. Quantitative research deals with the measurement and analysis between variables and emphasises product and outcomes. A quantitative researcher relies on numbers, rates and percentages to gain information about a research area (Denzin & Lincoln, 2007). In contrast, qualitative research, which is often described as interpretative research, emphasises on the understanding the data gathered. The qualitative researcher focuses what the data collected reveals about the research subject using qualitative research methods (Johnson & Christensen, 2007). This present research adopts a qualitative approach within a broader qualitative research paradigm. It is interested in finding out

what Saudi women students think about concept maps and how they use it rather than in investigating how many Saudi students use concept maps.

### **3.2 Research Methodology**

Qualitative research produces both exploratory and descriptive explanation (Hesse-Biber & Leavy, 2010). One of the common ways to conduct a qualitative research is by conducting case studies. The case study seeks a holistic interpretation of the research problem in its context (Merriam, 2009). Case study research focuses on a single case or multiple cases as a whole unit as they occur in real life contexts (Johnson & Christensen, 2007; Merriam, 2009; Yin, 2008). Case study has proven particularly useful for studying educational innovations, evaluation programmes, and in forming policy (Zainal, 2007). My present research makes use of the case study methodology to explore how Saudi women students, in the context of New Zealand university studies, implement concept maps as a learning strategy and how they perceive the usefulness of concept maps in their studies. I conducted a multiple case study of six Saudi female university students who use, or have recently used concept maps either paper and pen or computer assisted concept map (CACM) in their learning.

### **3.3 Research Questions**

This study aims to provide an in-depth picture of how six Saudi women students view concept maps; what beliefs they hold about concept mapping and its relationship to their learning; and to identify the factors, which in their experience, constrain or enhance their use of concept maps. Three research questions guided the research and investigation process. These are:

- 1- How do Saudi women students understand and use concept maps?
- 2- How do they consider concept maps influence their learning?

3- What factors they believe enhance or hinder their use of concept maps, including computer-assisted concept mapping (CACM) in their university study?

### **3.4 The Research Context**

The research site for this study was Victoria University of Wellington, a tertiary educational institution in New Zealand. This site was chosen for several practical reasons. In 2012 there were over 50 Saudi students studying at Victoria University in different faculties at different levels. Most of these students were supported by scholarships from the Government of Saudi Arabia enabling them to live and study in Wellington. Before attending Victoria University most of these students had attended English language or foundation studies courses in New Zealand. The researcher is one of these students and hence has a good knowledge of the Saudi students' social networking practices, a factor which enabled the researcher to use the Saudi student social networks to directly approach potential participants for the study.

### **3.5 Selection of cases & sample size**

According to Yin (2008), achieving the greatest understanding of the phenomenon depends on choosing the case(s) well. To choose well purposive sample is applied by many qualitative researchers (Creswell, 2008). In this method the researchers do not randomly select the sample of their study but they select the research participants in a strategic way so that the sample is relevant to answer the research questions (Bryman, 2012). For these reasons purposive or criterion-based sampling was used to select participants for this study. Ritchie and Lewis (2003) suggest that purposive sampling is particularly suitable for studies which involve subjects with particular features. They argue it is essential to decide which criteria are used for purposive selection: "the choice of purposive sample selection criteria is influenced by a review of the aims of the study" (Ritchie & Lewis, 2003, p. 97). As my interest is in how Saudi women students use



concept maps as a learning strategy I purposely selected my participants on the basis they were students who are using, or have used recently, either paper-pen or computer-assisted concept map in their learning at the university level.

The study was limited to Saudi women students for two reasons; first there are limited studies about Saudi women students, and second as a Saudi woman I am aware that for cultural reasons my access to Saudi female students would be greater than that to Saudi male students. In 2012 there were approximately 30 Saudi women students studying at Victoria university of Wellington. My preliminary research suggested that there were sufficient Saudi women who used concept maps in their studies to provide a large enough population from which I could draw to make a sample of six participants feasible. In fact there were more volunteers than needed, so I was able to further use random sampling to obtain participants for the study.

To recruit participants I used the social network, Facebook and web pages created by the 'Saudi students' club and 'Wellington Saudi girls', sites which are used by most Saudi students in Wellington. I sent an invitation (see Appendix 2: Invitation) through these websites to all Saudi women students who met my criteria with information about the nature and proposed research procedure. The risks involved in the selection of participants from a relatively close-knit community were considered carefully. Through the sending of the initial invitation on the mentioned websites, any element of coercion that might occur through a direct approach was removed.

Potential participants were able to download 'an expression of interest' which they could email to the researcher directly. Once an expression of interest was received, potential participants were sent more detailed information about the project, including the purpose of the research, the research procedure and methods of collecting data, the

amount of participant's involvement required, and the participant's rights (Appendix 1: Research Information Sheet). After receiving responses from potential participants, I discussed with them the extent of the research commitment involved. All potential participants had the opportunity to speak to me or meet me to voice any concerns or questions they had about the project. These meetings were arranged via phone calls and emails. I clearly explained the criteria for participants' selection and the number of participants needed to ensure that students who were not selected would not feel hurt in any way. Students who were selected for the project were asked to read and sign a consent form. No specific incentives or rewards were offered to participants.

### **3.6 Data collection methods**

Three data collection methods were used in this study. Multiple methods of data collection are often used in case study research to triangulate data (Merriam, 2009; Stake, 2005; Yin, 2008). Berg (2001) argues that when combining different methods of data collection, researchers obtain a better and more substantial picture of reality because different methods reveal slightly different facets of the same symbolic reality. The methods used in this study were a 'think aloud' session accompanied by a one to one interview of participant with the researcher, and a group discussion or 'focus group'. Interviews and focus groups are both research methods which aim to uncover the experience of the research subjects which in this case are six Saudi women students. Understanding the learner's experience is the central component of a qualitative approach in education (Esterberg, 2002). By using all three methods mentioned above, a deeper understanding of the participants' use of concept maps as a learning strategy and their cultural context was possible.

### **3.6.1 Think alouds session**

Think aloud is a technique in which a person is asked to describe what they are doing while performing a task. By explaining their approach to the task, participants reveal their understanding of the task. Ericsson (2006) suggests that ‘think aloud’ sessions are useful in order to discover the cognitive processes that take place during learning activities. To learn more about how the research participants constructed and understood concept maps, the participants were asked to take part in a think aloud session with the researcher while they develop a concept map on a topic of their choice, using either pen and paper or computer assisted concept map (CACM), whichever they were more comfortable with. These think aloud sessions were the first data collection method used in this study. In the think aloud session the researcher sat with each participant while they were developing their concept map and through the use of verbal prompts sought to find out about the participant’s thinking on using concept maps as a learning strategy. To encourage the participants to speak easily and freely, and to allow them to express their views and perceptions in their own words (Esterberg, 2002), the sessions were conducted in the participants’ mother tongue, which is Arabic.

The think aloud session was followed immediately by an interview. A research interview is an activity where a researcher and participant engage in a conversation to obtain a special kind of information (Merriam, 2009). Interviews are frequently used in educational research to provide researchers with an opportunity for detailed investigation of participants’ personal perspectives (Kvale, 2009). Cohen, Manion, and Morrison (2007) note that interviews enable participants to express how they regard situations from their own point-of view and to discuss their interpretations of the world in which they live. Radnor (2002) uses Cannell and Kahn’s (1968, cited in Radnor, 2002) definition of the research interview as “a two-person conversation initiated by the interviewer for the

specific purpose of obtaining research relevant information” (p.17) to emphasise the focused aspect of conversation undertaken as part of the research process. In this research the purpose of the conversation between the participant and the researcher was to provide more information about the participant’s experience and view of concept maps and to explore the issues raised in the think aloud session. An interview guide was used to provide this focus and to maintain consistency between the sub-cases (Johnson & Christensen, 2007; Stake, 2005). Ritchie and Lewis (2003) note that semi-structured interviews enable the interviewer to ask key questions and then to do some additional probing for further information. I used a semi-structured interview format with subsidiary questions to ensure covering the research objectives, and at the same time to give participants a chance to elaborate on the issues they thought were priorities (Radnor, 2002). The combined think aloud and interview session was conducted in a single 60-90 minutes session. With the participants’ consent the think aloud and interviews were voice recorded using a digital recorder to allow the researcher to focus on the interviews and to capture the data more accurately. During the session I also took notes to clarify any ambiguity that may arise during the conversation. After the interviews were transcribed, each participant was emailed a rough transcript of their own think aloud and interview session so that they could add or change any points if they wished.

### **3.6.2 Focus group session**

A focus group is a structured group discussion method used to gain detailed information from people as they communicate within the group. The main goal of focus group interviews is to gather data on attitudes, values and opinions (Cohen et al., 2007). Focus groups are considered to be valuable as a data gathering technique because they offer researchers a means of obtaining a wide range of views that people have about a specific issue as well as showing how people interact and discuss the issue (Krueger &

Casey, 2009). A distinct feature of the focus group interview is the use of the group interaction to give an insight into issues that might be less accessible in a one to one interview (Morgan, 1996). Ritchie and Lewis (2003) maintain that focus groups also create an opportunity for differences in opinions to be directly and explicitly discussed.

In addition to the think aloud sessions, the participants were invited to take part in a focus group interview to discuss factors which they consider enable or constrain the use of concept map as a learning strategy in their university study. The purpose of the focus group was to find out what the participants, as Saudi female students, thought about using concept maps, either paper and pen or computer assisted concept map within university level. Once the participant had agreed to participate in the focus group, a confirmation letter was sent by email to inform them of the date, time, and place for the focus group session, along with a statement of the purpose of the focus group (see Appendix 3: Data collection method forms). Though arrangements were made to secure a private room at the university for the focus group discussion, the participants voiced their preference to hold the focus group off campus. They argued that an off campus session would allow a more relaxed and open atmosphere to develop. For this reason the focus group discussion was held in the home of one of the participants. To further support social interaction and to create a relaxed atmosphere conducive to open and frank discussion, refreshments were served.

On arrival at the focus group location, participants were given a copy of the protocol to be used. This included a welcoming message to each participant and the researcher's appreciation for their willingness to participate. The ground rules for the focus group were explained as well as a signed agreement to maintain and respect the privacy of each other and not to name other participants or what they may say in the

discussion. The focus group protocol included the engagement questions the researcher intended to ask before the collaborative concept map, and also exploration and exit questions intended to be asked after the activity. To provide the focus group with an activity that would encourage participants thinking about concept maps, participants were asked to construct a collaborative concept map around the topic of ‘Saudi Women’s Education in the 21st Century’. As the focus group was conducted in the home of one of the participants, the concept map was produced using the traditional pen and paper method and not using CACM technology which would have been possible at the university location.

The original intention was that the focus group would last around 60 to 90 minutes; however, given the semi-social context of the focus group and observance of cultural considerations, this session ran for 120 minutes. Similar to the interviews, the focus group discussion was conducted in Arabic language. This allowed the participants to respond more accurately to the focused questions and to express their views more confidently. With the consent of all the participants the session was recorded using a digital recorder to allow an accurate transcription and for reviewing of the data. The discussion was first transcribed in Arabic and then translated into English. Notes were taken by the researcher during the focus group discussion and also immediately after the session to clarify any possible ambiguities in translation. Following the focus group discussion, a summary sheet of key themes covered by the group discussion was given to all the participants. However, they were not asked to member check the focus group discussion data.

During the research process all transcripts were stored in a safe place and individual information kept confidential. The data collected during this research will be stored securely and destroyed three years after the completion date of the study.

### **3.7 Data analysis**

All data analysis requires organisation and interpretation. This begins with data reduction, where the collected data are coded and sorted into categories and themes. To do this I used NVivo 10, a multifunctional software system for the development, support, and management of qualitative data analysis projects. After transcribing the interviews and focus groups by hand in Arabic, all of the recorded data, supplemented by notes taken during the sessions was translated into English and typed into Microsoft Word in order to import the raw data into NVivo 10. NVivo was then used to sort the raw data into categories, identified as nodes in the application (see Appendix 5: Example of Coding process Using NVivo). The initial categories (nodes) identified during the coding process were:

- The Saudi participants' experience of CM (past and present)
- Their knowledge and understanding of CM, CACM
- Their use of CM, CACM
- The impact of CM on their learning and motivation
- Factors that influenced their use of CM, CACM:
  - English language
  - Computer skills
  - Critical skills
  - Access and availability

Computer-assisted qualitative data analysis software such as NVivo is considered to be helpful because it offers a formal structure for writing and storing memos in order to develop the analysis and to support more conceptual and theoretical thinking about the data and can speed up the coding process for large projects (Barry, 1998). However,

software analysis does not replace the role of the researcher in making decisions about the data. Ritchie and Lewis (2003) point out that software such as NVivo should be seen only as an analytic support to aid the process of analysis and not as a replacement for the intellectual role that is required of the researcher. Through the process of transcribing then translating and typing up the think aloud sessions and focus group discussion in order to import it into NVivo 10, I had the opportunity to become thoroughly familiar with the themes emerging from the data. It became apparent that, given the relatively small scale of the project and the overall qualitative approach, it was not necessary to use NVivo to analyse the experiences and perceptions of the participants' use of concept maps. For this reason the subsequent analysis of the data was carried out manually using the translated transcripts and Microsoft Excel 2010. The results of this analysis are presented in CHAPTER 4 in the form of individual case studies of each of the six Saudi women participants. A cross case comparison is then made before presenting the findings from the focus group discussion using a thematic analysis to identify themes within the data. According to Ryan and Bernard (2000) the aim of a thematic analysis is to report the content and meaning of patterns (themes) in responses from which the investigator can then identify abstract themes before, during, and after analysis. These themes are presented at the end of CHAPTER 4 and discussed in CHAPTER 5 together with the findings from the focus group discussion and the findings from the individual case studies.

### **3.7.1 Trustworthiness and credibility**

Reliability and validity are the two central concepts used in the discussion of the credibility of scientific research (Silverman, 2011). However, in the context of qualitative research, it has been argued that trustworthiness and credibility are more relevant concepts. Golafshani (2003) argues that “the concepts of reliability and validity are



viewed differently by qualitative researchers who strongly consider these concepts defined in quantitative terms as inadequate” (p. 599). One of the ways to bring credibility to a qualitative study is through triangulation (Creswell, 2008; Ritchie & Lewis, 2003). In this study, the use of different methods of data collection helped to improve the trustworthiness and credibility of the research findings. Member-checking of the translated transcripts of both the think alouds and interview session allowed the participants to provide their views of the credibility of the researcher’s interpretations and to check the authenticity of the work, which as a result provided additional respondent validation. Disclosure of the researcher’s interest and a degree of reflexivity on the part of the researcher also contribute to the trustworthiness and credibility of qualitative research data. This is discussed further in 3.8.1 **The Role of the Researcher**.

### **3.8 Ethical considerations**

“Ethical responsibility is essential at all stages of the research process, from the design of a study, including how participants are recruited, to how they are treated through the course of these procedures, and finally to the consequences of their participation” (Miller & Brewer, 2003, p. 95). To protect the interests of the participants I followed all the required procedures to meet the ethical guidelines identified by the New Zealand Association for Research in Education (NZARE, 2010). This included a commitment to obtain informed consent from participants before conducting any research activity.

At my first meeting with potential participants, in addition to providing information about the proposed research I outlined the participants’ rights. Participants were told that they were free to answer or refuse to answer any questions asked in the think aloud and focus group sessions. They were also informed that they would be given

the opportunity to review the transcripts of their individual session to correct if they felt that their views or beliefs had been inaccurately represented. Participants were informed that they could withdraw from the study at any time they desired until the data analysis was completed. Participants were informed that they would be able to see the complete research findings if they wished. Although refreshments were provided at the time of the think alouds, interviews and focus group to support social interaction, no specific incentives or rewards were offered to participants for their participation in the research.

Participants were assured that the information collected from the think aloud session, interviews and focus group would not be used for anything other than legitimate academic purposes including the publication of the results of the study as a student thesis and the possible publication of a research report or conference paper. Participants were made aware that they would not be identified by name in any report of the findings to ensure their anonymity and the confidentiality of anything they may say during the research process.

Confidentiality has been identified as a main area of ethical concern (Cohen et al., 2007). Ensuring confidentiality during research means that “the researcher can match names with responses ... but ensures that no one else would have access to the identity of the respondent” (Miller & Brewer, 2003, p. 97). Confidentiality was respected and maintained at all times during the study. To maintain confidentiality and cover participants’ identities no personal names have been used. Instead I have used Arabic pseudonyms corresponding with the letters used to identify each case study (A, B, C...). Participants were also asked not to add their signature or any other identifying label to the concept maps they created in the think aloud sessions. To protect participant confidentiality further, participants were asked to agree to maintain confidentiality in the

consent forms they signed for their participation in the think alouds, interviews and focus group (see Appendix 4: Ethical Forms). It was again emphasized at the beginning and at the end of the focus group session that participants needed to respect each other's confidentiality and that they should not reveal the identities of other participants nor indicate who made specific comments during the discussion once outside the focus group setting. There were no foreseeable cultural, social or legal impediments to the successful completion of this research. It was not anticipated that participants would experience any harm from taking part in this study as it did not involve topics of a sensitive nature or the use of deception and there was no element of judgement of participants involved. By sending an invitation to participate in the research through Facebook, any sense of obligation that might be associated with personal friendship or acquaintance was removed as there was no pressure to participate and unwillingness to participate had no penalty. I was confident that this research would not harm my existing relationships in the Saudi community in any way.

### **3.8.1 The Role of the Researcher**

The researcher plays an important role in the conduct of any research; they are responsible for selecting the appropriate methodology for the research questions, constructing the data collection methods, determining sample, collecting data and managing the analysis and interpretation processes. Maxwell (2004) maintains that clarifying researcher bias, disposition from the outset of the study is important for the ethical conduct of research because it allows the reader to better understand how a particular researcher's values and expectations influence the conduct and the conclusion of a study. Identifying the researcher's position also provides a degree of reflexivity. Reflexivity is an important value in qualitative research and links directly to the

underlying theoretical framework of this research which is based on a social constructivist view of learning and society.

My position as student researcher was communicated to the participants before the research began. I was aware that I was asking them to help me conduct my research as a fellow Saudi woman student who shared many of their experiences in New Zealand. This experience and my knowledge of Saudi culture as a member of that society enabled me to communicate appropriately with the participants during the research process. Further, my experience as a teacher in Saudi Arabia helped me to deal with differences in accent, culture, habits and ethnicity that are inevitable whenever a group from different regions in Saudi Arabia come together. My experience as a Saudi woman student in New Zealand provided many areas of commonality with participants, including coming to terms with an unfamiliar education context and using concept maps as part of my studies. These shared experiences were useful in developing rapport with the participants during the research process. They are also relevant to my interpretation of the findings from the research. This is discussed in CHAPTER 5.

### **3.9 Summary**

The objective of this research is to gain a better understanding of Saudi women students' use and perception of concept maps, including computer assisted concept maps, as a learning strategy in their university studies in New Zealand. And, to identify the factors that they consider help or hinder their use of concept maps in their university studies. The case study approach used to investigate the research questions (3.3) is a qualitative research approach compatible with the underlying social constructivist perspective of this study and accepted research practice. This research also follows the recommended ethical guidelines.

## CHAPTER 4 FINDINGS

*There are three principal means of acquiring knowledge... observation of nature, reflection, and experimentation. Observation collects facts; reflection combines them; experimentation verifies the result of that combination.*

Denis Diderot (1713 – 1784)

### 4.1 Experiences and perspectives

This study addresses three questions: how do Saudi women students report their use of concept maps, how do they consider the use of concept maps influence their learning, and what factors do they consider enhance or hinder their use of computer-assisted concept mapping. The first part of this chapter presents the findings from six case studies of Saudi women university students completing degrees in various faculties at the same university in New Zealand. The information collected from each of the participants following individual think aloud sessions and subsequent interviews is considered under four headings based on the categories identified during the initial NVivo coding process (see 3.7). The headings are: *Concept map use*; *Understanding of concept maps*; *CACM (computer assisted concept mapping)*; and *Barriers and enablers*. These individual findings are then compared in a cross case analysis under two general headings:

*Participants use and understanding of concept maps as a learning strategy and Perceived barriers and enablers to the use of concept maps* (see 4.3.1 and 4.3.2). The second and final part of the chapter summarises the findings from a shared focus group discussion (see 4.4.) It was noticeable throughout that recurring themes emerged from the think aloud sessions and interviews, and the focus group discussion; these themes are identified at the end of the chapter and discussed further in CHAPTER 5.

## 4.2 The Case Studies

To find out how Saudi women students report their use of concept maps, how they consider the use of concept maps influence their learning and what factors they consider enhance or hinder their use of computer-assisted concept mapping. To answer these questions, six Saudi women university students were asked to think aloud while they developed a concept map on a subject of their choice using pen and paper or a computer assisted concept map program (CACM). All chose to use pen and paper although three subsequently sent the researcher computer generated concept maps on their chosen subject. During the think aloud session verbal prompts and additional questions were used to find out each participant's experience with concept maps, her thinking about them, and what factors she considered helped or hindered her in relation to her concept map use.

### ***Participant profile***

All of the participants were women from the Kingdom of Saudi Arabia studying in New Zealand on the King Abdullah Scholarship programme. To preserve their confidentiality each of the participants has been given a pseudonym which corresponds with the letter used to identify their case:

Case Study A	Amal
Case Study B	Basma
Case Study C	Carema
Case Study D	Duaa'
Case Study E	Eman
Case Study F	Farah

All of the participants were under 30 years of age. Three were undergraduate students and three were post graduate students with work experience. All of the

participants have lived and studied in New Zealand prior to their participation in the study. While all of the participants had sufficient English to carry out their studies at Victoria University, their level of proficiency varied with some more comfortable than others in expressing themselves in English. For this reason the think aloud sessions and interviews were conducted in Arabic. Each session was voice recorded and later transcribed and translated into English. Participants were given the opportunity to check their English translation for accuracy and make any changes if they wished. The participants' comments are presented using italics.

#### **4.2.1 CASE STUDY A – AMAL**

##### ***Background***

Amal registered as an undergraduate studying health science at Victoria University of Wellington in 2010. She reported that she had experience of mapping prior to studying in New Zealand. The mapping technique was introduced to her when she was at secondary school in Saudi Arabia. One of her high school teachers had presented the class with an incomplete map on the whiteboard and the students were asked to complete the map as a form of post lesson evaluation. Amal liked the idea and started since to construct maps for her own learning purposes to help her in her studies. She claims she regularly used mapping as a learning strategy when she was at secondary school. It is clear from her description that these were concept maps although Amal identified them as ‘mind maps’, the term used by her teacher.

While Amal knew how to create a concept map before coming to New Zealand her knowledge of concept mapping was limited. Specifically she was not aware of the importance of the relationship between concepts in a concept map until she began to compare her use of concept maps with how concept maps were presented and used by classmates and lecturers at the university. Amal said her understanding of concept maps increased after association with classmates who used concept maps to explain ideas related to their shared studies. Her classmates also identified that what Amal called ‘mind maps’ were actually ‘concept maps’. Amal was also introduced to computer assisted concept mapping (CACM) and concept map softwares such as *Inspiration*<sup>TM</sup>, Microsoft office *Visio*<sup>TM</sup> and *Bubbl.US*<sup>TM</sup> through association with other students who used these programs.



### ***Concept map use***

Amal used concept maps to summarise information that she read in textbooks or gained from lectures and to organise and plan her assignments. She often used concept maps in her final revision prior to the final examination. Amal credited her time at Victoria University of Wellington in New Zealand with extending her understanding of concept maps and ability to use different systems of concept mapping:

*My stay in New Zealand has given me the opportunity to learn about the various [computer software] programs and how to use them through both my coursework and from other students.*

Amal felt confident in her ability to produce both CACM and the traditional pen and paper concept maps and used both as a learning strategy in her studies. However, while Amal was keener for CACM, she found the procedure more time consuming when compared to making traditional pen and paper concept map. She also believed that the traditional concept maps were more helpful in her studies than the CACM. Amal considered that writing down information helped her to remember the information a lot faster and easier as compared to using CACM. Therefore, even when CACM was available, she still preferred to create a map using pen and paper first, and then to transfer it to the computer. Although this duplicating process may appear to be a waste of time, Amal felt that this technique was more helpful to her to develop a better understanding of new concepts.

### ***Understanding of concept maps***

Amal believed that concept maps helped her to analyse information and to illustrate the similarities as well as the differences between concepts:

*I find this strategy a useful way to organise my learning and maximise the mind potentials, to cope with the enormous amount of information involved in university study.*

In the think aloud session Amal was able to quickly identify concepts, though she did not always identify the relationship between the concepts. She confessed that she often did not write down the relationship between concepts when constructing a map. Amal was fully aware that this could cause a problem later on when she needed to remember the type of relationship between concepts on her map. Amal attributed her failure to identify relationships to her earlier practice of mapping in Saudi Arabia where concept maps were generally used as a type of mind map.

Amal identified the ability to produce a concept map as a necessary skill needed by university students but cautioned that whether the students can benefit from concept maps really depended on the students themselves. She believed concept maps helped her in the New Zealand university learning context where students are generally expected to learn independently although she recognised that some lecturers encouraged students to get peer support by facilitating group work activity. Amal believed that using concept maps not only helped her in her studies but that they also encouraged her to become a better critical thinker and self-learner. What she liked most about concept maps was that they facilitated the process of memorising by arranging ideas graphically using shape, colour and sometimes images. Amal believed that concept maps contributed fun to her study, especially when the map-creation was placed as a student group activity: “*Working*

*in a group benefits me so much, we can get information from each other and together learn more”.*

### **CACM**

Amal believed that CACM was more versatile than traditional paper and pen mapping because it enabled her to share her map with others through e-mail or to print it out. Another advantage of using the CACM that Amal mentioned was the ability to easily add to or modify the map. She also thought that the ability to add photos or videos to concept maps made learning dynamic and fun. However familiarity with CACM software applications and access to the internet could represent a problem. Amal had no internet access outside of the university and was hence limited in her use CACM. However, when Amal found out that CACM software could be used independently of the internet, her use of CACM significantly increased. She downloaded the CACM program onto her personal computer and readily used it for her mapping. She mentioned that the cost of the software applications could possibly be a limiting factor in the use of CACM.

Lack of experience with the use of CACM was another limiting factor, Amal initially learnt how to use CACM from other students. She now believes that the university should provide students with more support in using computer based concept mapping programs by providing workshops on how to operate the various computer applications. Amal is also of the opinion that the use of CACM would increase should the CACM applications be made available for smart-phones or I-pads, because most students possess these hardware and hence their readily availability would make their use closer to tradition pen and paper mapping. However, Amal concluded that the successful use of concept maps (either CACM or traditional concept maps) depended on the students’

motivation as much as any other factor because a motivated learner would use any strategies which benefited their learning.

### ***Barriers and enablers***

The main barriers to using concept map strategies identified by Amal were the lack of knowledge of how to create a concept map; the availability of CACM software; and the inability to use CACM effectively. Other factors she saw as barriers were related to course content in particular the complexity of the subject matter especially in health sciences: *“to find the relationship between concepts is really hard and it takes a long time to understand the content of the course”*. She believed that making a concept map for each lesson and studying in a group could help overcome this problem.

Amal found that the free internet access on campus, particularly the availability of Wi-Fi allowed her to access the university’s CACM programs when she needed them. The campus layout where students could learn in open area such as on the campus grass or garden was a positive factor. She appreciated the fact that she did not have to go home to pray because of the availability of a campus prayer room. However the inaccessibility of free CM software when she was not on campus was a limitation.

Amal believed she needed to learn more about CACMs to enable her to create concept maps with more ease. The time it took her to construct CACM acted as a barrier to her routine use of CACM. Amal suggested that in addition to offering students free access to CACM programs such as *Inspiration*<sup>TM</sup>, the university should also provide training courses on how to use this technique for study purposes.

### ***Summary of findings from case study A***

It was clear that Amal was a student who made use of concept maps to support her understanding of different ideas and to achieve her learning goals. She was able to use both traditional concept mapping using paper and pen and concept maps made by using computer based software. Her prior experience of concept maps was both an advantage and a disadvantage. She was aware that her lack of experience in identifying the relational components of a concept map reduced its learning benefit. Overall the unfamiliar aspects of the New Zealand educational system were considered a positive factor which had provided Amal with the opportunity to develop concept map and self-learning skills. This learning was supported through socialising with other students from different cultural backgrounds. She believes that more support is required from the university, through workshops and short courses, to maximise the use of CACM and to develop technical and critical thinking skills.

#### **4.2.2 CASE STUDY B – BASMA**

##### ***Background***

Basma was an undergraduate student studying a design subject. New Zealand was Basma's first choice for her study destination because it provided her with the opportunity to improve her English while at the same time she could pursue her studies in her area of interest. She is passionate about photography and art design. Basma had been using computers since she was a child and regularly uses digital technologies to enhance her learning. She had previous experience using the Arabic version of Microsoft word application make concept maps prior to coming to New Zealand. She said that concept maps were used in her secondary school as a method of summarising subject content mainly by students preparing to sit for examination.

Basma believed that concept maps were useful to organise information and also made information easy to remember especially when she used different shapes and colours to identify different concepts. Basma believed that her reliance on computers made it more difficult for her to recall information if it was not presented in the form of a concept map: “[A] concept map helps me to summarise the information in a picture form with different colours and shapes. This enables me to understand the subject”. She liked the fact that concept maps consisted of fewer words than texts which makes the subject easier to understand and to remember. Basma found concept maps critically supported her learning at the university level. She argued that “*without utilising concept maps, I could not continue my study*”.

##### ***Concept map use***

Basma used concept maps in a variety of ways; to take notes in lectures, to summarise subject material, and to plan for assignments. She reported that: “*concept*

*maps are very useful as I can take notes directly during the lecture using Bubbl.US<sup>TM</sup> I also use the program to summarise the content of a lecture”.*

In the think aloud session Basma was given the choice of using CACM to make a concept map but chose instead to use pen and paper because she was unfamiliar with the programs available in the think aloud session. Her lack of practice with building a traditional concept affected her confidence in constructing a map. However, it was clear that she understood the basic principles of concept mapping<sup>1</sup>. Reflecting on her concept map use, Basma admitted that sometimes she found it difficult to describe the relationship between concepts. She argued that the reason behind this deficiency was related to the inadequate level of understanding of the ‘Academic English’. She said *“I am not able to understand the academic language in the texts so well [and because of this] I cannot fully understand the relationship between concepts and how to find them”*. She also found that it was sometimes difficult for her to analyse the subject contents critically and therefore to find the relationship between concepts. In spite of this difficulty, Basma considered that concept maps really helped in her learning.

### ***Understanding of concept maps***

Basma admitted that her understanding of concept maps had developed significantly since she began her studies in New Zealand: *“[At first] I thought that concept maps are the same as mind maps, but I realised that there is a huge difference between them”*. She went on to clarify this stating that *“a mind map represents the process of mental output of ideas or thoughts, while a concept map represents mental input of ideas or information”*.

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<sup>1</sup> After the think aloud session Basma sent the researcher a concept map on the same topic demonstrating her preferred program *Bubbl.US<sup>TM</sup>*. (see Appendix 6: Example of Student’s concept maps)

However, when a subject was complicated, Basma found it hard for her to create a concept map. She related this specifically to her difficulty in understanding academic texts written in English: *“the complexity of the subject makes it hard to analyse the information especially because of the English language, which is not my mother-tongue”*. Basma also found competing study demands made it difficult for her to spend the time she needed to analyse information and to find the relationships between concepts in order to create concept maps at the level required.

### **CACM**

Basma expressed a strong preference for using CACM. She said she used computer assisted concept maps almost exclusively in her studies:

*It saves times and it is more organised allowing editing, addition and deletion; it facilitates working in a group with the participation of others via E-mail; and also it is easy to be printed and shared with other students in class.*

Basma attributed her preference for CACM to the fact that she had used a computer since she was a child. Basma was confident in her ability to use CACM to produce a concept map and in New Zealand she uses Inspiration™ and Bubble.USTM to create concept maps. She considered that *“both of these programs are easy to use because they include ready-made templates for the map”*. Despite her prior experience with Microsoft Word, she did not have good words for the program

*It is a waste of time whether in terms of creating the map or saving files and transferring them from one device to another as the map gets corrupted due to the difference in programs.*



Basma considered both her lack of sufficient knowledge of how to use particular CACM programs and the limited availability of internet access, to be obstacles to her use of CACM in her university studies. She also regretted the unavailability of Arabic language CACM programmes that could be used to create a high quality concept map.

### ***Barriers and enablers***

Although unavailability of software and internet access and lack of user-experience were issues, Basma believed that the main barrier to the successful implementation of a concept map strategy in her learning process was related to her lack of English language proficiency and lack of experience in self-learning. While Basma considered that the educational system in New Zealand to be excellent, she found that studying in New Zealand at university level posed a major challenge to her expectations and to her performance:

*The education system in New Zealand focuses on the development of research and self-learning skills, which has a significant impact on my academic performance.*

She believed that she often did not have the necessary background or skills needed to do as well as she wanted to at university and believed that: *“there is insufficient direction and guidance of how and what self-learning is. For me as an international student in New Zealand I face a great difficulty at the beginning of my study”*.

Basma thought that concept maps should be included in all courses and that providing ready-made electronic concept maps for each lesson as a summary would help students to gain better understanding of a subject as well as concept maps. She also thought producing concept maps as a collaborative effort at the end of each lesson or subject would be a good way to assess students' subject understanding.

Basma also advocated using concept maps as a form of a self-evaluation and to improve concept mapping skills, she recommended practicing making concept maps and discussing them with friends. Basma found that the study groups encouraged by her lecturers were an excellent strategy to motivate students to learn as well as a means of developing cooperative and self-learning skills.

***Summary of findings from case study B:***

Basma made use of concept mapping to support her learning and considered it to be one of her most useful learning strategies. Although she did not use concept maps as much as she would have liked to, Basma believed that students needed more help to understand the process of concept mapping and the usefulness of concept map as a learning strategy. She considered the provision of training courses to students on computer skills in general and on how to use various programmes to create concept maps in particular, were urgently required.

Basma understood the difference between mind map and concept map very well. However, she found it difficult when creating concept maps, to identify the relationship between concepts without help. The main barriers she faced were a lack of English proficiency and insufficient training in using concept maps. Basma found that the learning expectations in New Zealand universities and those of Saudi Arabia to be significantly different. In New Zealand the students are expected to be more autonomous learners and Basma feels she needs to be coached on how to be a self-directed learner.

#### 4.2.3 CASE STUDY C - CAREMA

##### ***Background***

Carema holds a bachelor's degree in English literature and has had work experience in this field. She has hence a high English proficiency combined with a high level of computing skills. Carema was a very outgoing person and had a lot of New Zealand or 'kiwi' friends as well as friends among other international students'. These friendships were very important to her. She said that her friendships supported her education journey as she every day learnt new things from her friends and fellow students about the culture, people and the learning system. Carema said *"people are one of the factors that can make someone experience good or bad things in an overseas country"*. Carema found New Zealand society to be highly tolerant and interested in and values other cultures.

Carema was aware of concept maps before coming to New Zealand but had no experience in using them: She said *"I saw concept maps in my textbooks when I was in high school, but I never made them before"*. Carema was also aware that there was a difference between concept maps and mind maps. When asked to define concept maps Carema identified them as *"A strategy for organizing information into shapes and pictures that are linked together by arrows"*.

While able to use a computer before coming to New Zealand, Carema expected to get more training to support her study while in New Zealand. She was also aware that she would need to become more independent in her learning as she had two sisters who had studied overseas. She saw her study in New Zealand as an opportunity to gain knowledge and skills with which so she could solve many problems in life.

### ***Concept map use***

Carema started using concept mapping as a learning strategy after she attended a workshop organised by the Saudi Student Club at Victoria University called 'Digital concept mapping and effective learning'. This workshop was conducted by a Graduate Saudi student from the University of Auckland and covered the construction of concept maps using different digital applications. Carema was enthusiastic about concept mapping and believed that they were important as a learning strategy, because university students are required to assimilate a huge amount of information, to read a lot of material in a short period of time and to memorise and remember information.

Although she was new to using concept maps, Carema made an effort to create and to use concept maps in her study. Carema believed that although she could do all her study without using concept maps, she needed to work hard arranging her thoughts, especially with very complex and complicated subjects. She said concept maps helped her to sort ideas and to retrieve information faster and more thoroughly. Carema also found that using concept map help her gain a better understanding in her studies because concept maps helped her to organize information and to remember them. The concept maps were particularly useful during examination time as they enabled easy memorisation of facts. She stated: *"I revise using concept maps that have been configured during the studying stage and rarely refer back to the original or reference book"*. Carema also found that making a concept map reduced her tension about the overload of study material at university level and during her revision for the examination.

## **CACM**

As a result of her training Carema was skilful enough to make computer assisted concept maps but preferred to use pen and paper to concept map than using CACM. She said:

*I feel that the pen translates my thoughts faster and in my opinion, writing with a pen is better for learning. But if I was asked to hand over a research or anything else that needs the participation of others, or to use the map to explain to a friend, I prefer using the computer-assisted concept maps.*

Carema considered that it was easier to use computer based concept map for presenting ideas as a group or for class room discussion. She also enjoyed collaborative concept mapping although she did not find it easy. Carema recounted how she had been asked by one of her lecturers to work with four other students as a group work project to create a concept map to summarise some theories related to their studies. They decided to use Microsoft Visio to create the concept map, an application which Carema found difficult to use. She considered other programs such as *Inspiration*<sup>TM</sup> were easier to use to create CACM.

Carema planned to use CACM more as one of her learning strategies but had not yet made a choice about which program suited her best<sup>2</sup>. Carema believed that the type of program used could make the creation process easy or difficult. Carema felt strongly that Saudi female students did not get enough chance to use computers or attend computer training workshops during their study in Saudi Arabia and as a result lacked the computer skills needed for their study overseas. Carema believed this lack of knowledge could influence learner's motivation to use computers for learning.

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<sup>2</sup> Like Basma, Carema sent the researcher a CACM after her think aloud session (see Appendix 6).

### ***Understanding of concept maps***

Carema recognised that concept maps illustrated the relationships between information and was able to identify the type of relationship when concept mapping. She used concept maps principally as a summarising device and for revision. In addition to seeing concept maps as a good means of organising information, Carema believed that concept maps help her to develop her study skills. Carema described herself as a learner who was easily distracted. She found that the use of concept maps especially pen and paper concept maps helped her to focus more in getting the main ideas from texts. She claimed that concept maps helped her store information in an organised way and saved much time in the retrieval of information from memory.

Carema acknowledged that concept maps contributed to her critical thinking and self-learning skills, which she saw as important skills required for her studies in New Zealand. She also believes that Saudi women need to be open minded and flexible in order to be prepared for a globalized world and would need to acquire both these skills.

### ***Barriers and enablers***

While Carema experienced few barriers to her use of concept mapping in New Zealand, she identified some factors that may influence the use of concept maps, particularly CACM. She believes that the availability of computers and internet, the know-how to use the various CACM applications, and the provision of adequate training on how to use these programs and concept mapping as a learning strategy, were all factors that should be taken into account. She also identified the financial aspect of CACM as a possible obstacle as the cost of CACM applications tends to be costly. Carema emphasised that the ready availability of internet on campus together with the availability of information about resources that could support students' learning were

essential. She believed that the university should provide students with training courses on how to use computers in general and concept maps in particular, to help them in their studies. Carema also argued that teachers or lecturers should possess expertise in concept mapping strategy so that they may transfer this knowledge to the students.

### ***Summary of findings from case study C:***

Carema considered that as Saudi woman she did not have enough training on using computers or concept maps prior to coming to New Zealand. She registered for courses to make up for her deficiencies in both these areas. She recognised that to be successful in the New Zealand educational context she needed to be an autonomous learner and to possess critical thinking skills. Carema expected the university to provide internet access and computer training for students. She also expected the university to provide information about the software to support students' learning. She argued that the university could help students by providing information about useful websites to support learning, either directly to the students or through public notices,

Carema found that the use of concept maps especially pen and paper helped her to concentrate on her studies for a longer period and supported her learning. She enjoyed working in group with other students and found that using concept maps in a group discussion really made ideas easy to understand. She supported the use of computer assisted concept mapping for collaborative learning.

#### 4.2.4 CASE STUDY D – DUAA`

##### ***Background***

Duaa` was an undergraduate student and was one of only a few Saudi female students studying tourism management at university level. In Saudi Arabia this major is only available for male students. Duaa` had good computer skills as she had used computers since she was a child. She was supported by her parents who have a positive attitude toward new technology. Duaa` said her parents also encouraged her to learn independently. Duaa` considered that the support and her early use of technology had helped her to learn independently and kept her motivated. She now finds it easy to successfully integrate the use of computers in her university studies.

Duaa` had an interest in drawing, photography and effective thinking strategies before coming to New Zealand. Duaa` was introduced to mind maps while at secondary school: “My teacher used to draw a blank concept map on the whiteboard and then ask the students to help her complete it. She called these mind maps”. Duaa`s experience of mind mapping led her to read books about analysing and processing information. However, she was not familiar with concept mapping until she came to New Zealand.

*I did not know previously anything about concept maps although I used it [a concept map] thinking that it was a mind map, so I did not understand the difference between the two types.*

Duaa` also attended the ‘Digital concept mapping and effective learning’ workshop organised by the Saudi Student Club at Victoria University and she said that it was through her study in New Zealand that she learnt about the differences between concept maps and mind maps.



### ***Concept mapping use***

Duaa` used concept maps to prepare her for exams and to review lessons and considered them an important learning strategy. She reported that:

*The strategy of concept map is very important in the field of university study for several reasons: it focuses on the terminology and key points in each subject. It helps to achieve the main learning goals of each subject at the university level which helped this information to be used in the practical life, even after finishing university.*

Duaa` stated that after she started using concept maps regularly, it was much easier for her to understand and cover the concepts in her marketing course. She also summarised topics in the form of points as an alternative to concept maps, as in some cases it was difficult to create a concept , especially with subjects that contained a lot of details. Duaa` found that it was hard for her to create a concept map that when the subject matter from the text book was long and complex. She avoided the use of concept maps in such cases.

### ***CACM***

Duaa` had experience using computer assisted concept maps because one of her lecturers had introduced Microsoft Visio and asked the class to create a concept map as a group work project. In addition Duaa` attended a training course for CACM. She said “*we learnt to use Inspiration and Bubbl.US; I think it is really fun and easier to use than the Microsoft programs*”. Despite her ease in using a computer, Duaa` found that the traditional method of concept mapping was more helpful to her studies than using the computer. She believed that using pen and paper had a greater impact on her learning compared to CACM because “*whatever is written by hand stays longer in the memory*”. She argues that paper and pen concept maps could be created at any time in any place.

Since she liked to draw, she found the paper and pen process more fun than the CACM which required a lot of organisation. Duaa' also found it hard to focus on her study when she was using computer assisted concept map. The distractions of social networking: programs such as Facebook, Skype and others are difficult to resist when using the computer. Duaa added that:

*Computer concept mapping can be very fast but the variability of options in the program used to create the maps is very confusing to me. It requires a longer time to choose one of the suitable options and I am not as comfortable using it.*

Duaa' had relatively good access to computers at home but had access to the internet only on the university campus. She said she would like to use CACM more to create a digital concept maps for her course assignments, but confessed that she needed help to operate CACM effectively. She also pointed out her problem of working space. She reported:

*I currently don't have an office at home or study room which makes it difficult for me to use the computer. I really want to have a space where I can use my computer comfortably. That is another reason I prefer to use a pen and paper concept map.*

### ***Understanding of concept maps***

In the think aloud session Duaa' created a concept map that illustrated the types of marketing involved in tourism. Duaa' had a clear understanding of how concept map could and should be used. However because her teacher at secondary school had used concept maps in a limited way she sometimes found it difficult to differentiate between mind maps and concept maps.

Duaa` considered that concept maps had helped her in her studies in New Zealand. In response to a question about how she thought concept maps helped her to learn. Duaa` answered that: *“Definitely, concept maps help me a lot, organising and summarising as well as easing the process of remembering information especially when different colours and shapes are included in the map”*.

### ***Barriers and enablers***

Duaa` identified the availability of internet access, the high speed internet connection, and the availability of concept map software are all enablers of CACM use. Duaa` had an I-Pad and an I-Phone device and she was familiar with all types of applications available on these devices. She longed for a CACM application for apple devices that would have enabled her to use her devices anywhere. Duaa` said that:

*I think that if creating a concept map using applications for apple devices (such as for I-phone or I-pad) was available, that would help promoting the effective use of computer concept map compared to using pen and paper.*

The other factors Duaa` considered to support her use of concept map strategies in her university study were her early use of computers and the encouragements from her parents to use technology. She said

*The motivation of the family (parents) and their encouragement on using various means of technology in early age had an impact on the improvement of my computer skills as well as the self- learning skills.*

Duaa` also believed that learning English had granted her more opportunities for developing self-learning skills. She also thought that working in a group was really beneficial. In her group work project, she was able to discuss concept maps and exchange

knowledge. Duaa` believed that if teachers or lecturers promoted the concept map strategy, the students would be encouraged to follow suit.

***Summary of findings from case study D:***

Duaa` used concept mapping as one of her learning strategies and was confident in constructing a concept map, although her understanding of concept maps was affected by early confusion between mind maps and concept maps. Duaa' considered that her early use of computers had encouraged her to learn independently and believed that concept maps encouraged her to develop good study habits. She considered that concept maps also helped her to think critically about the relationship between concepts and in this way developed her critical thinking skills.

In spite of confident computer use, she found using pen and paper to make a concept maps was easier than using CACM. This was partly because she was still learning to use CACM but also because she enjoyed the process of drawing a concept map and believed that the information she wrote by hand stayed longer in her memory as compared to information entered in a CACM. Duaa' believed that it would be benefiting the students if lecturers provided students with more information about how to create concept maps, especially the computer assisted concept maps.

#### **4.2.5 CASE STUDY E – EMAN**

##### ***Background***

Eman was a post graduate student of art education specializing in graphic design. A large part of her study involved understanding the elements that make up an artwork and analysing them in order to identify the meaning of the painting or image. She was also personally interested in drawing and confessed that she found joy in dealing with pictures, colours and shapes. Eman was introduced to graphic representation and mapping at an early age. She said that when she was in primary school, her mother would help her to summarize the information she had learnt by using a form of concept map. Eman later used this method of concept mapping at secondary school with her history and science subjects. She said had tried to use it with mathematics but had had limited success which she attributed to her lack of knowledge of concept mapping. Eman also used concept maps in her undergraduate studies in art in Saudi Arabia.

##### ***Concept map use***

In her post graduate-studies Eman used both traditional pen and paper and computer assisted concept maps to support her study. She used concept maps to memorise new vocabulary in art and design, to analyse the art she was studying and to illustrate its aesthetic sense. However, when dealing with a difficult and complicated subject, she found it very hard to organise all the important information in just one map. Therefore, Eman considered that more than one map was often needed for a single topic or artwork.

Eman liked to use concept maps in her study because she said she could not remember information unless she linked it to shapes and colours, which helped her to remember better than just words. Eman reported that: *“For me, it is much easier to*

*remember a picture- the picture tends to stick to my mind for a long time*". She believed that *"The concept map has facilitated the process of recalling information, summarising and linking it to each other"*. Eman believed strongly that using concept map has helped her process the huge amount of information needed in her studies as a post graduate student. Concept maps, she believes, help her to link information and to focus on the most important aspects of her studies. She said that *"This helps me to understand the sequence of information"*. Eman considered concept maps to be a really good learning strategy for her and has greatly helped her in her studies of art and design.

### **CACM**

Eman was enthusiastic about computer assisted concept maps, she said:

*Definitely [a computer assisted] concept map is very useful, as the field of my speciality requires the presence of images (pictures) and video clips, so the computer assisted concept maps helped me a lot in creating concept maps with colours and images which have made it much easier in the analysis of art paintings using the concept map.*

Her experience with CACM led her to the conclusion that CACM is a fast and efficient to make concept maps using the computer. Other advantages of CACM are that they are easy to modify, to add or delete information and to present or retrieve them whenever required. Eman appreciated the fact that she could save all her CACM as files on the computer. She also liked the fact that she could share them with others for learning purposes or use them in her explanation or present them to groups or classrooms. Eman used university computers in the computer lab to create CACM. However, the unavailability or 'slow' internet when she used her own laptop at the university campus

was an obstacle. She said *“this situation turned me off using digital concept maps”*. For this reason she preferred to use her own computer to make CACM.<sup>3</sup>

Before coming to New Zealand Eman had used both Microsoft Power point and MS Word to make concept maps but was unfamiliar with specific concept map applications until she came to New Zealand. Here she was introduced to several different types of software including as *Cmap*, *Bubbl.US*<sup>TM</sup> and *Inspiration*<sup>TM</sup>. Eman said that she found the use of such programmes in particular Inspiration<sup>TM</sup> to be fun. She found that these applications made the creation of a concept map with colours and images much easier and faster due to the availability of ready-made templates as well as to the ease with which images or video clips could be added to the map. While she liked other CACM applications, Eman tended to rely on her previous experience with Microsoft applications to make CACM.

### ***Understanding of concept maps***

Eman had a clear understanding about what should make up a concept map. She also had a very clear understanding about the differences between a concept map and other kind of maps. She expressed this as:

*A concept map represents sequential concepts; these concepts are arranged from the most important to the least important in an arboreal or hierarchical way, interrelated with specific relations between them.*

While Eman was previously aware that a concept map was more than a mind map, it was not until her studies at Victoria University of Wellington that she became more sophisticated in her own use of concept mapping, particularly structuring concept maps in an appropriate hierarchical manner.

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<sup>3</sup> Eman also supplied a CACM version of her think aloud concept map to the researcher.

### ***Barriers and enablers***

The main obstacle faced by Eman in using concept maps to support her learning was related to her difficulty in purchasing CACM software for her use outside of the university computer lab's opening hours and off campus. This was because the relevant software was only available online: *"I do not really trust online purchases. It would be beneficial to us if somehow the university could help us to download CACM software on our personal computers."* Eman believed that students should be able to get free CACM programs from the university. As a Saudi teacher intending to return to Saudi Arabia after her studies, Eman considered the limited availability CACM programs in Arabic to be an obstacle to their future use by her: *"it is possible to use the Microsoft Office to make concept maps but the quality and the speed of this program is very low. It is better to use other specialised programs for this purpose"*.

Eman believed that teaching students the basic principles of concept maps, how to use them effectively, as well providing training on how to use digital concept maps would be helpful. *"In my point of view, organising a workshop on CACM at the university will be a very helpful in promoting the use of computer assisted concept map"*. She also advocated more use of concept maps by Lecturers to explain and summarize course content.

### ***Summary of findings from case study E:***

Concept maps were an integral part of Eman's university study both to support her learning and as a form of analysis used in her research. Eman had used a form of concept map since she was at secondary school. She really understood what a concept map was and how it could be used. Eman was good at making computer assisted concept maps and found it easy and fast to create a concept map using a computer. She liked the way it was



easy to add, modify or delete information on CACMs. She also liked being able to add colours and images to her concept maps using CACM. The fact that she could save her concept maps on the computer and present or discuss them whenever required, was appreciated. She preferred to create concept maps individually rather than in group.

Eman preferred CACM to traditional concept mapping using paper and pen. While she believed that concept maps helped her to memorise and remember information she did not consider pen and paper more effective in relation to memorising information. In addition to aiding memorisation, Eman saw concept maps as an aid to critical thinking. She believed that her early use of concept maps had helped her develop critical thinking skills. Eman advocated early training in using concept maps and computer technology to develop critical thinking skills and computer literacy. At university Eman suggested providing training courses and workshop on how to use concept maps and how to make digital concept in order to promote the effective use of this strategy. Eman believed lecturers should teach students the basic principles of concept map and how to use them. She also suggested that lecturers explain and summarize their course content by using concept maps, which would encourage the greater use of concept maps by both students and lectures.

#### **4.2.6 CASE STUDY F – FARAH**

##### ***Background***

Farah is a postgraduate student. She had been exposed to mapping as a learning strategy at intermediate school and had used maps as a personal learning strategy. However, she had a limited understanding of concept maps which she used mainly as a type of information organiser. Farah considered that concept maps were a good way to organize thoughts and information and made it easy to remember information. She defined a concept map as “*an arboreal graph that helps to summarise, arrange and organise information*”. Farah believed that the successful people were the ones who could organize their thoughts and recall the information any time these were needed.

Farah did not consider herself to be good at using computers because of a lack of computer experience although she was enthusiastic about developing skills in this area. Farah said that studying in New Zealand had opened the door to integrate technology into her life. She could now use search engines and other computer programs such as the blackboard for her study and doing assignments, while at the same time becoming proficient with the different social networking programs to keep in touch with family and friends back home.

##### ***Concept map use***

Because Farah had little experience in using computers and digital technology, she preferred the traditional method of pen and paper to make concept maps. She said “*I just started using modern technology here in New Zealand, so I find it easier to use the pen and paper*”.

Farah used concept maps to make study plans; to summarise the curricula, and to set up research projects. Farah said that she depended on using shapes, images and

colours to recall information faster, and that she uses colours to help her in classifying topics according to their importance. Farah considered concept maps to be very beneficial to her study: *“I believe this is a very useful strategy, especially with the huge amount of information in the university stage”*. She said that concept maps were an essential part of her learning strategy.

*Concept map has helped me to develop a simple and easy way to picture information in my brain, and to organise information and relate it to each other. This has saved me much time during the processes of studying and recalling information.*

### **CACM**

Farah was aware that computer assisted concept mapping was possible but did not use CACM as a learning strategy. This was directly related to her limited experience of using computers before coming to New Zealand. She attributed her shortcomings with computer to limited exposure to digital technology in Saudi Arabia, both at school and at work:

*Owing to my insufficient computer experience or back ground on how to use the programs for building concept maps, it was hard for me to use computer assisted concept map. I knew these programs were available but it was too hard for me to use them. Trying to use CACM was more of a burden and a waste of time for me.*

Farah did not consider her lack of computer skills to be a barrier in relation to concept mapping. She said: *“I don’t have many computer skills, but I am able to think”*.

### **Understanding of concept maps**

In the think aloud session, Farah demonstrated a good understanding of concept maps. Using pen and paper, Farah quickly identified the concepts she wished to highlight

and the relationships between them. She was able to explain how her map was arranged and why she had placed the different concepts in relation to each other. Farah attributed her ease in constructing a concept map to her previous experience with concept mapping. Farah said that as an undergraduate she is used to different kinds of maps, including concept maps, to deal with different types of information. However, in spite of her clear understanding of concept maps, Farah believed that she could use them more effectively with more training.

### ***Barriers and enablers***

The biggest challenge for Farah in relation to concept maps was a lack of computer skills. This lack of skills meant that she could not easily make a computer assisted concept map but saw this as more of a short term problem. Since arriving in New Zealand she had already developed a range of computer skills and expected that she would have the opportunity to develop this skill further. She believes that the availability of plenty of leisure time; the opportunity to communicate with people from different cultures and the availability of learning programs and web sites would all contribute to her educational journey in New Zealand.

*I had no idea about what kind of programs I can use to produce a good concept map, but during my conversation with some friends at university I discover some fantastic programs such as Bubbl.US and Inspiration which I plan to use it in future in my study.*

Other factors which influenced Farah's use of computer assisted concept maps was related to the availability of the internet. She said that

*I like to study in the garden or in public places and internet access is not available in those places, and that's why I prefer the traditional pen and paper concept map.*

Farah believed that the university should organise training courses and workshops to promote the use of concept maps by students. This would also introduce students to the latest programs that could be used to create easy and effective computer assisted concept maps.

***Summary of findings from case study F:***

Farah used concept maps effectively as a learning strategy. She used them to make study plans, summarise lessons and organise her research. She found that it was very helpful to use concept maps in her university learning since she often deals with huge amount of information. Farah had a good understanding of how concept maps could be used and could make different kinds of concept maps by using different colours and shapes. She believes that concept maps helped her to concentrate longer in her learning. She claims that it was also easier for her to memorise and recall information when she organized the information in a concept map.

Farah used pen and paper concept maps exclusively as she did not have much experience with computers and technology. For her, it was easier to use pen and paper concept map as she was not literate in computer and internet before coming to New Zealand. Although Farah had developed her computer skills since coming to New Zealand and was able to use word processing and the internet for study and social purposes, she still has some barriers in using computer assisted concept map.

### **4.3 Cross case comparison**

Cross case comparisons are used compare information gathered from multiple case studies in order to identify commonalities and differences between the individual cases. Merriam (2009) suggests this should be done only after a thorough within case analysis has taken place. By making a comparison of individual cases it is then possible to build an integrated framework covering multiple cases. The cross case comparison in this study looks first at the participants use and understanding of concept maps as a learning strategy and then at what the participants perceived to be barriers and enablers to their use of concept maps in their university studies.

#### **4.3.1 Participants use and understanding of concept maps as a learning strategy**

All of the participants had been exposed to the idea of concept maps before coming to New Zealand. Two participants had been introduced to concept mapping by their parents while still at elementary school. The remaining participants were introduced to concept maps while attending secondary school. All of the participants, except Carema, said that they had used concept maps before coming to New Zealand. Two participants had experience of CACM.

**Table 2 Previous knowledge and experience of concept maps and CACM**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Total</b>
Previous exposure to concept maps	1	1	1	1	1	1	6
Previous experience of concept mapping	1	1	-	1	1	1	5
Previous experience of CACM	-	1	-	-	1	-	2

With the exception of Carema, none of the participants had called the maps they produced concept maps before they came to New Zealand. Instead they knew them variously as mind maps and graphic summaries. It was clear that there was some confusion for most of the participants between a mind map and a concept map, even

though they could describe what a concept map was. This was demonstrated in the think aloud sessions when in spite of their apparent understanding of what should be included in a concept map, some of them constructed their concept maps as if they were mind maps. Most of the participants had difficulty identifying the relationships between concepts. When this fact was drawn to their attention, the participants attributed this difficulty to the limited form of concept mapping practiced at their schools where concept maps were generally constructed by their teacher or produced as a worksheet to be ‘filled in’ in post lesson summary and evaluation.

**Table 3 Concept map use**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Total</b>
to summarise subject content	1	1	1	1	1	1	6
advance planner for assignments and exams	1	1	1	1	-	1	5
note taking for lectures	-	1		1	-	-	2
review the literature	-	-	1	1	-	-	2
as research tool	-	-	-	-	1	-	1
collaborative group projects	1	1	1	1	-	-	4
for presentation	-	-	-	-	1	-	1

All the participant used concept maps as a learning strategy in their studies at Victoria University but not all used concept maps to the same extent or in same way. The most common use of concept maps was to summarise subject content. The next most common use of concept maps was as an advance planner for assignments and examination. Concept maps were also used for collaborative group projects and as a means of note taking for lectures and to review the literature. One participant used concept maps as research tool to analyse graphic images and for presentation purposes.

**Table 4 Traditional CM vs. CACM**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Total</b>
Use traditional pen and paper CM	1	-	1	1	1	1	5
Use CACM	1	1	1	-	1	-	4
Preference for CACM	-	1	-	-	1	-	2
Preference for pen and paper	1	-	1	1	-	1	4

All participants, except Basma used the traditional pen and paper method to construct concept maps. Three of these also used computer applications (CACM) to make concept maps. Four participants expressed a preference for pen and paper concept mapping and only in one case was this based on a lack of ability to use CACM. Two of the participants expressed a strong preference to CACM. Three participants attributed their preference to their learning habits. Several participants expressed a belief that the traditional method of using pen and paper to construct a concept map was superior to CACM because the act of using pen and paper helped in retention of the information. They believed that using pen and paper to construct a concept map had an impact on their ability to recall information. However, the same participants also saw advantages to the use of CACM.

**Table 5 Advantages of CACM**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Total</b>
Can use multiple media	1	1	-	1	1	-	4
Easy to add, edit and modify	1	1	1	-	1	-	4
Ability to share	1	1	1	1	1	-	5
Ability to save	-	1	-	-	1	-	2
Better for presentation	-	-	-	-	1	-	1

The ability to share CACMs with others, either to construct collaborative concept maps or to share information, was identified as the most useful character of using CACM. The ability to use multiple media sources such as photographs, video and other graphics as well as the ability to link digital concept maps to source material and other documents was also seen as an advantage along with the greater ease in adding, editing and



modifying the concept map. Only Eman specifically referred to the advantage of CACM for presentation purposes, although the ability to share and save concept maps made using computer applications implies the ability to present completed concept maps. The only participant to see no advantage to using CACM was the participant with the fewest computer skills and experience.

#### **4.3.2 Perceived barriers and enablers to the use of concept maps**

All of the participants identified misunderstanding the principles of concept maps and a lack of experience in how to construct concept maps as the biggest barriers to using concept maps effectively as a learning strategy. Those with previous experience of concept mapping attributed their own misunderstanding of concept maps to the lack of modelling of good CM practice as well as a lack of knowledge about concept maps. Five of the participants considered that the complexity of the topic or the subject being studied was a barrier. Amal and Basma related this to a lack of English proficiency while Duaa' and Eman related the inability to deal with complex concepts to a lack of experience in concept mapping. Carema also linked experience in concept mapping to the ability to deal with complex topics but also considered that a lack of practice in critical thinking skills was relevant. For Farah, both a lack of English proficiency and of experience in concept mapping were the greatest barriers.

**Table 6 Perceived barriers to CM use**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Total</b>
Misunderstanding	1	1	1	1	1	1	6
Experience	1	1	1	1	1	1	6
Complexity of the topic	1	1	1	1	1	-	5
English language proficiency	1	1	-	-	-	1	3
Lack of critical skills	-	1	1	-	-	-	2

English language proficiency was also seen as an issue in relation to CACM use. Three of the participants considered that the unavailability of Arabic language CACM applications was a barrier to CACM use. Eman in particular saw this as a problem in the future when she will return to Saudi Arabia to resume her work as a teacher. All of the participants thought that lack of knowledge of CACM applications was a barrier. A lack of knowledge here refers to both not knowing enough about the types of CACM programs available and to the limited knowledge of how to use specific programs that they knew about. Carema, Eman and all considered a lack of general computer skills to be a barrier. Access to the internet was seen as a barrier mainly because of the number of CACM applications that are internet based.

**Table 7 Perceived barriers to CACM use**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Total</b>
Lack of computer skills	-	-	1	-	1	1	3
Lack of knowledge of applications	1	1	1	1	1	1	6
Availability of applications	1	1	-	-	1	-	3
Access to internet	-	1	-	1	-	1	3
Unavailability of Arabic applications	1	1	-	-	1	-	3

Access to the internet and the availability of CACM applications were considered to be important enablers of CACM use. However, Critical thinking skills and specific training in concept maps and CACM were considered to be the most important enablers.

**Table 8 Perceived enablers of CM and CACM**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Total</b>
Specific training in CM and CACM	1	1	1	1	1	1	6
Computer skill	1	-	-	-	1	1	3
Critical thinking skills	1	1	1	1	-	1	5
Integration of CM in course work	1	-	-	1	1	-	3
Modelling CM by lecturers	1	1	1	1	1	-	5
Collaborative concept mapping	1	1	1	1		-	4
Access and availability	1	1	1	1	1	-	5

Integrating concept mapping into course work and modelling concept maps by lecturers were seen as ways in which the university could encourage students to use concept maps as a learning strategy at the same time as teaching them how to make concept maps correctly. Encouraging students to make collaborative concept maps as group projects was seen by the participants to benefit international students in several ways: by encouraging them to collaborate they were able to learn from other students and improve their language skills at the same time. They were also exposed to different methods of learning.

#### **4.4 The Focus Group**

The focus group was conducted after all the think aloud sessions and interviews had taken place. All six of the Saudi women students who participated in the think aloud sessions agreed to take part in a focus group discussion to further explore Saudi women students' perceptions of concept maps as a learning strategy. Arrangements had been made to secure a private room at the university for the focus group; however the participants favoured holding the focus group off campus. They felt that this would allow a more relaxed and open atmosphere to develop. The choice of location had one other consequence. To provide a group activity that would focus the participants thinking about concept maps, after establishing the ground rules for the session, participants were asked to produce a collaborative concept map around the topic of 'Saudi Women's Education in

the 21st Century'. Because the focus group was conducted in the home of one of the participants, this map was produced using the traditional pen and paper method and not using CACM technology, which would have been possible at the university location. The traditional method had the advantage that the concept map could be produced in Arabic, the mother tongue of all of the participants and of the researcher as the lack of Arabic language CACM applications would have compelled the participants to create a CACM in English if this method had been used. So like the think aloud sessions and interviews, the focus group was conducted in Arabic. With the consent of all the participants the session was voice recorded. This was subsequently transcribed and translated so that it could be coded and linked to the initial categories (nodes) identified during the NVivo coding process (see 3.8). However unlike the individual think aloud sessions and interviews the focus group discussion was not member checked. The focus group discussion is presented here using five general headings:

- Participants' experience of concept maps;
- Their use of concept maps as a learning strategy;
- Perceptions about constructing concept maps;
- Participants' experience of using CACM;
- Perceived challenges in using concept maps.

These headings encompass both the initial categories and the research questions.

#### **4.4.1 Participants' experience of concept maps**

In the focus group the participants shared their experiences of concept mapping before coming to New Zealand. It was apparent that they had different experiences of using concept maps as a learning strategy. Most of the participants had been introduced to

concept maps while at intermediate school without being aware that they were concept maps. In the words of Amal:

*We always used to work out a concept map as a post-lesson evaluation ... we used to generally call it a 'summary' not a 'concept map'. We were using the strategy of concept mapping without knowing its name*

Basma was introduced to concept maps as a summary device at secondary school but like Amal, she did not call them concept maps. She had also used MS Word to construct her own very simple concept maps. Duaa` discovered concept maps for herself and was under the impression she was making mind maps:

*I read Tony Buzan's book<sup>4</sup>, who is a specialist in mind mapping .... I liked the idea of using maps to summarise information using shapes and colours ... I did not know there is something called the concept map, as I thought that the concept map was the same as the mind map.*

Reflecting on her mapping experiences Duaa' believed that she had produced concept maps but had thought of them as a type of mind map:

*Although I used to practice it correctly... only when I came to New Zealand and attended training course on the strategy of concept mapping and effective learning, that I realised the great difference between the two types.*

Eman had a similar experience to Duaa' when it came to her use of concept maps and shared the same feeling about concept mapping although she had been introduced to concept mapping much earlier:

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<sup>4</sup> Tony Buzan is the author of a number of popular books on mind mapping some of which have been translated into arabic

*My mother used it [concept maps] to explain to me new ideas and information... she would link concepts to each other ... until I could fully understand them*

Eman continued to use concept maps as a learning strategy throughout her schooling because she found it useful:

*I prefer not only to write, but also to use colours, images and drawings in making these summaries because I like to draw and colour, and that helps me to remember faster.*

However she did not identify what she did as concept mapping until she came to New Zealand:

*I had no idea that strategy was called concept mapping. Since then I used it in all the following educational stages and I used to call it “the organizational structure of the lesson” or “a summary of the lesson”.*

Like Eman, Farah started using concept maps when she was in elementary school. Her mother had noticed that Farah did not study well directly from the text book so she taught her to write the information herself in a simplified arboreal form using different colours. That is how she learnt this method and she is still using it. Farah said;

*It's very necessary to use colours, and I always try to include all the important information in this map in a way that enables me to do without referring back to the main book.*

Farah said that now she is at university, she usually makes concept maps after each lesson and keeps it until the preparatory period for examination. She said she also did this when she was at secondary school, which made her very popular because she used to share these maps with her class mates: “*many of my friends would come to me to use the concept maps I made*”.

At university Carema found sharing her concept maps with classmates helped both them and her. She believed, that:

*Sharing my concept maps with class mates was very useful for us all and it was a motivation to me to continue producing and sharing concept maps. I benefited from their opinions as to whether there were any mistakes or editing required that I was not aware of.*

While Carema had been introduced to the idea of concept maps at the secondary school level as many of her text books used a concept maps at the end of each lesson as a summary, she did not pay any special attention to concept maps as a learning strategy until she came to New Zealand. Here Carema found that

*With the increasing amount of information at university level, I realised the importance of using concept maps to summarise information and organise it in a simplified way.*

Carema was the only participant who had no experience in making concept maps before she came to New Zealand.

Although all the other participants had some experience of constructing concept maps before they came to New Zealand, their understanding of concept mapping was very limited. For example Amal said that before she came to New Zealand:

*I did not realise the importance of writing the type of relation on the arrows between concepts.*

This failure to appreciate the role or importance of the relational links between concepts in a concept map before coming to New Zealand was common among all of the participants.

#### 4.4.2 Using concept maps as a learning strategy

The participants used concept maps in a variety of ways including summarising information, planning for research, preparing for exams, and as a method of note taking during lectures. From the discussion it was clear that while all the participants used concept maps, their use of concept mapping as a learning strategy was diverse with some using it as a formative tool and others as a summative tool.

Carema believed using concept maps in her study saved her a lot of time and helped her to focus more and to organise the large amount of the information she needed to process in her university studies. However, because she was relatively new to using concept maps she used other strategies as well. She said:

*I may tend more to summarise topics in the form of points as I do not have sufficient background on how to use concept mapping in the proper way. I also do not have sufficient skills of extracting the important information or concepts and of finding the relationships between them easily.*

As well as her lack of experience in constructing concept maps Carema speculated that her failure to use concept maps as a learning strategy was due to her individual learning preferences and her subject material:

*My speciality depends on a lot of theories and rules that are difficult to summarise, and this may be the reason why I seldom use concept maps as a learning strategy.*

Eman disagreed with Carema and maintained that on the contrary, concept maps were useful for presenting complex ideas and theories:



*I think that these types of complex subjects are the ones that need the use of concept mapping strategy in order to summarise those theories, rules and regulations and to simplify them.*

Eman considered concept mapping to be a very effective way to summarise and arrange ideas irrespective of subject. She said

*In my point of view, this strategy develops the ability of text analysis and critical thinking when reading any book or any article, as it is very effective in stimulating both of the brain hemispheres to work together at the same time.*

Basma agreed with Carema that it was sometimes difficult to summarise complex ideas but attributed this to different learning styles:

*Some people are more holistic and they only consider general points or the principle headlines of the lesson without paying much attention to the details. Other people ... have a great ability to analyse information and fine details.*

Basma attributed her preference for concept maps to her visual approach as a photographer: *"I do not see words, I only see images"*. She repeated what she had said in her think aloud session that she found reading long texts to be very difficult which is why she preferred concept maps (as pictures) to make her study easier and to help her store information in her memory.

Duaa' agreed that it could become difficult and time consuming to make a concept map with complex concepts. However, she considered the complexity of study material at university level makes the use of concept mapping as a learning strategy a necessity, especially when preparing for the final examinations. She considered that: *"using a concept map is the most successful method to summarise and deal with the complexity of*

*the subject material at this level.*” Although Duaa’ had used concept maps before coming to New Zealand, she did not think that she had used them as an effective learning strategy in her study before now because of her lack of knowledge about them.

Farah said that all her study, whether in research planning, lecture summaries or in preparation for examination, depends on concept mapping. Like Basma, she maintained that it was easier to understand and remember concepts when they were presented in a concept map. Farah said:

*[In a concept map] you are able to make a pictorial reading rather than follow a detailed text; this way surely helps information to be stored in the brain for a longer period of time especially if it includes pictures and colours. For this reason, I fully depend on concept maps in all my study.*

Amal used concept maps for note taking during lectures and to summarise her readings during her course. Amal believed that her use of concept maps helped her to focus on her weaknesses and strengths in her study by identifying what sort of information she needed to focus on. Amal, Duaa’ and Farah were happy with their level of concept map use. However, the other participants said that they considered that their use of concept maps was still at a low level.

#### **4.4.3 Perceptions about constructing concept maps**

Most of the participants admitted to feeling nervous when they started to create a concept map especially if it was part of a class project. Amal said that:

*I face a little difficulty at first when I start making the map because I am not sure of what to include and I am not confident with my English proficiency to write translate my thoughts in the concept map.*

Eman thought that she rode over this feeling with time *“when you start making concept maps, the process of extracting information and concepts and summarising them was difficult, but over a period of time with practice the process becomes much easier.* She said: *“I am excited in the process of making concept maps and I feel pleased when I finish creating it.”* However Eman was worried about the volume of material she needed to summarise and about her retention of ideas if she did not immediately make a concept map. Eman found that producing a collaborative map reduces this worry as well as makes the experience more enjoyable:

*I get worried when I do not make a map at the end of each lesson, as the accumulation of lessons just worries me. When working with groups of other students, the process becomes much easier and enjoyable.*

Basma’s feeling of anxiety was related primarily to her perceived lack of proficiency in English and her unfamiliarity with using pen and paper:

*Initially I got nervous, especially when I could not understand some English expressions, which made it hard to figure out the relationship between the concepts. Using pen and paper added to my frustration as I do not like writing by hand*

The complexity of the topic was also an issue for Basma although she considered this could be overcome more easily when she was able to use a computer:

*After I got to use several electronic programs to create concept maps, it became very easy and enjoyable. If I feel bored, I can always save the file on my computer and return to it at a later time for completion. Also any editing, deletion or addition can be made easily using the computer.*

Basma felt less anxiety in constructing a concept map when she liked and understood the subject: *“I expect I will be enjoying working out this map especially with*

*the subjects I like; there may be some tension in case of a difficult and complicated subject". In contrast, Carema felt that making a concept map was itself proof that she fully understands the information that she is dealing with. She maintained that "this situation makes me feel happy and relieved".*

Farah also saw concept maps as a formative learning tool and reported "*I depend on concept map 100 per cent and I cannot study without using this strategy. My awareness of its importance removes out any feelings of tension towards it*". Duaa` was the only participant to express no anxiety about constructing a concept map even when it involved complex concepts:

*When I create a concept map, I feel like I am living in a world of my own and I am completely cut off from everything around me. I enjoy working out the map and I feel happy after I finish it especially with long and difficult subjects, I usually make a concept map if I face a difficulty in a particular subject in order to analyse it and to try to understand it, which makes me feel relieved later on.*

Duaa` said she preferred to revise from her original concept map as she increased her knowledge and understanding of a subject rather than to construct a new map;

*If I make any alterations to the map, whether it was deletion or addition, I tend to keep the original map after the alteration so that I always remember the mistakes I have made.*

All of the participants, except Carema, admitted that they had difficulty in identifying the relationship between concepts in spite of their previous experience of concept maps before coming to New Zealand. They attributed this first to their difficulty in finding the right terms in English, which is a foreign language to them, and also to their lack of practice in critical analysis. Eman, who used concept maps as an analytic tool in

her work, did not see the problem to be one of analysis but to a lack of practice in correctly constructing concept maps. This led to a discussion of the expectations of the New Zealand education system and the need for Saudi students to develop the critical thinking and self-learning skills to analyse information and to find the relationships between concepts.

#### **4.4.4 Participants' experience of using CACM;**

The use of communication and information technology, especially computers, for study purposes differed among the participants. The type and amount of use depended on the background of the students, their personal learning styles and experience. These differences tended to be reflected in their attitude to CACM. For example, Basma expressed a strong preference for using a computer rather than pen and paper to create concept maps: *"I prefer to use computer. It is faster to create concept maps using the computer and it is easier to edit, delete or add information to the maps before having a final output"*.

Basma also considered that CACM was more useful to create a collaborative concept map. Yet in spite of this, Basma believed that using pen and paper to create concept maps was more helpful for the learning process. It seems information is retained in the memory for a longer time when it is hand written. Basma also saw her dependence on computers have some disadvantages:

*I cannot bear hand writing because I am used to using computer since an early age, and I fully depend on it. I know that this has affected my learning in terms of spelling mistakes in my writing but still using computer is the fastest and the best method according to me.*

Eman agreed with Basma about the advantages of using a computer to produce concept maps, in particular the ability to add different elements and to save concept maps as computer files:

*[A] computer is definitely better to save a created concept map for a longer period of time. In addition, the ability to add pictures, videos and other links to the concept map can make it comprehensive and fun at the same time.*

Although Eman preferred CACM to pen and paper concept mapping it was her practice to use pen and paper to set up and plan an initial map and then transfer this information to the computer. She thought her preference in choosing to use computer-assisted concept mapping in her study was related to her area of study:

*Maybe it is my speciality that controls my choice of using computer to create concept maps. My study depends on analysing art paintings and adding pictures and videos to the concept map is a must, a process which cannot be done except by using the computer.*

Eman also considered that CACM was better suited than pen and paper for collaborative work because it allows other students to take part in creating the map at the same time.

Carema also used Eman's method of making a pen and paper concept map at first, and then transferring the information to the computer, but unlike Eman or Basma did not declare a strong preference for CACM. Carema said she found using a computer to create concept maps useful when producing maps for group projects because a CACM could be accessed from anywhere using her online university account, though she tended to make pen and paper concept maps for her own use.

In contrast Duaa`, Amal and Farah completely disagreed with the idea that using CACM to produce concept maps was better than the traditional pen and paper methods. Amal found it faster to use pen and paper to create concept map. This was partly an issue of language. Amal said:

*The obstacle in my opinion is the unavailability of programs in Arabic language, other than Microsoft Word, to create a concept map. Using MS Word to create concept maps is a time consuming procedure.*

Duaa` believed using pen and paper was easier and more accessible than CACM because it did not need internet access. Farah said that she personally did not like to use CACM because she did not have sufficient computer skills or a fast typing speed. Farah also thought that the idea of inputting a concept map in the computer after creating it using pen and paper is a waste of time. Although she conceded that this was a matter of personal learning style and preference: *“I believe this depends on the nature or method of learning, which varies from one person to another”*. All three conceded that there were advantages to using CACM when others were participating or a more elaborate presentation was required.

#### **4.4.5 Perceived challenges in using concept maps**

The participants identified several challenges to using concept maps as a learning strategy. The most dominant concern was their lack of experience in constructing a concept map correctly followed by their lack of experience with CACM applications. It was clear that when using computer–assisted concept maps, there were some distinct challenges which created obstacles for some of the participants to integrate CACM as a learning strategy for their university study. Even Basma, who preferred using a computer to make concept maps because she found it easier than pen and paper, found access to the internet an on-going problem. She said lack of internet access prevented her from

downloading images and videos she wished to be included in her concept maps when she was working at home. Basma also found that as an Apple Macintosh user, she had reduced access to CACM applications:

*I face two problems in using a computer to create concept maps; [internet access and] ... there is not enough variability of concept mapping programs available that can work with the computer model [Apple Macintosh] that I am using.*

Basma identified the lack of compatible programs as also an issue for other than English language speakers because of the limited availability of non-English language CACM applications.

Duaa` considered herself very motivated to use CACM, and did not believe that there was any problem related to learning how to use CACM because training was available through the internet. However, she also felt that she was restricted in her choice of applications. This was partly because of the costs involved in purchasing CACM software, of the difficulties related to purchasing online and also because of language limitation. Like Basma, Duaa` considered that there is a lack of CACM programs that can be used to generate concept maps in Arabic. She referred specifically to her preferred program, *Inspiration*<sup>TM</sup>. Limited availability of the internet was also an issue for Duaa. Many of the available free CACM programs required internet access to function and the internet was not always available to her. For this reason Duaa` found that using pen and paper was easier than using CACM. Duaa' also believed that pen and paper mapping enabled her to retain information longer.

Farah also saw access to internet based CACM programs as an issue but her real challenge in relation to CACM was her lack of computer skills and experience. Farah



thought that to use CACM effectively it was necessary to have good computer skills:

*“The individual should have high computer skills, which I do not have at this stage.”*

Farah again expressed her belief that she remembered concepts better when she used pen and paper to construct concept maps *“I only remember whatever is written by my hands”*.

Eman also identified computer skills as important although she thought that the motivation to use CACM would encourage an individual to develop their computer skills. More important to her was access to software such as *Inspiration*<sup>TM</sup> and having a suitable place to use the computer. She saw a need for a CACM program that did not require internet access so that they could be used at any time and from anywhere. Eman said that interrupted internet connections while working on a concept map could lead to its loss thus wasting time working on it again.

Neither Amal nor Carema considered access to the internet or the availability of CACM programs to be a problem in New Zealand. However Amal was concerned about the availability of appropriate CACM software in the future when she returned to Saudi Arabia: *“I do not currently need those programs in Arabic ... but certainly I will need them later on”*. For Amal the challenge of CACM was linked to what she saw as the inherent distractions of computer use: *“when working on the map I can be distracted by browsing; the email and other social communication such as contacting my family in Saudi Arabia via Skype ... much time is wasted and there is a loss of focus of the main objective.”* She thought a preference for CACM or pen and paper depended on the learner’s personal learning style. Carema concluded this discussion by saying:

*To me, I do not have any obstacles in using the internet and the computer to create the concept map. I prefer using [the] computer to establish the concept maps because it is faster, easier to use and more organised.*

More serious than any challenges related to internet access and CACM use was the challenge of correctly constructing a concept map. All the participants believed that it was important to know how to construct a concept map correctly. They all said that they did not know how a concept map should be constructed until they came to New Zealand, even when they had used concept maps as a learning strategy in Saudi Arabia. During the focus group activity of making a collaborative concept map it became apparent that, even with an understanding of how a concept map should be constructed, most of the participants tended to focus on identifying concepts and their hierarchical position but not their relationship to each other.

While constructing the collaborative concept map, it was Carema, who had the least experience in concept mapping, who paid the most attention to all aspects of the concept map. She treated identifying the relationship between concepts as importantly as identifying the concepts and would remind other participants that they needed to put in the relationship between concepts. Her thoroughness was attributed to the fact that she had learnt to make concept maps correctly in a workshop that also introduced her to CACM after she came to New Zealand. Of the other participants, Duaa` who had also attended the same workshop as Carema, appeared to be more aware of the importance of identifying the relationship between concepts.

All the participants believed that their concept mapping skills had improved since coming to New Zealand, either because of working with other students on collaborative concept maps or because they had received some specific instructions. They all believed that training on how to construct concept maps correctly should be incorporated into their curriculum and that the university has a responsibility to discuss and follow-up this issue. In our discussion emphasis was placed on the need for better training and guidance for

international students, especially Saudi students, to develop the critical thinking and self-learning skills they needed for their studies at university in New Zealand. It appears that New Zealand students received such training prior to attending university. The participants did not feel that they were lacking in ability, only in practice.

#### **4.5 Emerging themes**

The analysis of the think aloud sessions, subsequent interviews and the focus group discussion show some clear recurring themes. It is clear that:

- The participants found concept mapping to be a useful method for managing and understanding complex topics. Concept maps were considered to be a useful teaching and learning tool.
- The participants considered that explicit training was needed to know how to construct and understand concept maps successfully.
- Lack of English language proficiency and critical analysis skills were seen as limiting factors in the participants' ability to construct concept maps.
- Peer support and collaborative concept mapping helped participants both to increase participants' understanding of their subject areas and how to understand and how to construct concept maps.
- Lack of training in CACM and the lack of availability of CACM applications in languages other than English were seen by participant as barriers to CACM use.

None of the participants had any doubts that making concept maps helped them in their studies. All of the participants believed that training is needed to know how to construct a concept map correctly. All of the participants considered lack of training to be a major barrier to the effective use of concept maps as a learning strategy. None of the

participants considered that they had this training before they came to New Zealand. Half of the participants also considered the lack of language skills to be a barrier.

Most of the participants found that working on collaborative concept maps and peer support had helped them to develop their understanding of concept maps and their concept mapping skills. All participants believed that they needed more training in the use of CACM before they could effectively use CACM as a learning strategy. All of the participants thought that computer assisted concept maps (CACM) had advantages to traditional pen and paper concept maps, specifically their versatility and ability to include multimedia content. However, several participants expressed the belief that making a pen and paper concept map helped them to retain information longer than a computer generated concept map. These themes are discussed in greater detail in CHAPTER 5.

## CHAPTER 5 DISCUSSION

*Starting to create an interpretation is like trying to start a jigsaw puzzle that has a million indeterminate pieces. To make this puzzle more confusing, there is no unique solution. That is, one piece may fit with many other pieces*

Feldman (1995)

The purpose of this study was to learn more about how modern educational learning strategies are understood and practiced by international students, specifically how concept maps are understood and used by a group of Saudi women students. This chapter discusses the themes which emerged from a multiple case study of six Saudi women students who used concept maps to support their learning at a university in New Zealand. It looks at how their understanding of concept mapping is shaped by their previous educational experiences and how their use of concept maps as an effective learning strategy is limited by their experience, knowledge and language. Three research questions guided the investigation process:

- 1- How do Saudi women students understand and use concept maps?
- 2- How do they consider concept maps to influence their learning?
- 3- What factors do they see enhance or hinder their use of concept maps, including computer-assisted concept mapping (CACM) in their university study?

### **5.1 Concept map use and understanding**

Concept maps are one of a number of forms of graphic representation used in educational contexts to convey information. The case study participants used concept maps in a variety of different ways: to summarise and organise information, to take notes and plan assignments, and to revise and prepare for examinations. All of the participants

believed that concept maps helped them to increase their understanding of complex topics. This supports research by Novak and Gowin (1984); Rueda et al. 2009 and Moreira (2011) which indicates that concept maps can be used to facilitate meaningful learning. In addition to the benefits of using concept maps to organise information, the participants believed that concept mapping contributed to the development of their critical thinking and self-learning skills. A number of studies support the idea that the act of concept mapping encourages the development of creative and critical thinking skills (Cicognani, 2000; Kostovich et al., 2007; Novak & Canas, 2007). However, the findings of this study indicate that while concept mapping may support the development of critical thinking it does not by itself teach critical thinking. This is significant when it is recognised that the development of critical thinking skills may not be part of the learners' educational background.

Most of the participants had some experience of concept maps in Saudi Arabia although they did not always call them concept maps and confused with other forms of mapping such as mind maps. Furthermore it was clear from the think aloud sessions that the participants understanding of concept maps were often incomplete, particularly with respect to the importance of identifying the relationship between concepts. Confusion about the nature of concept maps and how they can be used to support learning is not unique to the Saudi students in this study. As Eppler (2006) demonstrates (see 2.1.1) mind maps and concept maps share some features. Nor is a limited understanding of concept mapping restricted to the participants of this study, Novak (2010) himself recognizes that confusion exists about what constitutes a concept map and how it should be constructed even among those who promote concept maps as a learning strategy. Åhlberg (2004) argues that only maps based on Novak's technique whereby "meaningful propositions may be produced out of linked concepts" can properly be called concept

mapping (p. 189). The findings from the think aloud sessions suggest that the participants' limited experience and understanding of concept mapping technique in Saudi Arabia had a direct influence on their understanding of concept maps as well as their ability to construct concept maps effectively. This can be highlighted by comparing the case of Carema, who only learnt to use concept maps as a learning strategy after attending a workshop in New Zealand on using digital concept maps for effective learning, and Duaa' who attended the same workshop but had previous mapping experience in Saudi Arabia. Of all the participants, Carema had the least difficulty in identifying the key relationship between concepts when constructing concept maps. This can be attributed to the explicit instruction Carema received which integrated critical thinking skills with the concept mapping process. In contrast Duaa', who had experience of concept mapping in Saudi Arabia, only identified relationships between concepts when prompted, demonstrating a lack of practice in applying critical thinking to the construction of concept maps. This suggests that the participants' previous concept mapping experiences in Saudi Arabia were not linked to critical thinking.

#### **5.1.1 Critical thinking 'key'**

All the participants believed that their concept mapping skills had improved since coming to New Zealand and linked this to their becoming more critical thinkers as a result of New Zealand teaching practices. However, they considered that, unlike New Zealand students who were encouraged to develop critical thinking and self-directed learning skills at an early age, Saudi students were disadvantaged because they lacked experience and practice in both these areas. This can be linked directly to their previous educational experience in Saudi Arabia where, even when the importance of critical thinking and self-directed learning is recognised, more emphasis is placed on memorization of material and the demonstration of established knowledge.

While critical thinking is encouraged in the New Zealand curriculum (Wright, 2010) and is one of the key competencies required by university level studies, the education environments from which many international students come do not always encourage them to take a critical approach to the information they are presented. Nor do those environments necessarily encourage them to develop the critical thinking skills they need to generate new ideas, as indicated by the observation of Al-Rashdan (2009) (see 1.3.3) that at most Arab universities students are not encouraged to take a critical, analytical approach.

All of the participants considered that critical thinking and self-learning skills were essential for them to meet the expectations of the New Zealand education system and achieve successful learning outcomes. All of the participants argued for more support to develop the critical thinking and self-learning skills they needed to succeed at university in New Zealand. With respect to the use of concept maps as a teaching and learning strategy in their university studies, in the focus group discussion, the participants argued for more explicit explanation of concept maps and how to construct them. While there was no overt criticism of the university curriculum or their New Zealand lecturers, the participants stressed their need for more assistance to understand and use concept maps, both for their personal use as a learning strategy and in order to complete group projects which required creating a concept map. This suggests that ‘reading’ and ‘making’ concept maps do not receive enough attention when used at university, possibly because it is assumed that students already possess the skills needed to concept map effectively. From their comments it was clear that all the participants were frustrated to some extent by the assumption that they already had the critical thinking skills they needed to create and use concept maps effectively.



### **5.1.2 Computer literacy ‘a factor’**

Computer literacy was a factor in how comfortable and willing participants were to use computer assisted concept mapping (CACM) but acceptance of new technology was not an issue. Student acceptance of new technology is recognised as one of the factors which determines whether that technology will achieve its objectives (Hsu & Chang, 2009). In this study there was little evidence that the participants had any problem with the idea of using computers, however the limited computer experience of some of the participants and a general lack of specific training in using CACM were considered by participants to be barriers to their using CACM effectively to support their learning. Some participants cited the limited availability of CACM software and limited access to the internet as factors in their failure to use CACM, but neither factor obviously affected their understanding or interest in CACM as a method of concept mapping. The language of the available CACM applications was a greater factor than the participants’ level of computer literacy.

### **5.1.3 A preference for pen and paper**

Surprisingly in spite of recognising the value of CACM, most of the participants believed that traditional pen and paper concept mapping was superior to CACM when using concept maps as a personal learning strategy, particularly for revision purposes. The participants expressed a belief that using pen and paper aided their memory retention. While the benefits of handwriting are to some extent supported by research (Longcamp et al., 2006; The University of Stavanger, 2011) and there is evidence which suggests that there is a sensorimotor component to memory (Mangen & Velay, 2010) this belief is not supported by the comparative research on traditional pen and paper concept mapping and CACM (Liu, Chiang, Chou, & Chen, 2010; Royer & Royer, 2004) which suggests that

concept mapping using CACM applications has a positive effect on motivation and achievement.

#### **5.1.4 Language ‘a barrier and a gateway’**

English language proficiency emerged as both a barrier and a gateway for the participants. Some of the participants expressed frustration about their language proficiency which they felt did not allow them to analyse adequately the complex concepts they were studying or to express their understandings in English. For this reason they saw language as a barrier to their ability to create concept maps. However it is likely, based on the experience of using concept maps in ESOL teaching that the act of concept mapping actually helped their English reading comprehension (Khiabani, & Nafissi, 2010; Liu, 2011). Interestingly two of the participants used concept maps to improve their understanding of English grammar and practice their writing skills.

English language proficiency was linked by the participants to their ability to benefit from various modern information and communication technologies and applications, including but not limited to CACM. For example, learning to use the internet to search for information and supporting resource material. The lack of availability of CACM applications in Arabic was considered a limiting factor by some of the participants with respect to their motivation to use CACM. It was also seen as a limitation on their future use of CACM when they returned to Saudi Arabia. This deficiency was keenly felt by participants considering careers as teachers on their return to Saudi Arabia. In the focus group discussion it was claimed that not only did improved English language proficiency give them access to a wider variety of sources than they were used to in Saudi Arabia, being forced to express themselves in a new language opened up new and unfamiliar ways of thinking and in this way contributed to the

development of their critical thinking skills. This is supported by literature which suggests that language learners show greater cognitive flexibility, better problem solving and higher order thinking skills (Hakuta, 1986).

## **5.2 Learning to learn**

Constructivist learning is based on the idea that new knowledge is built on existing understandings. What then occurs if the existing understandings are limited or flawed? As pointed out in Chapter 1, a strong link can be made between culture and learning both “how people prefer to learn and how they tend to process information” (Samovar et al., 2009, p. 338). All of the participants showed that their Saudi educational background influenced their learning in New Zealand to some extent. The participants considered that it was difficult for them to learn to use their own judgement when analysing information and identifying relationships between concepts. This supports Al-Rashdan (2009) observations regarding students’ reluctance to voice their opinion in Arab educational contexts but also the importance of teaching international students facilitating strategies such as concept maps. Moreira (2011) suggests the use of facilitating strategies such as concept maps together with the mediating action of the teachers are crucial factors in helping learners move progressively from a culture of rote learning to a culture of critical thinking. The experience of this study’s participants with respect to their use and understanding of concept maps supports the importance of some form of mediating action when it comes to the development of critical thinking skills. This mediating action does not need to be teacher directed as the participants’ experience of collaborative concept mapping indicates.

### **5.2.1 Collaborative mapping and collaborative learning**

All of the participants agreed that collaborative concept mapping helped them to learn how to use and understand concept maps at the same time as it helped them to understand their topic. This relates directly to Vygotsky's theory that learners benefit from their interactions with more capable learners. In addition to increasing their understanding of concept maps, the participants indicated that collaborative mapping also improved their critical thinking skills. This finding agrees with the work of (Gokhale, 1995) which states that that collaborative learning contributes to critical thinking. Collaborative activities provide international students with alternative models of behaviour and this is important for students who have only experienced rote learning. Taking part in collaborate activities allows international students to practice their own critical thinking skills in a low risk environment. An additional benefit of collaborate learning for international student is the opportunity to practice and expand their vocabularies and to engage with their classmates in a meaningful way. This also contributes to their sense of belonging and supports their social adjustment in a foreign country.

## **5.3 Summary**

Three principle themes emerged from this study of how a group of Saudi women students used concept maps, a modern educational learning strategy, in their university studies in New Zealand. First, their limited experience of concept maps in Saudi Arabia influenced their understanding of concept maps and concept mapping. Second, their lack of practice in critical thinking affected their ability to concept map effectively. Third all of the participants found that taking part in collaborate activities helped them to gain a better understanding of concept mapping and at the same time develop skills they needed to succeed in the New Zealand educational context.

## CHAPTER 6 CONCLUSION

*Were all instructors to realize that the quality of mental process, not the production of correct answers, is the measure of educative growth something hardly less than a revolution in teaching would be worked.*

John Dewey (1859 – 1952)

Through a multiple case study of six Saudi women students, this research looked at how a group of international students understand and use concept maps: how they consider concept maps to influence their learning and what factors they see enhance or hinder their use of concept maps, including computer-assisted concept mapping (CACM), in their university studies in New Zealand. This research found that six case study participants used concept maps in a variety of ways to support their learning; as a tool to summarise and organise information in order to prepare for examinations. Concept maps were also used to plan assignments, review learning and as a form of presentation of material in group projects. All of the participants believed that concept mapping contributed positively to their learning and increased their understanding of complex topics. In addition they believed that concept mapping contributed to the development of their creative and critical thinking skills. These findings are consistent with existing research and literature about concept mapping which argues that concept mapping is a flexible and learning strategy (Laight, 2004) which assists in the development of creative and critical thinking skills (Novak & Cañas, 2007). However it was apparent that the participants' limited experience of concept maps in Saudi Arabia affected their understanding of concept mapping principles and produced some confusion about the nature of concept maps. Further their lack of practice in critical thinking before coming to New Zealand affected their ability to construct concept maps effectively.

## **6.1 Implications of the findings**

The findings of this study indicate that concept mapping is a useful tool for learning and can be used effectively by international students to support their learning in New Zealand. But it is clear from the experiences of the participants in the study that both technical and critical thinking skills are needed to create and use concept maps effectively. This research found that while concept mapping supports the development of critical and creative thinking skills, concept mapping does not by itself teach these skills. All of the participants believed that they needed help to develop critical thinking skills and assistance to learn how to concept map effectively. The most difficult thing for them to learn was to use their own judgement when analysing information and identifying relationships between concepts. This study suggests that it may initially be difficult for learners from educational environments which place more emphasis on the memorisation of material and the demonstration of established knowledge to engage in the type of creative and critical thinking need to produce concept maps, even when creative and critical thinking is valued. It should not be assumed that international students will have these skills before they commence their studies in New Zealand. This suggests that more attention needs to be paid to ensuring international students learn these skills early prior to the beginning their studies. More explicit instruction in learning strategies such as concept maps and critical thinking would be beneficial, and this research suggests that collaborative learning opportunities provides a rich environment for international students to enhance their critical thinking skills and improve their understanding of learning strategies such as concept mapping, as well as providing learners to develop their English language skills and confidence in a relatively low risk manner.

### **6.1.1 Computer assisted concept maps (CACM)**

The findings of this study show that although it is important to recognise that varying levels of computer literacy exist among international students from developing countries, there was no evidence that computer literacy alone was a significant barrier to the use or acceptance of CACM. More significant was a lack of experience in using CACM applications and the lack of availability of CACM applications in the participants' native language. The findings suggest that it is likely that the use of CACM would increase should CACM applications be available in languages other than English. The availability of CACM applications for smart-phones, I-pads and other mobile personal devices may also increase the use of CACM simply because this will improve accessibility. While the belief expressed by most of the participants that traditional pen and paper concept mapping was superior to CACM when concept maps were used as a personal learning strategy, particularly for revision purposes has some support from research (Longcamp et al., 2006; The University of Stavanger, 2011) it may also be related to the participants' lack of familiarity and practice with CACM. Additional research would be needed to establish if traditional pen and paper concept mapping is superior to CACM with respect to memory retention.

## **6.2 Limitations of the study**

This study has several limitations. As a project undertaken as a student work in partial fulfilment of the requirements for the Degree of Master of Education, this study is necessarily limited in scope and size. The sample is based on the experiences of six Saudi women at one university and as a result the findings may not necessarily be generalised to a broader population or other universities. It looks only at the use and understanding of one teaching and learning strategy; concept maps, and not any of the many other modern teaching and learning strategies used in New Zealand today, such as self-assessment, goal

setting and computer assisted learning. However, as Merriam (2009) states, every situation is theoretically an example of something else, therefore what we learn from this multiple case study may be generalised to similar situations regarding the use of western education strategies by international students from countries with traditional education practices and prove useful to educators wishing to understand more about the experiences and needs of international students.

### **6.3 Directions for future research**

This study identifies several directions for future research. Further investigation of the benefits of concept mapping as a learning strategy for international students, particularly the benefits for students studying in a second language would be useful. In respect to the needs of Saudi students in New Zealand, it would be useful to investigate further the factors which hinder and enhance the self-learning abilities of Saudi students so they may better meet the expectations and demands of the New Zealand education system. In relation to the use of concept maps as a teaching and learning strategy, experimental research to discover out the impact of more explicit instruction in the use and construction of CM/CACM on the student understanding and use of CM/CACM would be beneficial. More research into the role of critical and creative thinking skills in the construction of concept maps would also be desirable. With respect to CACM, it may also be useful to discover if the availability of CACM applications for smart-phones, I-pads and other mobile personal devices and in languages other than English increases the use of CACM simply because it improves accessibility. As already noted additional research would be needed to establish if traditional pen and paper concept mapping is superior to CACM with respect to memory retention.



It can be argued that if educators teach their students basic skills and information, but do not ensure that these students are also able to analyse and evaluate what they are taught; educators are leaving their students with only half the skills they need to succeed. This research suggests that Saudi women at university in New Zealand need greater support to develop their own academic voice and to become confident in their ability to study independently and think critically and creatively.

# Appendices

## Appendix 1: Research Information Sheet

VICTORIA UNIVERSITY OF WELLINGTON

*Te Whare Wananga o te Upoko o te Ika a Maui*



### Research on learning with concept maps in higher education

#### INFORMATION SHEET FOR PARTICIPANTS

**Researcher: Reem Abu Askar**

I am a Masters of Education student at Victoria University of Wellington. As part of this degree I am undertaking a research project looking at learning with concept maps in higher education.

#### **Purpose of the research**

This research aims to explore and describe:

- 1- Saudi women students' views on 'concept mapping' in their learning process
- 2- Any beliefs they hold about concept mapping and its relationship to learning
- 3- What learning if any occurs as students use concept mapping (CM)
- 4- Any factors that enhance or hinder the use of Computer-Assisted Concept Maps (CACM) in their learning.

#### **Invitation**

If you are a Saudi female undergraduate student and you use or have recently used concept mapping (either paper-pen or computer-assisted) in your learning and you are interested to be part of this study, you can take part in this study. If you would like to accept this invitation to find out more about the research, and possibly to participate in the research please complete the expression of interest form and send it to me. I hope that your experiences will help in future decisions about education and development.

#### **What being a participant involves**

If you meet the selection criteria and agree to participate in this research project you will be asked to take part in two sessions. The first session is a think aloud activity while you develop a concept map using pen and paper OR CACM (choosing whatever method you feel most comfortable to use) followed by an interview with the researcher in which you

will be asked about your beliefs and experiences. The second session is a focus group discussion with five other Saudi women students and the researcher. The focus group will discuss participants' experience of concept mapping. All sessions will be voice recorded but full confidentiality will be maintained.

### **Your rights**

Participation is voluntary. I will be happy if you want to volunteer to become one of the participants in this research but you do not have to take part in this research if you do not want to. If you accept my invitation to participate you have the following rights:

- To withdraw from the study up to a week after the focus group session.
- To refuse to answer any particular question in the interviews.
- To ask any questions about the study at any time.
- To select the time and place of the think aloud and interview session.
- To be provided with transcripts and translation of your interviews.
- To be sure that confidentiality will be maintained and that your identity will be protected.
- To be given access to the summary and findings of the research when it is finished.

### **The process**

All the activities will be conducted in a convenient and informal environment at the University Student Union building room 217. Refreshments will be provided. The combined think aloud and interview session will be conducted for 60-90 minutes starting during October. In the think aloud sessions I will sit with you while you develop a concept map using pen and paper OR computer assisted concept map (whichever you are more comfortable with) and through the use of prompts find out the participant's thinking and learning as a result of using concept mapping strategy.

Following completion of the participant's concept map, I will carry out a semi-structured interview with you to explore in greater detail your views and experience of concept mapping using a combination of closed and open-ended questions. A focus group session with all six research participants will be held at the end of October 2012. In this session you and the other research participants will collaboratively create a concept map. The content of the collaborative CM will be used as data to provide an insight into Saudi female students' views of Saudi women and education. Participants will not be asked to think aloud during the creation of the concept map but on completion of the map they will be asked for their opinions about concept mapping and its impact on learning. These opinions will be noted by the researcher but not attributed to individual participants. The

focus group session will also be held at VUW SU 217 and will be conducted for 60-90 minutes. To facilitate communication all sessions will be conducted in Arabic to allow the participants to express their views more confidently and to respond more accurately to the focused questions. The recorded material will then be transcribed to an ‘intelligent verbatim’ standard and translated into English by myself. Once the material has been translated it will be made available to each participant to check the English version for accuracy.

### **How the results will be used**

The data will be collated and analysed then included in a Master’s thesis that will be available through Victoria University of Wellington. The result will be shared with the education and teaching community through journal articles and conference presentations. If you request it you will be sent a summary of these results.

### **Privacy and confidentiality**

- Your identity will remain confidential. Any aspect that may identify you will be changed in the thesis and any presentations.
- Participants in the focus group will be asked to respect each other’s privacy and confidentiality.
- All the written material will be kept in a locked file and electronic information will be stored in a password-protected file I will keep your information in a locked file.
- I will audio-tape the interviews and focus group and transcribe them myself.
- The information will only be seen by me, and my supervisor.
- All notes and raw data will be destroyed five years after the thesis is completed.

### **More information**

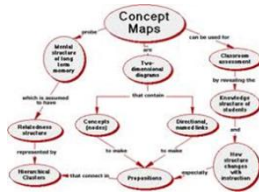
If you have any questions or want to know more about the research you may contact the researcher or her supervisor.

<p>Researcher: <b>Reem Abu Askar</b>  Victoria University of Wellington  School of Education policy and Implementation.  <a href="mailto:r.m.askar@hotmail.com">r.m.askar@hotmail.com</a>  Ph; 04 463 5233 Ext 8954  Mobile: 021641934</p>	<p>Supervisor: <b>Dr. Louise Starkey</b>  Associate Dean Primary &amp; Secondary  School of Education Policy and Implementation  Victoria University of Wellington  <a href="mailto:Louise.Starkey@vuw.ac.nz">Louise.Starkey@vuw.ac.nz</a>  Ph; 04 463 9768</p>
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This research has been assessed and approved by Victoria University Faculty of Education Ethics.

**Thank you for taking the time to read this letter and for your help.**

## Appendix 2: Invitation



I am a Masters of Education student at Victoria University of Wellington.



I am inviting you to take part in this research as a user of concept mapping in your studies in higher education.



As part of this degree I am undertaking a research project looking at learning with concept maps in higher education.



If you agree to participate in this research project.. you will be asked to take part in two sessions:

If you are : Saudi Female Students, studying in undergraduate level in Wellington, and you are using concept maps in your learning, you can take part..

Think aloud activity

and

Interview session



If you would like to accept this invitation please complete the expression of interest form and send it to me



I will choose six participants to take part in this study

Focus group discussion with other Saudi women students and with me..

All sessions will be conducted in Arabic

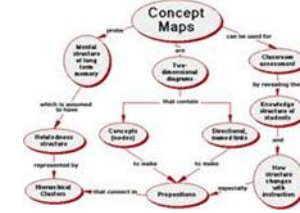
Full confidentiality will be maintained

Researcher : Reem Abu Askar



# مرحباً

أنا طالبة دراسات عليا بجامعة فيكتوريا بويلنغتون



هذه المرحلة , أقوم بتقديم أطروحة , التي تركز  
لم باستخدام الخرائط المفاهيمية في المرحل الجامعية..



أدعوك للمشاركة في هذا البحث كمستخدمة لاستراتيجية الخرائط  
المفاهيمية خلال دراستك الجامعية .



سيطلب منك الانضمام لمرحلتين

التفكير بصوت عال

المقابلة الشخصية الفردية

إضافة إلى



خصوصيتك  
الكاملة  
ستكون  
محفوظة

11



المناقشة الجماعية مع طالبات سعوديات أخريات ومع

كل اللقاءات ستكون باللغة العربية

الباحثة : ريم أبو عسكر



إذا كنت ترغبين في قبول دعوتي فأرجو منك تعبئة نموذج  
الرغبة في المشاركة في البحث وإرساله

6 ستة مشاركات  
سيتم اختيارهم لهذه الدراسة



## Expression of interest

Dear Reem,

I am (your name).....and I have  
read the research information sheet carefully and I am very interested in your project. I would  
like to talk about it. We can arrange a time to meet and discuss.

You can contact me at (email)

.....

Or ..... (mobile).

My preferred time/day

.....

.....

.....

.....

Yours sincerely

### **Appendix 3: Data Collection Method Forms**

## **Think aloud prompts**

### **Possible prompts for the think aloud :**

Can you talk to me through what you are doing?

Why did you do this/that?

Do you think you would have thought of this without using a concept map?

What have you learnt from the concept map?

Do you think doing concept mapping can enhance your learning? Why?

How do you think concept mapping helps you to learn?

Do you find the use of computer-assisted concept mapping helpful comparing to the traditional one?

What sort of things do you think make it easier/ more difficult to use computer when you establish your concept map?



## Interview schedule

Participant information:

Participant code:	Age:
-------------------	------

### **Q1. Tell me about your past experience of using concept mapping**

What do you know about concept mapping?

When did you first learn about concept mapping?

What do you like about concept mapping?

What don't you like about concept mapping?

### **Q2. Tell me about your present experience of using concept mapping**

How often do you use concept mapping in your study?

What do you use it for?

Why do you use it?

What is your opinion on whether using concept mapping is beneficial or not to your study in higher education?

### **Q3. Tell me about your experience of using computer-assisted concept mapping (CACM) in your study?**

Do you currently use CACM in your study?

Do you think computer assisted concept mapping has had an impact on your learning?

What kinds of software are available for you to use in the university?

What barriers have you encountered in trying to use CACM in your study?

### **Q4. Are there any factors that enable or hinder the use of either pen and paper OR CACM in your study?**

Do you think there are any cultural influences on the use of concept mapping?

### **Q5. What do you think can help to improve the way you learn with computer-assisted concept mapping in higher education?**

Would you like to add anything else?



## Focus Group Protocol

### On learning with computer-assisted concept mapping in higher education

#### Welcome

Thanks for agreeing to be part of this focus group. I appreciate your willingness to participate

#### Purpose of the focus group

The reason we are having this focus group is to find out what you think as Saudi female students about using concept mapping, both paper and pen or computer assisted concept mapping within university level. How you use concept mapping in your study, what you think about it and why. In addition, to what factors you think enhance or hinder the use of computer- assisted concept mapping in university study. I need your input and want you to share your honest and open thoughts.

#### Ground rules

- 1. I will be voice recording the group:** I want to capture everything you have to say but I will not identify anyone by name in the final report. You will remain anonymous.
- 2. I want you to do the talking:** I would like everyone to participate. I may call on you if I haven't heard from you in a while.
- 3. There are no right or wrong answers:** every person's experiences and opinions are important. Speak up whether agree or disagree. I want to hear a wide range of opinions.
- 4. What is said in the room stays here:** I want everyone to feel comfortable sharing their opinion. For this reason I ask you to respect the privacy of each other and not to name other participants or what they may say in discussion.

#### Focus Group activity

You have all taken part in a think aloud exercise before we discuss the role of concept mapping in learning, and in particular computer assisted concept mapping, I would like us to create together a concept map on:

**“Saudi women and education in the 21st century”**

VICTORIA UNIVERSITY OF WELLINGTON  
*Te Whare Wananga o te Upoko o te Ika a Maui*



Focus Group Confirmation letter

Dear, .....

Thank you for agreeing to participate in this focus group. The focus group session will be conducted for 60-90 minutes. The date, time and place are listed below.

As discussed, you will be in a focus group with five other Saudi female students at university level. You will together create a computer assisted concept map on the topic of "Saudi women and education in the 21st century" and then discuss concept maps.

The content of the collaborative CM will be used as data to provide an insight into Saudi female students' views of Saudi women and education. I am very interested in hearing your opinions about using concept mapping (either paper and pen or computer- assisted concept mapping) during your study at university and your views about concept maps in general. This discussion will be voice recorded but in any published material your identity will be kept anonymous. You are asked to respect the privacy and confidentiality of the other participants and keep their opinions and identities confidential.

Date: Saturday, October 27<sup>th</sup>, 2012

Time: 6:00 pm to 8:00 pm

Place: Student Union Building room 217. Victoria University of Wellington, Kelburn.

Refreshments will be provided. Please look for signs once you arrive directing you to the room where the focus group will be held.

If you have any question or need directions to the focus group or will not be able to attend for any reason please call Reem Abu Askar at 0211641934. Otherwise I look forward to seeing you.

Sincerely,

Reem Abu Askar

## **Focus Group Questions**

### **Engagement questions (to be asked before the collaborative concept map):**

When did you first learn about concept mapping?

How often do you use concept mapping? Could you give me an estimate of the number of the number of times you have used concept mapping

What do you use concept maps for? Why you use it?

Do you know of any other ways of using concept maps?

How do you feel when you start your own concept map?

Do you find concept maps helpful to your learning? Why / why not?

### **Exploration questions (to be asked after the collaborative concept map):**

Do you think there are any advantages to using computer assisted concept mapping software?

What, if any impact has the use of computer assisted concept mapping on your learning?

What kinds of concept mapping software are available for you to use in the university?

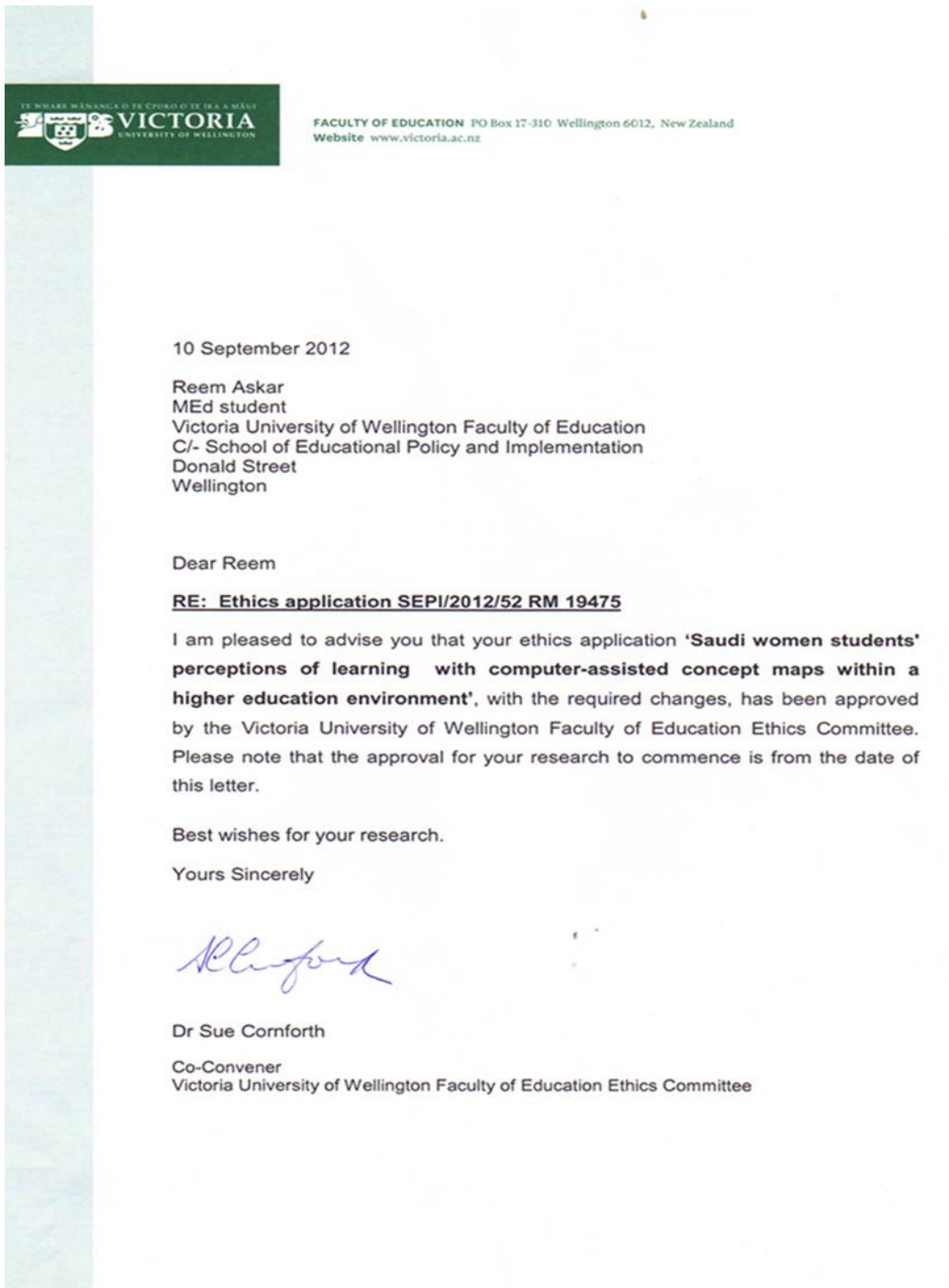
Have you encountered any barriers in trying to use computer- assisted concept mapping in your study? For example, getting the technology training you want or need? Getting access?

What do you prefer to use – pen and paper or a computer program?

### **Exit question:**

Is there anything else would you like to say about why you do or you don't use or like about using concept mapping in university study?

## Appendix 4: Ethical Forms





**Research on learning with concept maps in higher education**

**PARTICIPANT CONSENT FORM**

**Please tick if you agree:**

- ☐ I understand the purpose of this research and what I am being asked to do.
- ☐ I have had an opportunity to ask questions and have them answered to my satisfaction.
- ☐ I agree to take part in an interview and think aloud session and a focus group for this research project.
- ☐ I understand that my identity will remain confidential.
- ☐ I understand that I can refuse to answer any particular question in the interviews.
- ☐ I understand that I may withdraw myself or any information I have provided from this project before data collection and analysis is complete without having to give reasons or without penalty of any sort.
- ☐ I understand that data I provide will not be used for any other purpose than those outlined in the information sheet or released to others without my written consent. The published results will not use my name or identify me in any way.
- ☐ I understand that as a participant in a focus group, I need to respect the other participant's privacy and confidentiality.
- ☐ I agree to have all sessions recorded, and I understand that all recordings and all other information will be destroyed after a year.
- ☐ I understand that I will have an opportunity to check a transcripts of my think aloud session, interview and a summary of the focus group discussion before publication.
- ☐ I would like to receive a summary of the results of this research when it is completed.
- ☐ I have not been pressured by anyone to take part in this research and I freely give my informed consent.

**Name of Participant (Printed):** .....**Signature:** ..... **Date:** / /2012

## Appendix 5: Example of Coding Process Using Nvivo

The screenshot shows the NVivo interface with the 'Nodes' list on the left. The main window displays the 'Concept map in higher education' node, which has 7 references. The text content of this node is visible in the right pane.

Name	Sources	References	Created On	Created By	Modified On	Modified By
Beliefs about CACM	13	13	22/01/2013 12:44 p.m.	RA	23/01/2013 9:39 a.m.	RA
Challenges in CACM	13	13	22/01/2013 12:44 p.m.	RA	23/01/2013 9:39 a.m.	RA
Concept map in higher education	7	12	22/01/2013 12:43 p.m.	RA	23/01/2013 9:39 a.m.	RA
Cultural effect	6	6	22/01/2013 1:23 p.m.	RA	22/01/2013 1:33 p.m.	RA

Reference 1 - 25.11% Coverage

Concept maps can be used to facilitate meaningful learning in a number of ways. They can be used to display students' prior knowledge about a given topic, or they can be used to summarize what has been learned. Concept maps are often used for note taking or as a study aid. Concept maps can also be used as a curriculum development, planning tool, and teaching tool. It can also be used as assessment tools in teaching practice, aiming for instance at monitoring the learning process. Moon, Hoffman, Novak and Cañas (2011) argue that concept mapping is most beneficial when it is integrated into the full educational experience.

The screenshot shows the NVivo interface with the 'Think Aloud' node selected. The main window displays the text content of this node, which includes a list of barriers encountered in using CACM.

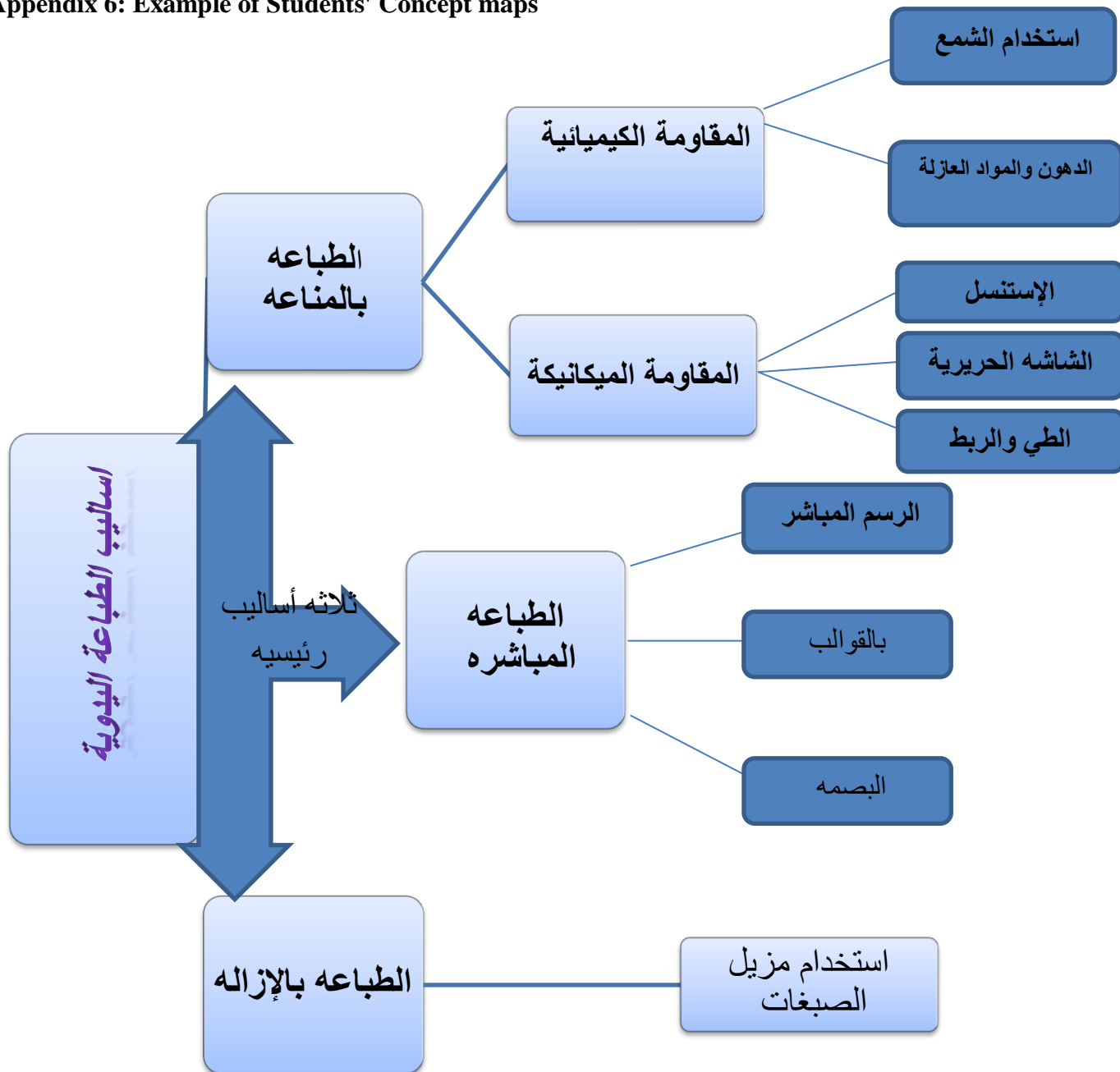
Name	Nodes	References	Created On	Created By	Modified On	Modified By
Batool ( Think Aloud)	3	3	21/01/2013 12:01 p.m.	RA	22/01/2013 1:38 p.m.	RA
Doha ( Think Aloud)	3	3	21/01/2013 12:02 p.m.	RA	22/01/2013 1:37 p.m.	RA
Fatimah ( Think Aloud)	3	3	21/01/2013 12:02 p.m.	RA	22/01/2013 1:37 p.m.	RA
Linda ( Think Aloud)	3	3	21/01/2013 12:02 p.m.	RA	22/01/2013 1:36 p.m.	RA

N (12): What barriers have you encountered in trying to use CACM in your study?

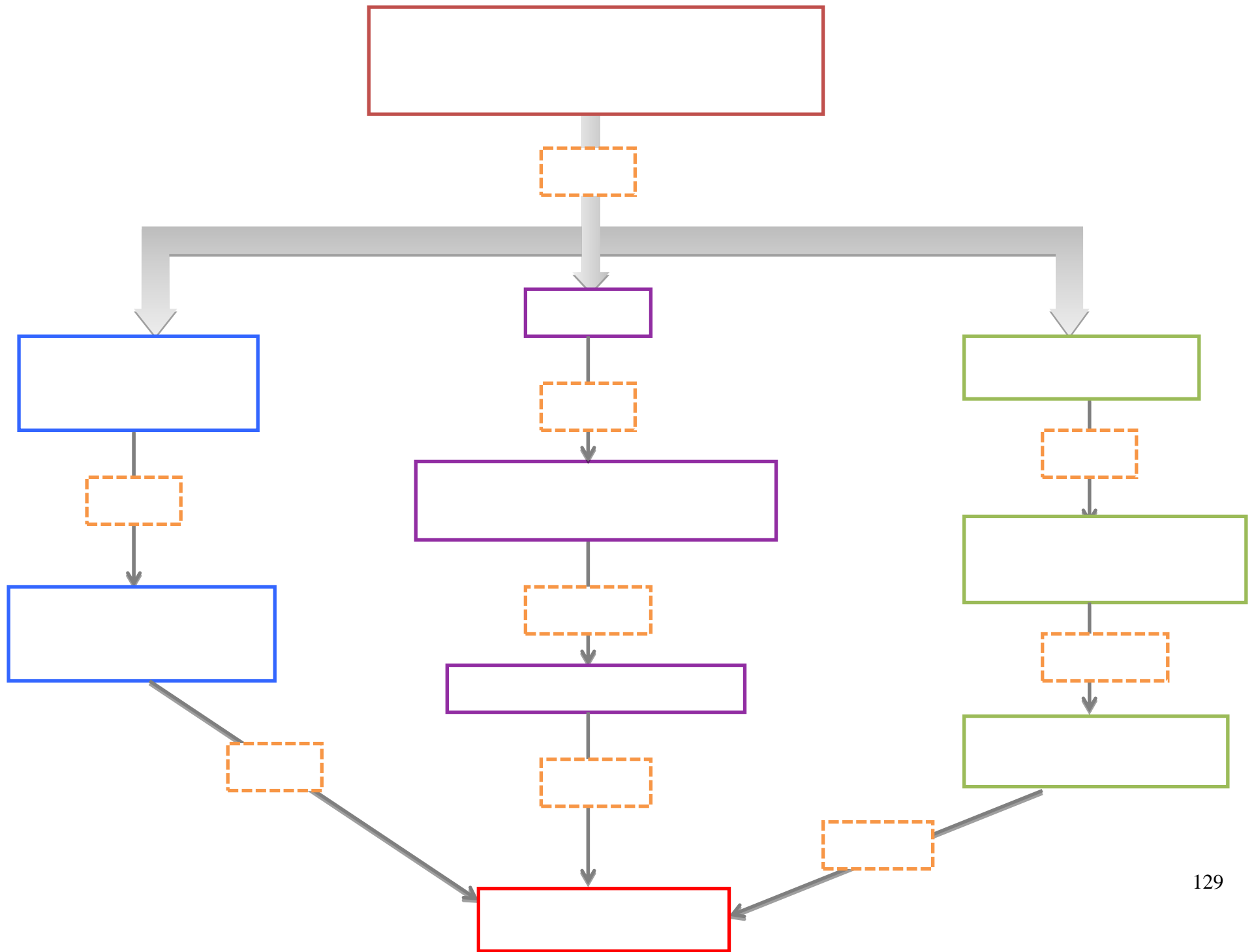
From the obstacles that may face me in using electronic concept maps is that I have to buy them online and I do not really trust online purchases, therefore, if it is possible to make some programs such as "inspiration" available on a CD, and then download it on the computer, that will make things much easier. Another obstacle, is the slow or unavailability of internet at the college which will reduce or turn me down in using electronic maps.

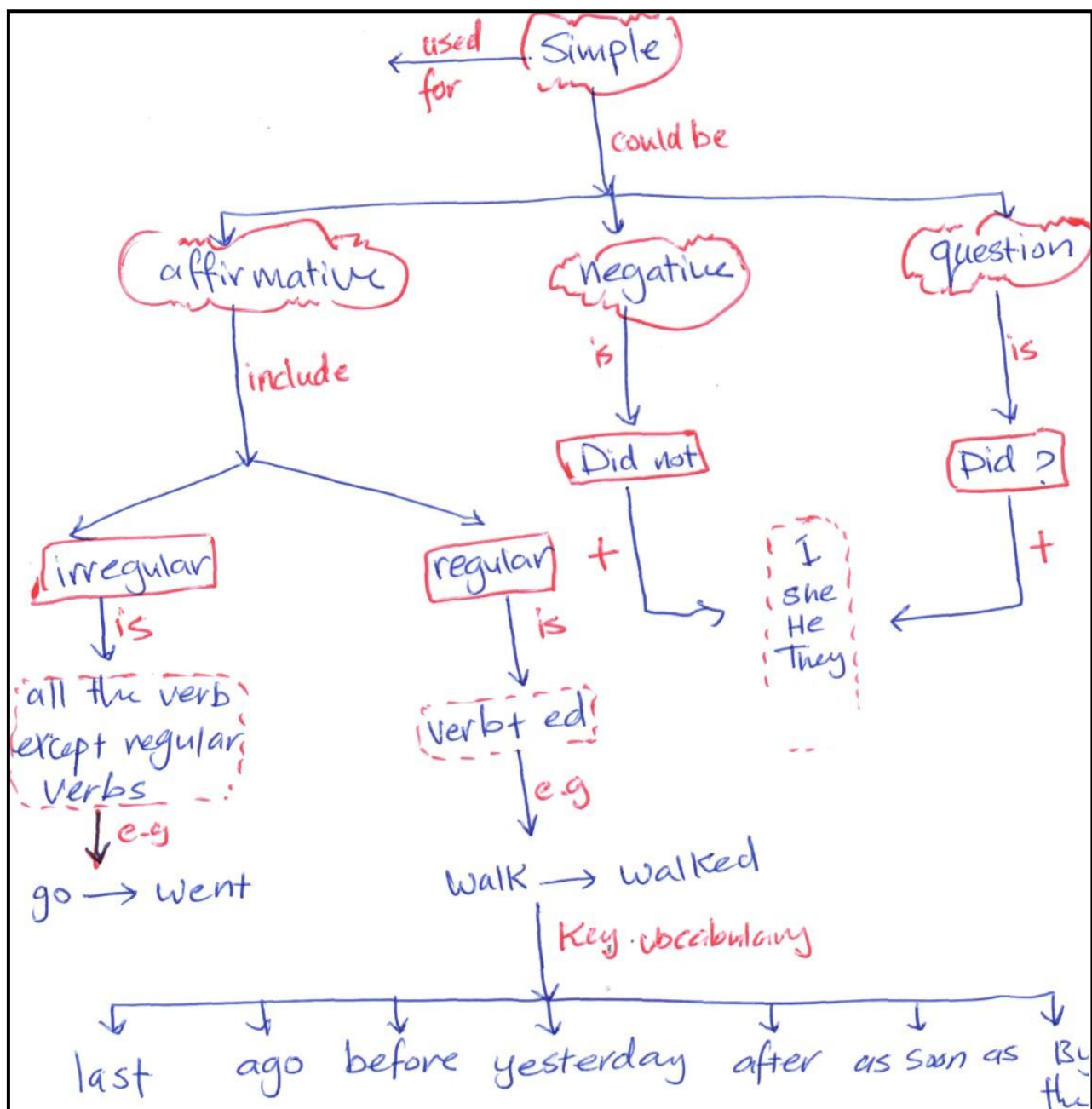
N (13): Are there any factors that enable or hinder the use of either pen and paper OR CACM in

## Appendix 6: Example of Students' Concept maps

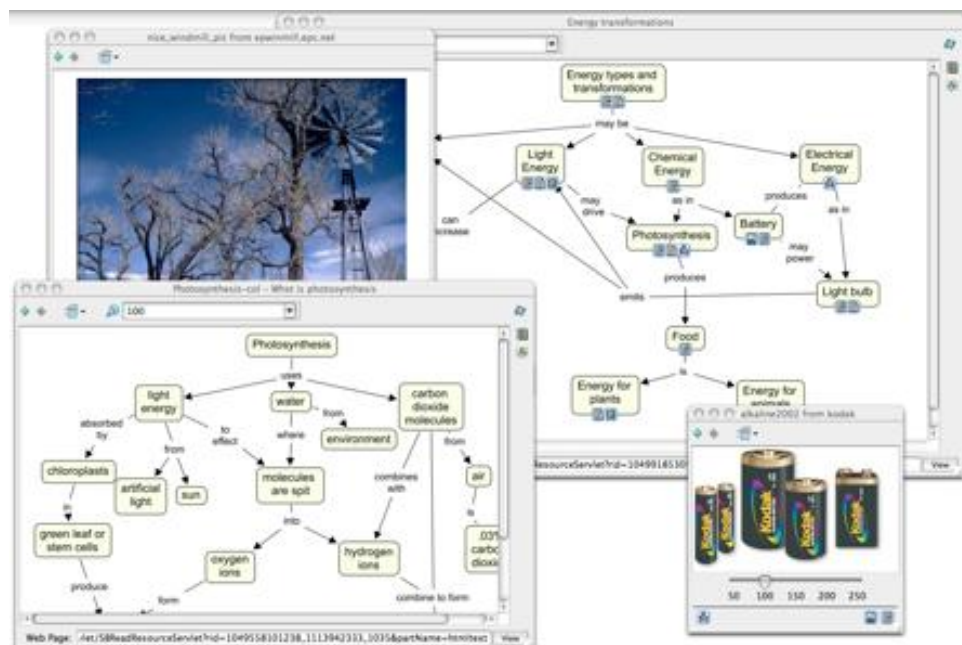
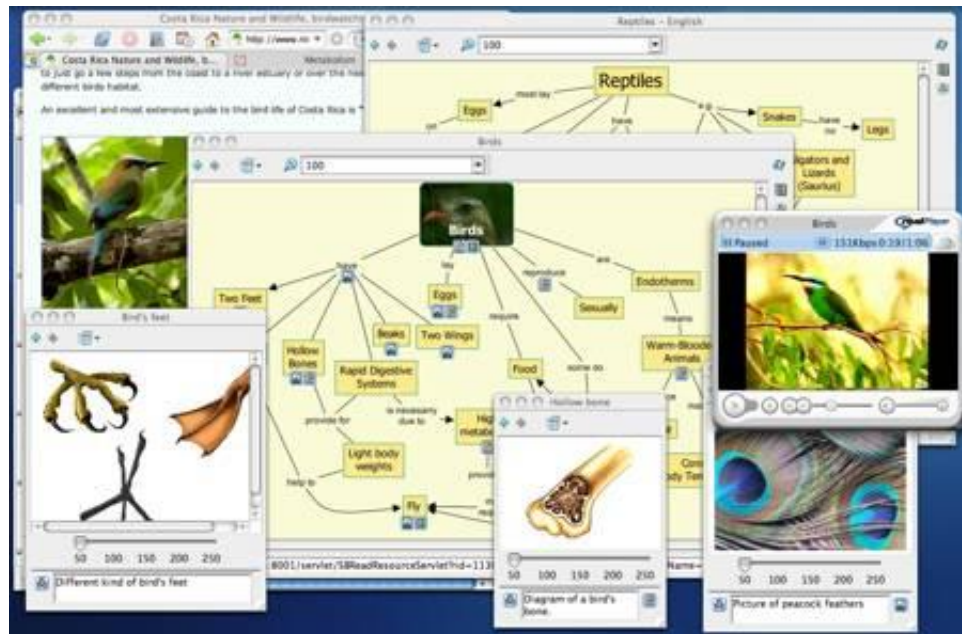








## Appendix 7: Example of CACMs



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