Learning information literacy: qualitatively different ways education students learn to find and use information

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Abstract

Learning information literacy reports on an empirical study that explores the qualitatively different ways students in an Australian university experience learning how to find and use information. Recognised as a generic skill and graduate attribute that enables independent and lifelong learning, information literacy is increasingly accepted as a broad and complex educational and social concept.

The study uses phenomenography as its methodological and theoretical basis. Phenomenography is a qualitative research approach that originated in educational research, where it was developed to gain a greater insight into student learning in educational settings. It has received considerable recent support in information literacy research. This study is based on interviews with 15 education students. Seven of the participants were drawn from an undergraduate Technology Education program, while the remaining eight were a mixture of undergraduate and postgraduate students undertaking more traditional text-based courses.

The study reveals that these students experienced learning information literacy in a range of inclusive ways. In order of increasing complexity, these were:

1. Learning to find information;
2. Learning a process to use information;
3. Learning to use information to create a product;
4. Learning to use information to build a personal knowledge base in a subject area;
5. Learning to use information to advance disciplinary knowledge;
6. Learning to use information to grow as a person and to contribute to others.
While there are no other studies that explore students’ ways of experiencing learning information literacy, this study discusses the experiences of information literacy that are represented in key empirical studies that use the phenomenographic research approach and three information literacy curriculum models. Through juxtaposing the results with these studies and models, ways of experiencing information literacy and learning information literacy are illuminated. Implications for information literacy education are also discussed.

Understanding the different ways that students experience learning information literacy will assist librarians, academics and other educators to design and deliver information literacy education across this range of experiences and facilitate more expansive experiences for students.
Statement of original authorship

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

Signed:

Date:
Acknowledgements

In my time as a librarian, I found students would often remark that postgraduate study can be a very solitary and often a lonely and isolating experience. However, this has fortunately not been my experience. I believe that undertaking higher degree research does not happen without the support and assistance of a lot of people, who accompany you on the journey. I would like to acknowledge those who have been especially important to me.

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Chapter 1
Investigating Learning Information Literacy

*Learning information literacy* is a study that explores education students’ experiences of learning information literacy.

Information literacy is a complex and abstract phenomenon that has attracted considerable interest in research in the last two decades. Moving beyond a narrow library focus to become increasingly accepted as a broader educational and social concept, information literacy is identified as a generic skill and graduate attribute that enables independent and lifelong learning (Candy, Crebert, & O’Leary, 1994; Garner, 2006). In higher education, information literacy appears on the graduate attribute statements of most Australian universities. Breivik claims ‘academic institutions, in fact will have failed their graduates if they do not empower them to be independent lifelong learners who can access, evaluate and effectively use information to address the needs or questions which confront them’ (2000, p. 1).

While there is no one definitive description or definition of information literacy, two distinct paradigms have emerged over time, which are underpinned by different views of learning and teaching. One view sees information literacy as content, while the other view sees information literacy as it is experienced by people.

The former describes an information literate person and the individual attributes and characteristics that can be demonstrated and measured (see ACRL, 2000; ALA, 1989; Bundy, 2004; Doyle, 1992; Eisenberg & Berkowitz, 1990). For example, to be information literate, a person must possess the capacity to ‘recognise when information is needed and have the ability to locate, evaluate and use effectively the needed information’ (ALA, 1989, p. 1); or ‘the ability to access, evaluate, and use information from a variety of sources’ (Doyle, 1992 p. 8).
As will be seen in my findings, embedded in this perspective of information literacy is a view of learning information literacy as acquiring and developing individual skills, techniques and knowledge. These attributes and competencies can be demonstrated and measured and thus, information literacy forms the content of learning.

The latter view of information literacy moves beyond the individual and advocates that information literacy is experienced as a relationship between the individual and the situation, and is therefore a range of different experiences – dynamic and contextualised to the individual and the situation (see Bruce, 1997; Limberg, 2008; Lupton, 2004, 2008; Markless, 2009). Descriptions of information literacy that encapsulate this view include: ‘a way of engaging with, and learning about, subject matter’ (Bruce & Candy, 2000b p. 7); ‘a complex of different ways of interacting with information’ (Bruce, Edwards, & Lupton, 2006 p. 5); ‘experiencing different ways of using information to learn’ (Bruce, 2008 p. 5) and ‘a learning approach’ (Lupton, 2004 p. 89).

As will be seen in my findings, embedded in this perspective of information literacy is a view of learning information literacy that moves beyond learning individual skills and knowledge to the conceptualisation of learning information literacy as an enabler or process of learning. This view recognises the complexity of the concept of information literacy and the collective and diverse range of ways students experience learning information literacy.

**Motivation for this study**

Academics and librarians alike play a role in providing students with opportunities to experience information literacy as both the content and process of learning. But what do students see they are learning? What approaches do students use to learn information literacy?
As the former Education Librarian across two campuses at Griffith University, I worked closely with academics to integrate and embed information literacy in the curriculum. Over several years, I strived to continuously improve my teaching and build my awareness and knowledge of information literacy, learning and teaching. I learned from many sources: experience, particularly my mistakes; feedback and advice from colleagues; evaluation by students and academics; constantly reading and reflecting; and by undertaking a higher education program of study.

However, despite these endeavours I never really felt that I understood how students experience learning information literacy. Without an understanding of how students learn information literacy, I wondered how I could offer truly effective learning and teaching activities. How could I offer students more expansive educational experiences if I did not know how students currently experience or approach learning information literacy?

This dilemma provided the motivation for this study. Hence, my research question is “What are the different ways students experience learning information literacy?” In order to answer my research question, the objectives of my research are to describe:

1. Students' ways of experiencing learning information literacy; and the
2. Approaches students use to learn information literacy.

To best answer my research question, I have chosen a relational perspective (Marton & Saljo, 1997; Prosser & Trigwell, 1999b; Ramsden, 1987) from which to examine students’ experiences of learning information literacy. Widely used in student learning research in higher education, a relational perspective is underpinned by phenomenography. Phenomenography is a research approach that ‘investigates the qualitatively different ways in which people experience or think about various phenomena’ (Marton, 1986 p. 31).

Answering this research question will provide a greater understanding of the different ways that students experience learning information literacy. This
understanding will assist librarians, academics and other educators to design and deliver information literacy education across this range of experiences.

**Organisation of this thesis**

Following this introduction, chapter two provides a review of the literature and theoretical framework that underpins this study. Starting with the phenomenographic view of learning, I review relevant studies from the information literacy literature. I discuss the experiences of information literacy in the studies and then analyse the views of *learning* information literacy that are either explicit or implicit in these studies. Similarly, I discuss the views of information literacy in key information literacy curriculum models and then analyse views of *learning* information literacy that are explicit or implicit in these models.

In chapter three, I describe the research approach phenomenography and the assumptions that underpin it. I then detail my methodology, including the research design, data collection and data analysis processes.

In chapter four, I present the detailed results of my study as six qualitatively different ways students experience *learning* information literacy.

In chapter five, I provide an overview of the results, drawing together the similarities and differences in the way that critical aspects of the phenomenon of *learning* information literacy are viewed in the six experiences. I also provide an overview of the relationships between the six categories of description, highlighting where significant structural shifts occur.

In chapter six, I compare my findings with my analysis of the experiences of *learning* information literacy in both the empirical studies and information literacy curriculum models that were introduced in chapter four. I then discuss the implications for information literacy education, based on significant aspects of students’ experience of *learning* information literacy that are revealed by my study. Next, I discuss the study’s limitations and the
significant contributions followed by suggestions for future research. I conclude by considering what an information literacy curriculum model might look like, based on the students’ experiences of *learning* information literacy in this study.
Chapter 2
Learning Information Literacy: Theoretical Framework, Key Literature and Curriculum Models

Introduction

In this chapter I discuss the theoretical framework that underpins this study and the information literacy and learning literature in which it is situated. While there are many models of student learning, I have chosen a relational perspective (Marton & Saljo, 1997; Prosser & Trigwell, 1999b; Ramsden, 1987) from which to examine students’ experiences of learning information literacy. Widely used in student learning research in higher education and more recently in information literacy research, a relational perspective is underpinned by phenomenography (the research approach used in this study). As phenomenography is detailed more fully in the methodology chapter, only the phenomenographic view of learning is discussed here.

First describing the key characteristics of a relational perspective, I highlight key relevant information literacy studies that have used a relational perspective. I then explore the perspectives of information literacy and learning information literacy inherent in these empirical studies and in key information literacy curriculum models.

The phenomenographic perspective of learning

Phenomenography is a research approach that ‘investigates the qualitatively different ways in which people experience or think about various phenomena’ (Marton, 1986 p. 31). The phenomenographic view describes learning as ‘a qualitative change in a person’s conception of a certain phenomenon or a certain aspect of reality, it is a distinct change in how the phenomenon is perceived, how it is understood, and what meaning it carries for the learner’ (Johansson, Marton, & Svensson, 1985 p. 235). As such, it is not a quantitative change in the amount of knowledge someone possesses. It is
not simply knowing more or possessing more skills but knowing or doing things in a different way. Phenomenography holds that when conceptual and experiential change results in a more sophisticated way of knowing or doing, then a person experiences a more complex and inclusive understanding of the object of the learning.

Furthermore, phenomenographers believe that for someone to learn, they have to discern variation in something they previously knew or experienced (Bowden & Marton, 2004; Marton & Booth, 1997). People become aware of this variation, of things they had not previously been aware of, and learning takes place. There are a limited number of qualitatively different ways of experiencing a phenomenon as people can only discern so many aspects of the phenomenon at a time. Certain aspects of the phenomenon are held in the foreground of the person’s awareness, while other aspects are in the background (Marton & Booth, 1997). So for example, in the case of students attending the same information literacy class involving a database, some might focus on the mechanics of a database – where to click and so on, others might focus on the content of a database, while others might focus on the concept of a database and how it is different from or similar to a search engine like Google. Each person discerns different aspects simultaneously; therefore they have different experiences of the same phenomenon. So students in the same information literacy class will experience it differently.

As Prosser and Trigwell explain, ‘for some students, aspects of awareness brought to the foreground will be substantially greater and broader than for other students’ (1999b p. 33). Students who are able to hold more aspects in their awareness simultaneously have more complex and inclusive experiences. Similarly, a person can experience this same phenomenon at another time and experience it differently. This is because the person may discern different aspects of the phenomenon this time than they had discerned the previous time (Marton & Booth, 1997 pp. 107-109). As phenomenography looks at the relationship between a person and a phenomenon, the phenomenographic view of learning is commonly described
as relational. Therefore, I will henceforth use the term relational perspective when describing the theoretical framework used in this study.

**The what and how of learning**

If learning is relational, then ‘how we go about experiencing and understanding that world is inseparable from what we experience and understand’ (Prosser, 1993 p. 21 my emphasis). In a relational perspective, learning consists of two closely intertwined elements – a what and a how. Marton and Ramsden explain, ‘there is obviously no learning without a content – you have to learn something. And there cannot be learning without an act of learning – something has to be learned in a certain way’ (1988 p. 273).

The what refers to the content of learning – what is actually being learnt. The what of learning is also known as the direct object of learning. The how focuses on the approach the student takes to learning. The approach to learning consists of the:

1) act of learning, which comprises the strategies the student uses to learn – a strategy being the actions a person takes, i.e., what the student actually does to learn or the way they go about learning; and the

2) indirect object, which represents the intention that this act of learning is directed at. The student’s intention explains the reason underpinning the use of the strategies, i.e., their aim or why the student performs a particular action. (see Figure 1)
Information literacy and a relational perspective

The relational perspective has received considerable recent support in information literacy research (Boon, Johnston, & Webber, 2007; Bruce, 1997; Edwards, 2006; Limberg, 1999; Lupton, 2008; Maybee, 2007; Webber, Boon, & Johnston, 2005). Bruce, Edwards and Lupton (2006) promote a relational perspective as the frame most suited to viewing and teaching information literacy as people experience information literacy in different ways. A relational perspective captures this variation. By being aware of the variation in the ways students experience information literacy, teachers and librarians can design curricula so that students can have a particular experience, which in turn might expand their focus of awareness.

Bruce, in her seminal work, ‘The Seven Faces of Information Literacy’ (1997, p. 77), advocates a shift from researching the view of experts to studying the experiences of users. Bruce strongly supports adopting a relational perspective in regard to information literacy education and research. In adapting Ramsden’s features of a relational approach, she believes:

- The way students experience information literacy is more important than specific skills and knowledge because their ways of experiencing
influence their learning approaches and outcomes and whether they use their skills and knowledge in a particular learning situation;

- The focus should be on the relationship between the students and the subject or the environment (1997, p. 60).

Like Bruce, Lupton also argues for the adoption of a relational model, which maps variation in ways of experiencing information literacy from a user’s perspective (2004 pp. 31-33).

**Learning information literacy**

If information literacy and learning can be experienced in different ways, then it follows that the phenomenon of *learning information literacy* could also be experienced differently by students. Exploring the variation in students’ experience of this phenomenon is the aim of my research. But firstly what do I mean by *learning information literacy*? I have adopted a relational description of learning as ‘a change from one way of understanding to another, qualitatively more complex one’ (Dall’Alba, 2000 p. 99). In this way, my characterisation of *learning information literacy* is that there may be a qualitative change in students’ experiences of finding and using information. This change results in different ways of doing and seeing. In addition, I propose that this change may imply a more complex understanding of the many aspects of information literacy. This understanding would encompass an expanding awareness of the potentiality that results from learning. Bruce and others describe a similar view of the expansive nature of *learning information literacy* (Bruce, 1997 p. 171; 2008 p. 5; Bruce et al., 2006 p. 6). However, it is important to highlight that this research does not map change in the student sample in this study.

As noted earlier, for someone to learn, they have to discern variation in something they previously knew or experienced. People become aware of this variation, of things they had not previously been aware of, and learning takes place (Bowden & Marton, 2004; Marton & Booth, 1997). So in this case
‘information literacy is learned when different ways of experiencing it are discerned’ (Bruce et al., 2006 p. 6).

I have intentionally chosen to describe my research in terms of *learning information literacy* rather than *learning to be information literate*. I have chosen *learning information literacy* as it implies an ongoing journey, as distinct from an end point, which is implied by the phrase *learning to be information literate*. My belief is that there is no destination at which a person is information literate. Rather, one develops a repertoire of skills, knowledge and awareness from which one draws as needed.

The information literacy research which is reviewed for this study is limited in scope to empirical studies that have used a relational perspective to explore ways of experiencing information literacy (and learning in some cases) by students and/or educators in higher education. In the next section I will discuss the ways of experiencing information literacy and *learning* information literacy that are either explicit or implicit in these studies. Following this, I will discuss the key information literacy curriculum models and the views of information literacy and *learning* information literacy that are explicit or implicit in them.

**Ways of experiencing information literacy and learning information literacy – empirical studies**

My research question asks ‘What are the different ways students experience learning information literacy?’ In seeking to answer this question, I have found in the literature that there are multiple ways of experiencing information literacy. As there is a relationship between peoples’ views of information literacy and their views of *learning* information literacy, I can analyse the assumed views of *learning* information literacy that are inherent in these multiple ways of experiencing information literacy.

In this section, I will introduce the studies that are relevant to my study. In her study of higher educators, Bruce (1997) identified a broad range of
qualitatively different ways of experiencing information literacy: information technology, information sources, information processes, information control, knowledge construction, knowledge extension and wisdom. Similarly, in their investigations into ways of experiencing information literacy by two distinct disciplinary groups – marketing and English academics – Webber, Boon and Johnston (2007; 2005) reveal variable experiences, ranging from accessing information and using technology to critical thinking and becoming a practitioner. The experiences revealed in these studies of higher educators encompass those of Maybee’s (2007) undergraduate students. All of these studies reveal a focus on information technology, sources and processes and the importance of a personal knowledge base, both for study and for professional practice. However, in Bruce’s study, the experience is more expansive, with an additional focus on extending disciplinary knowledge and the wise use of information.

While the above mentioned studies explore ways of experiencing information literacy and have implicit assumptions about views of learning, there are fewer studies that have directly investigated the relationship between information literacy and learning. One of these is Limberg’s (1999; 2000) study of 25 high school students in Sweden, which explored the relationship between finding and using information and learning about their subject content. She concluded that finding and using information was not independent of the content and that student experiences of the content influenced the approach used and the learning outcome.

In her study of how undergraduates experience information literacy when writing an environmental studies essay, Lupton reported students ‘experienced information literacy as the interrelationship between the essay, information and learning. The experience was clearly influenced by the context of the course, their choice of topic and their intent’ (2004 p. 70). The students’ experience of information literacy in both Limberg’s and Lupton’s studies included searching for facts and evidence, synthesising information, forming a viewpoint and developing arguments (Limberg, 2000 pp. 196-197; Lupton, 2004 p. 53). Of note is her more recent study, where Lupton (2008)
expressly focuses on the relationship between information literacy and learning by interviewing music and tax law students. She found this relationship is experienced as applying techniques, using information as a process of discovery or expression and as a means to understanding the content and context of learning. Only in Lupton’s 2004 study do students see information literacy more expansively, with learning as a social responsibility (p. 53).

In Limberg’s and Lupton’s studies, the view of learning information literacy is more explicit. This view ranges from learning to find information, learning techniques, forming arguments and viewpoints, applying learning, and building knowledge and understanding (Limberg, 1999, 2000; Lupton, 2004, 2008). The view of information literacy as reported by the authors in each of these empirical studies and of learning information literacy as analysed by me is captured in Tables 1 and 2.

From these studies, it is clear that there is a broad range of ways of experiencing information literacy, from more limited to more expansive, which reflects a view of information literacy as the what or how of learning. There is a strong emphasis in all studies on finding information and with that, using and knowing about information tools, sources and technology. In finding information, students’ experience of information literacy includes locating, evaluating, accessing and retrieving different types of information. Techniques and processes involve a series of steps and activities for both finding and using information, while controlling and organising information is also very process driven.

In acquiring and developing skills, techniques and processes to find and use information, the view of learning information literacy that is implicit in the experiences in Table 1 is that learning is objective, quantifiable and external to the student. The skills and techniques can be taught, observed and measured. In this way, the skills, techniques and processes which represent the students’ experiences of information literacy, are the what of learning. Therefore, information literacy is the content or direct object of learning. So
the skills and techniques are the focus of learning information literacy, rather than how the person can use learning information literacy to accomplish other things, such as learning subject or discipline content, as is seen in the latter ways of experiencing.
<table>
<thead>
<tr>
<th>Students’ experiences</th>
<th>Higher educators’ experiences</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Information Literacy is seen as...</th>
<th>Learning Information Literacy is seen as...</th>
<th>Information Literacy is seen as...</th>
<th>Learning Information Literacy is seen as...</th>
<th>Information Literacy is seen as...</th>
<th>Learning Information Literacy is seen as...</th>
<th>Information Literacy is seen as...</th>
<th>Learning Information Literacy is seen as...</th>
<th>Information Literacy is seen as...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Learning to use technology to find information</td>
<td>Information Technology</td>
<td>Learning to use technology to find information</td>
<td>Information Technology</td>
<td>Learning to use technology to find information</td>
<td>Information Technology</td>
<td>Learning to use technology to find information</td>
<td>Information Technology</td>
</tr>
<tr>
<td>Information sources</td>
<td>Learning to use sources to find information</td>
<td>Information sources</td>
<td>Learning to use sources to find information</td>
<td>Information sources</td>
<td>Learning to use sources to find information</td>
<td>Information sources</td>
<td>Learning to use sources to find information</td>
<td>Information sources</td>
</tr>
<tr>
<td>Fact finding</td>
<td>Learning to find information</td>
<td>Seeking information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
</tr>
<tr>
<td>Applying techniques</td>
<td>Learning techniques</td>
<td>Learning techniques</td>
<td>Learning a process</td>
<td>Learning a process</td>
<td>Learning a process</td>
<td>Learning a process</td>
<td>Learning a process</td>
<td>Learning a process</td>
</tr>
<tr>
<td>Using information by a process of discovery (music)</td>
<td>Learning a process of discovery through learning &amp; applying skills</td>
<td>A process</td>
<td>Learning a process of discovery through learning &amp; applying skills</td>
<td>A process</td>
<td>Learning a process of discovery through learning &amp; applying skills</td>
<td>A process</td>
<td>Learning a process of discovery through learning &amp; applying skills</td>
<td>A process</td>
</tr>
<tr>
<td>Accessing information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
<td>Learning to find information</td>
</tr>
<tr>
<td>Controlling information</td>
<td>Learning to manage information</td>
<td>Learning to manage information</td>
<td>Learning to manage information</td>
<td>Learning to manage information</td>
<td>Learning to manage information</td>
<td>Learning to manage information</td>
<td>Learning to manage information</td>
<td>Learning to manage information</td>
</tr>
<tr>
<td>Basic research/ information skills</td>
<td>Acquiring &amp; using skills</td>
<td>Acquiring &amp; using skills</td>
<td>Acquiring &amp; using skills</td>
<td>Acquiring &amp; using skills</td>
<td>Acquiring &amp; using skills</td>
<td>Acquiring &amp; using skills</td>
<td>Acquiring &amp; using skills</td>
<td>Acquiring &amp; using skills</td>
</tr>
</tbody>
</table>

Table 1 Ways of experiencing information literacy and learning information literacy in the empirical studies: the what of learning
In the experiences in Table 2, information literacy is viewed is a qualitatively different way. With a focus on information use, information literacy is experienced as engaging with information for various purposes, for example for constructing a knowledge base in a subject. This is most commonly in the context of the university studies or future professions. However, students’ experiences of information literacy transcend these boundaries in some studies, beyond the classroom to everyday life and the outside world (Bruce, 1997; Lupton, 2004).

In the same way that information literacy is viewed in a qualitatively different way in the experiences in Tables 1 and 2, so too is learning. Learning information literacy becomes personal, subjective and internal. In some cases, learning information literacy can also be transformational, with change to a person and to others (Boon et al., 2007; Bruce, 1997; Bruce et al., 2006; Lupton, 2004, 2008; Webber et al., 2005).

Here, information literacy shifts from being the what or content of learning, to also being the how or process of learning. As the how of learning, information literacy becomes an enabler to other things. Examples of information as a how of learning in the latter experiences are learning information literacy as an enabler to learning subject content or learning to use information wisely to benefit others (Bruce, 1997; Lupton, 2008).
<table>
<thead>
<tr>
<th>Information Literacy and Learning Information Literacy as the What and How of Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students’ experiences</strong></td>
</tr>
<tr>
<td>Lupton (2004)</td>
</tr>
<tr>
<td>Maybee (2007)</td>
</tr>
<tr>
<td>Bruce (1997)</td>
</tr>
<tr>
<td>Boon, Johnston, Webber (2007)</td>
</tr>
<tr>
<td>Webber, Boon, Johnston (2005)</td>
</tr>
<tr>
<td><strong>Balancing information to choose the right side</strong></td>
</tr>
<tr>
<td><strong>Scrutinising &amp; analysing</strong></td>
</tr>
<tr>
<td><strong>Forming a personal viewpoint</strong></td>
</tr>
<tr>
<td><strong>Using information to discover big picture of topic</strong></td>
</tr>
<tr>
<td><strong>Using information to understand the tax system</strong></td>
</tr>
<tr>
<td><strong>Using information to express self</strong></td>
</tr>
<tr>
<td><strong>Building knowledge</strong></td>
</tr>
<tr>
<td><strong>Applying Knowledge</strong></td>
</tr>
<tr>
<td><strong>Growth as a composer &amp; musician</strong></td>
</tr>
<tr>
<td><strong>Understanding subject content</strong></td>
</tr>
<tr>
<td><strong>Using information to express self</strong></td>
</tr>
<tr>
<td><strong>Developing an argument</strong></td>
</tr>
<tr>
<td><strong>Understanding subject content &amp; building a knowledge base</strong></td>
</tr>
<tr>
<td><strong>A knowledge base</strong></td>
</tr>
<tr>
<td><strong>Building a knowledge base</strong></td>
</tr>
<tr>
<td><strong>Knowledge construction</strong></td>
</tr>
<tr>
<td><strong>Building a knowledge base</strong></td>
</tr>
<tr>
<td><strong>Problem solving</strong></td>
</tr>
<tr>
<td><strong>Critical thinking</strong></td>
</tr>
<tr>
<td><strong>Independent practitioner</strong></td>
</tr>
<tr>
<td><strong>Growth as a learner</strong></td>
</tr>
<tr>
<td><strong>Growth as a professional</strong></td>
</tr>
<tr>
<td><strong>Knowledge extension</strong></td>
</tr>
<tr>
<td><strong>Creating new disciplinary knowledge</strong></td>
</tr>
<tr>
<td><strong>Learning as a social responsibility</strong></td>
</tr>
<tr>
<td><strong>Helping others</strong></td>
</tr>
<tr>
<td><strong>Wisdom</strong></td>
</tr>
<tr>
<td><strong>A way of being &amp; using information wisely to benefit others</strong></td>
</tr>
</tbody>
</table>

Table 2 Ways of experiencing information literacy and learning information literacy in the empirical studies: the what and how of learning
A summary of the experiences of information literacy that are reported by the authors in these studies and the views of learning information literacy as analysed by me is captured in Table 3.

<table>
<thead>
<tr>
<th>Information Literacy is seen as…</th>
<th>Learning Information Literacy is seen as…</th>
<th>Learning Information Literacy is…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skills</td>
<td>Acquiring and developing skills in finding information</td>
<td>The what of learning</td>
</tr>
<tr>
<td>Technology</td>
<td>Learning to use technology to find and use information</td>
<td></td>
</tr>
<tr>
<td>Information sources</td>
<td>Learning about sources to find information</td>
<td></td>
</tr>
<tr>
<td>Finding information</td>
<td>Learning to find information</td>
<td></td>
</tr>
<tr>
<td>Techniques and processes</td>
<td>Developing processes to find and use information</td>
<td></td>
</tr>
<tr>
<td>Controlling and organising information</td>
<td>Learning to manage information</td>
<td></td>
</tr>
<tr>
<td>Solving problems</td>
<td>Learning to find and use information to solve problems</td>
<td>The what and how of learning</td>
</tr>
<tr>
<td>Producing essays, music compositions, personal viewpoints and arguments and other outcomes of using information</td>
<td>Learning to use information to produce a specific outcome</td>
<td></td>
</tr>
<tr>
<td>Using information</td>
<td>Learning to use information</td>
<td></td>
</tr>
<tr>
<td>A personal knowledge base</td>
<td>Learning about a subject to build a knowledge base Learning to use information like a practitioner</td>
<td></td>
</tr>
<tr>
<td>Creating new disciplinary knowledge</td>
<td>Learning to use information to advance knowledge</td>
<td></td>
</tr>
<tr>
<td>Using information to benefit others</td>
<td>Learning to use information wisely to help others</td>
<td></td>
</tr>
</tbody>
</table>

(Boon et al., 2007; Bruce, 1997; Limberg, 1999, 2000; Lupton, 2004, 2008; Maybee, 2007; Webber et al., 2005)

**Table 3 A summary of the ways of experiencing information literacy and learning information literacy in the empirical studies**

Having explored the ways of experiencing information literacy and learning information literacy in these empirical studies, it is useful to now explore the same in the major information literacy curriculum models.
Ways of experiencing information literacy and learning information literacy – curriculum models

While there are many models of information literacy education, I have chosen to limit the scope of my review to three models – the Standards, Six Frames and GeST. I have chosen the Standards model because it is a dominant paradigm in higher education and the Six Frames and GeST models because they provide different lenses to view information literacy education, while advocating a relational perspective.

The Standards model
Based on the American Association of College and Research Libraries’ Information Literacy Competency Standards for Higher Education (ACRL, 2000), the Australian and New Zealand Information Literacy Framework (Bundy, 2004) provides a curriculum model, which consists of principles, standards and learning outcomes for information literacy education.

‘The principles frame six core standards which underpin information literacy acquisition, understanding and application by an individual. These standards identify that the information literate person:

1. recognises the need for information and determines the nature and extent of the information needed
2. finds needed information effectively and efficiently
3. critically evaluates information and the information seeking process
4. manages information collected or generated
5. applies prior and new information to construct new concepts or create new understandings
6. uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the use of information’ (Bundy, 2004 p. 11).

In the Standards model, the experiences of information literacy range from the more limited focus of finding and managing information through to an
awareness of the responsible use of information. Intrinsic to this array of experiences is a view of learning information literacy that ranges from learning skills to find information, to learning to use information in an appropriate, ethical and legal way. Only the what of learning is evident in standards one to four. In contrast, the what and how of learning is evident in standards five and six.

**The Six Frames and GeST models**

In the Six Frames for Information Literacy Education model, the authors view information literacy education through six lenses, each of which represents a different perspective on information, learning and curriculum design. These lenses are termed the content, competency, learning to learn, personal relevance, social impact and relational frames (Bruce et al., 2006). Once again, there is a span of ways of experiencing information literacy from limited skills sets to more expansive information practices. The sixth relational frame recognises this span and advocates information literacy can be viewed as different ways of interacting with information. The view of learning information literacy in the Six Frames mirrors this range of experiences – from learning skills to the development of a sophisticated awareness that information literacy can be an enabler to social change.

Lupton has developed the Six Frames further by incorporating aspects of literacy models to form the GeST (Generic, Situated and Transformative) model (2008). The view of information literacy and learning information literacy largely mirror those of the Six Frames and range from a set of skills to context dependent information practices that benefit an individual and society. This range of experiences in both models encompass learning information literacy as the what and how of learning.

Like the empirical studies, the views of information literacy encapsulated in the three models spans the full spectrum, from skills and techniques in finding and managing information through to engaging with information to enact social change. The Standards in particular have a focus on information literacy as an individual characteristic – a set of skills, attributes and practices
that a person possesses and uses. Therefore, the dominant view of *learning* information literacy in the Standards is a quantitative one. *Learning* information literacy is largely considered to be observable, measurable and assessable.

Again, as was the case with the empirical studies, learning skills, processes, building knowledge and learning to use information are views of learning that can be found across all models. However, while the sixth standard is concerned with the ethical, legal and culturally appropriate use of information, only in the Six Frames and GeST models is it evident that information literacy and *learning* information literacy are critical to society and an agent for personal and social change. Therefore, the view of information literacy and *learning* information literacy in these two models is more expansive.

A further significant difference is a relational perspective advocated by both the Six Frames and GeST models. A relational perspective recognises that information literacy and *learning* information literacy can be viewed in a number of ways, from the more elementary to more complex. A relational perspective can be used to facilitate students’ capacity to experience different and more sophisticated aspects of *learning* information literacy (Bruce et al., 2006; Lupton, 2008). By experiencing different and broader perspectives, students can recognise and respond to different learning situations and draw on a repertoire of experiences.

The view of information literacy as reported by the authors in each of these curriculum frameworks and of *learning* information literacy as analysed by me is captured in Table 4.
<table>
<thead>
<tr>
<th>Standards</th>
<th>Six Frames</th>
<th>GeST</th>
<th>Learning information literacy is</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Literacy is seen as...</td>
<td>Learning Information Literacy is seen as...</td>
<td>Information Literacy is seen as...</td>
<td>Information Literacy is seen as...</td>
</tr>
<tr>
<td>Standards 1-3: A set of skills a person uses to find &amp; evaluate information</td>
<td>Acquiring &amp; developing skills to find relevant &amp; appropriate information</td>
<td>1. Content knowledge about the world of information</td>
<td>1. Knowing more about information tools &amp; context</td>
</tr>
<tr>
<td>5. Building knowledge</td>
<td>Learning to use information to build knowledge</td>
<td>3. A way of learning</td>
<td>3. Learning to use information like a practitioner</td>
</tr>
<tr>
<td>4. Experienced differently in different contexts and by different people</td>
<td></td>
<td>4. Learning an awareness of what information literacy can do for the individual</td>
<td>Learning to find &amp; use information in different authentic contexts</td>
</tr>
<tr>
<td>6. Using information ethically, legally &amp; appropriately</td>
<td>Learning to use information responsibly</td>
<td>5. Using information to help society</td>
<td>5. Learning an awareness of what information literacy can do for society</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Critically using information to transform individuals &amp; society</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Learning to critically use information to empower individuals &amp; society</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Learning to critically use information to empower individuals &amp; society</td>
</tr>
</tbody>
</table>

Table 4 A summary of the ways of experiencing information literacy and learning information in the three models
Information literacy as a learning approach – the what and how of learning information literacy

While it has been shown that there are many descriptions of information literacy, as reported in chapter one, some of the most sophisticated and contemporary conceive information literacy as an ‘approach to learning’ (Lupton, 2004 p. 85) or ‘a way of engaging with and learning about subject matter’ (Bruce & Candy, 2000a p.7). As an enabler to learning subject content and learning about other aspects of the world, information literacy shifts from being the what of learning to also being the how of learning.

Lupton states ‘that information literacy cannot be decontextualised from the learning process’ (Lupton, 2004 p. 89). Information literacy can be the what of learning as it involves content, which focuses on specifics such as searching databases, constructing searches, evaluating information and so on. However, if information literacy is viewed as a learning approach and therefore the how of learning, the content of the information literacy class is not the main focus. Rather the focus is on using information literacy to learn the subject content. So for example, while a student is searching for information, reading abstracts and articles to determine their appropriateness, synthesising the information into an essay or presenting information to others, he or she is using information literacy to learn about the subject being studied. Therefore, learning information literacy could be experienced as learning to find and use information in order to learn about a subject.

Acknowledging that students learn subject content while learning information literacy and in addition, learn information literacy whilst they are interacting with particular learning tasks, subject and program content is a critical element of my study. This learning is embedded in the discipline the students are studying. If learning has both a content and a process, then it follows that there is a relationship between learning information literacy and learning about a subject (Bruce, 1997 p. 174; Limberg, 1999 p. 30; Lupton, 2004 p. 29).
In exploring this relationship, Limberg and Lupton had two complementary foci as researchers. Both focus on the students’ experience as an outcome of the qualitatively different ways they found and used information. Limberg’s (1999; 2000) study concentrated on both how and what the students learned, whereas Lupton’s (2004) study concentrates on how students learn. In contrast, Lupton’s (2008) recent study examines both the how and what of the relationship between learning and information literacy.

My own study explores the what and how of learning information literacy; however, it has an additional emphasis. Like Lupton and Limberg, I propose that my study may describe how students learn about their subject content while learning information literacy. In addition, I propose that my study may also describe how students learn information literacy while engaging with their university subjects. However as noted earlier, this study does not focus on how well students learn information literacy, nor does it measure their learning or change in their understanding. The different emphasis on the relationship between information literacy and learning and subject content between Limberg, Lupton in her 2004 study and my study is depicted in Figure 2.

Hence, the arrow pointing to the right represents Lupton and Limberg’s emphasis on learning content through information literacy. Whereas the arrow pointing in both directions represents my additional emphasis on using subject content to learn information literacy. Hence the students’ learning outcome is that they become more advanced information users. Therefore, this cyclical process of engaging with information and subject content is two way and dynamic.

Figure 2 The relationship between learning information literacy and learning subject content
In chapter six, I will explore the experiences of *learning* information literacy that are implicit in the cited empirical studies and curriculum models against my own findings. However, it is useful here to foreshadow how this implicit view of *learning* information literacy might appear, based on my analysis of these studies and models to date.

If learning is viewed as additive and information literacy is viewed as skills, techniques and processes, then it follows that *learning* information literacy might be viewed as acquiring and developing the skills, techniques and processes to find and use information. Similarly, if learning is viewed as qualitative and information literacy is viewed as building a knowledge base, extending disciplinary knowledge, growing as a person or practitioner or using information to help others for example – then *learning* information literacy might be viewed as learning to use information to achieve these very same objectives.

In depicting *learning* information literacy as a qualitative change in students’ experiences to a more complex, inclusive and advanced understanding, then the view of learning implicit in these studies and models would suggest that students move from experiencing *learning* information literacy as the acquisition of skills to developing the capability and awareness to use information in a way that transforms individuals and others. Educators can then use this view of *learning* information literacy to design curricula to encourage students to experience *learning* information literacy in a range of ways.

**Conclusion**

The empirical studies and education models provide strong evidence of the multiple ways students experience information literacy and learning. In turn, they point to the potential for describing multiple ways of experiencing *learning* information literacy.
The literature demonstrates the capacity of a relational perspective to effectively manage the complexity of student learning and supports the framework as one that best fulfils my research objectives of describing students’:

- Ways of experiencing learning information literacy; and
- Approaches to learning information literacy.

As my study explores the experiences of students from practical and text-based contexts, a relational perspective also captures the variation of experience from the students’ perspective.

With acceptance in the higher education and information literacy literature, I believe a relational perspective is best to explore students’ experiences of learning information literacy. It is well established within the teaching and learning literature in higher education and has gained considerable popularity in the academic information literacy literature, and more recently in information literacy education models.

In the next chapter, I will describe the methodology of my study.
Chapter 3
A Phenomenographic Approach to Investigating Learning Information Literacy

Research approach

In order to investigate the depth and range of experiences needed to address my research question, ‘What are the different ways students experience learning information literacy?’ I have used the qualitative interpretative methodology, phenomenography. ‘Phenomenography is a research method for mapping qualitatively different ways in which people experience, conceptualize, perceive and understand various aspects of, and phenomena in, the world around them’ (Marton, 1986 p. 31). Phenomenography originated in educational research in the 1970s, where it was developed to gain a greater insight into student learning in educational settings. As shown in my literature review in chapter two, it has received considerable recent support in information literacy research.

Interpretive research approaches seek to understand the world through the experiences of other people (Blaikie, 2000 p. 115). It is the task of the interpretive researcher to discover these meanings and describe them from the person’s view, in order to provide an understanding of the experience (Blaikie, 2000 p. 115; Denzin & Lincoln, 2008 p. 34). There are many principles that underpin phenomenography that reflect this interpretive view, particularly the non-dualist ontological stance and the adoption of a second order perspective.

The notion underpinning the non-dualist ontological stance is that people are not separate from their world. The world exists as people experience it – that is, the world exists through the phenomena a person experiences, constructs or interprets as they go about their everyday life. A person and their world are linked by a relationship, and it is through this relationship that the person
experiences their world (Marton & Booth, 1997 p. 122). In everyday life people have different experiences, which they interpret and give meaning to and this constitutes their reality. There is no single reality; rather there are multiple and changing realities. People’s experiences of their world varies and consequently, people can experience the same phenomenon differently, even in the same context (Marton, 1986 p. 31; Marton & Booth, 1997 p. 13; Richardson, 1999 p. 66; Saljo, 1988 pp. 37-45; Svensson, 1997 pp.59-71).

Both the person and the phenomenon cannot be separated, so ways of experiencing are both a part of the person and a part of the phenomenon. Phenomenographers believe ‘meaning is constituted in the relation between the person and the phenomenon’ (Trigwell, 2000 p. 64). As such, ways of experiencing do not describe the mental or cognitive processes within a person’s mind, nor do ways of experiencing describe the phenomenon. Rather ways of experiencing describe the relationship between the two (Prosser, 2000 p. 44; Prosser & Trigwell, 1999a pp 32-33; Trigwell, 2000 p. 64) In this study, the phenomenon is learning information literacy, so this study investigates the relationship between students and learning information literacy.

Another principle is that phenomenographers investigate people’s experiences of the world by employing a second order perspective. A second order perspective involves focussing on how people experience or perceive their world and is in contrast to a first order perspective, which focuses on the world itself (Johansson et al., 1985 p. 247; Marton, 1986 p. 33; Marton & Booth, 1997 pp.118-121). A second order perspective involves the researcher bracketing his or her own experience and seeing the students’ world and experiences of their world through the students’ eyes. So in this case, by using a second order perspective, I will be focussing on students’ experiences of learning information literacy.

Phenomenography is consistent with the hermeneutic tradition (Blaikie, 2000 pp. 138-139) because the researcher becomes the learner, in order to learn how people experience and make sense of their world. The research from
Saljo (1988 pp. 37-45) and Svensson (1997 pp.59-71) suggests that by understanding learners’ experiences, the researcher learns. In the same hermeneutic way, the phenomenographic researcher tries to grasp the meaning of the person’s experience through the statements the person makes. In this way, the researcher interprets the meanings behind the statements rather than takes a literal translation. For example, students will express their experiences of learning information literacy using different terms and statements and these might in turn be different again from the ones this researcher or the information literacy literature might use. Similarly, students might say the same thing, using the same words, but mean different things. So it is this researcher’s task to use the hermeneutic process to construct a set of categories that captures students’ ways of experiencing learning information literacy, from their diversity of descriptions and language. In this interpretive process, the researcher may use his or her language to form the categories but this is done in such a way as to ensure the meaning of the experience represented in the categories comes from the people’s own descriptions (Saljo, 1988 pp.37-45; Svensson, 1997 pp.59-71).

The unique focus of phenomenography is the variation in the ways people experience a phenomenon. The phenomenographic research approach involves analysing qualitative data, looking for similarities and differences and mapping this variation into clusters called categories of description. These categories are logically structured by the qualitatively different ways participants experience the phenomenon and the meaning that is given to this experience. The categories and the structure within and between the categories form an outcome space. The outcome space represents the participants’ collective experience of the phenomenon (Akerlind, 2005c pp. 322-323; Marton & Booth, 1997 pp. 124-128).

Represented in the categories of description are the qualitatively different ways that the participants experience a phenomenon and this in turn identifies which aspects of the phenomenon are held most prominently in the participants’ focus of awareness. ‘Hence, the limited number of qualitatively different ways in which something is experienced can be understood in terms
of which constituent parts or aspects are discerned and appear simultaneously in people’s awareness’ (Akerlind, 2003 pp.45-47). Marton and Booth explain this *structure of awareness* constitutes the different ways people experience the same aspect – that is, the ‘dimensions that are discerned and are simultaneously focal in awareness’ (1997 p. 108). People are aware of some aspects more prominently than others at all times and our awareness changes all the time. Some aspects are in the foreground, others recede to the background while others are in the margin of awareness.

Marton and Booth (1997 pp.86-87) argue that to experience a phenomenon, one must *discern* it from its context and assign a meaning to it. Therefore, each experience has two aspects – 1) a *structure* and 2) a *meaning* (also referred to as a referential aspect). The structural aspect of an experience is the way people discern the parts and the whole and how these relate to each other and to the context. The referential aspect shows how the phenomenon is seen by people. Both structure and meaning are intertwined in the way people experience a phenomenon. However, the resulting categories of description do not represent an individual’s experience. Rather, they capture the group’s collective experiences.

Structure and meaning are fundamental to understanding learning. From a phenomenographic perspective, Bowden and Marton believe that learning is seen as ‘a change in people’s ways of experiencing a phenomenon in, or an aspect of, the world around them… to experience something involves different meanings and structure, to recognise the whole and the parts and the way they relate and what they all mean’ (2004 pp. 30, 31).

When considering the experience of learning, the structural aspect refers to *how* a student approaches learning and the referential aspect refers to *what* the student believes he or she learns. The *what* and the *how* of learning are important aspects from the phenomenographic perspective as they are considered to be ‘two interwoven aspects of the same whole’ (Marton & Ramsden, 1988 p. 273). Marton and Ramsden explain ‘the two aspects simply cannot exist without one another’ (1988 p. 273). My study will explore
both the *what* and the *how* of students’ experiences of learning information literacy.

In this way, phenomenography is an eminently useful research approach to investigate students’ experiences of learning information literacy. In the following sections, I detail my research design, data collection and data analysis.

**Methodology**

**Research design**

The most important aim in recruiting data sources for phenomenographic research is to achieve maximum *variation* in students' experiences. As the then Education Librarian across two campuses of Griffith University, I recruited study participants from two distinct areas.

The first came from the Bachelor of Technology Education, a four-year undergraduate program that prepares teachers for careers in industrial technology and design, technology studies, graphics and engineering technology. In the past Technology Education had been referred to as manual arts, with students commonly working with materials such as wood, metal and plastics and in areas such as computer assisted design and technical drawing. The cohort was predominately male and comprised about 50% school leavers and 50% mature aged, generally from a trade background. Much of the program is applied and a large proportion of the assessment is practical, comprising folios, workshop activities, design and construction using problem-based learning. Seven Technology Education participants were recruited, with five being mature aged tradesmen and two entering the program directly from school. Three participants were from 3rd year, with the remaining four being 4th year students. All participants were male.
The second group of students were recruited from education courses that require more traditional text-based assignments and research. The eight participants in this group included two males and six females. All were mature aged students, with four former teachers and two in-service teachers. One was an undergraduate and the remainder were postgraduate students, three of whom were doctoral students.

The focus on recruiting participants was on the potential differences and similarities in learning to find and use information between text-based and more practical disciplines. As students were asked to reflect back on their learning experiences across their years of university, students from 1<sup>st</sup> and 2<sup>nd</sup> years were intentionally not approached. The limit of fifteen participants in total reflected the recommended minimum number to achieve variation in a phenomenographic study whilst remaining within the practicable scope of this study (Trigwell, 2000 p. 66). The demographics of the participants are represented in Table five. The names are pseudonyms.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jeanette</td>
<td>Mature aged, postgraduate, former teacher</td>
<td>Text-based students</td>
</tr>
<tr>
<td>Bill</td>
<td>Mature aged, doctoral student, school principal</td>
<td></td>
</tr>
<tr>
<td>Elizabeth</td>
<td>Mature aged, doctoral student, in-service teacher</td>
<td></td>
</tr>
<tr>
<td>Sandy</td>
<td>Mature aged, postgraduate, former teacher</td>
<td></td>
</tr>
<tr>
<td>Veronica</td>
<td>Mature aged, postgraduate, former teacher</td>
<td></td>
</tr>
<tr>
<td>Keegan</td>
<td>Mature aged, doctoral student, school principal</td>
<td></td>
</tr>
<tr>
<td>Karlee</td>
<td>Undergraduate</td>
<td></td>
</tr>
<tr>
<td>Kimberley</td>
<td>Mature aged, postgraduate</td>
<td></td>
</tr>
<tr>
<td>Zachary</td>
<td>Trade background, 3&lt;sup&gt;rd&lt;/sup&gt; year</td>
<td>Technology Education students</td>
</tr>
<tr>
<td>Percy</td>
<td>Mature aged, trade background, 3&lt;sup&gt;rd&lt;/sup&gt; year</td>
<td></td>
</tr>
<tr>
<td>Callam</td>
<td>School leaver, 4&lt;sup&gt;th&lt;/sup&gt; year</td>
<td></td>
</tr>
<tr>
<td>Cody</td>
<td>School leaver, 4&lt;sup&gt;th&lt;/sup&gt; year</td>
<td></td>
</tr>
<tr>
<td>Cooper</td>
<td>Mature aged, trade background, 4&lt;sup&gt;th&lt;/sup&gt; year</td>
<td></td>
</tr>
<tr>
<td>Howard</td>
<td>Mature aged, trade background, 3&lt;sup&gt;rd&lt;/sup&gt; year</td>
<td></td>
</tr>
<tr>
<td>David</td>
<td>Mature aged, trade background, 3&lt;sup&gt;rd&lt;/sup&gt; year</td>
<td></td>
</tr>
</tbody>
</table>

Table 5 Study participant demographics

Data collection and analysis

Data collection
Interviews are the preferred means of collecting data in phenomenographic studies. Semi-structured one-on-one interviews were conducted with students
in a library study room. Kvale explains that the semi-structured interview seeks to obtain descriptions of participant's interpretation of their life world. He describes the techniques of qualitative interviewing, which I have adopted including: 1) having prepared questions in addition to an openness to flexibly probe participant’s responses; 2) briefing and debriefing participants; 3) and creating a comfortable environment so participants feel encouraged to relax, reflect and respond to questions (1996 pp. 124-125). Human Ethics approval was granted according to Griffith University protocols (see Appendix A and B).

**Pilot study**
Pilot interviews were conducted with one Technology Education and one text-based student. These interviews took between 45 to 60 minutes and were audio recorded. The questions were open-ended and went from a specific focus on a project or assignment the student had recently completed, to a more general focus on their learning. The pilot interviews were conducted to practise phenomenographic interviewing skills, to see if the students understood the questions, to refine the questions if needed and to see if sufficient variation was being solicited (Akerlind, Bowden, & Green, 2005 p. 81; Bowden, 2005 p. 19).

The first two questions asked students to describe how they went about a specific assignment and how they found and used information for this assignment. These questions provided a specific context for the students to focus on and allowed them to relax into the interview by talking about concrete things that were very familiar to them. It also provided me with specific information literacy aspects to follow up later. The next two questions asked participants to reflect back on comparable assignments and note similarities and differences in this approach and in the way that they have learned to find and use information or incidences of successful or unsuccessful learning experiences. These questions also elicited concrete examples and provided evidence of the different aspects of learning information literacy held in the participant’s awareness.
These contextual questions were followed by four open questions, which focussed specifically on learning to use information. By this stage students had been talking about their context and were able to reflect more broadly on the learning that resulted or contributed to that context. So for example, by talking about how they designed or constructed an artefact or searched a database to find information and then used it to write an assignment, the student’s thinking and conversation could shift more naturally to how he or she learned to do these things (Akerlind, 2005b pp.104-107).

The pilot questions were:

<table>
<thead>
<tr>
<th>Q1. How did you go about doing this project/assignment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2. How did you go about finding and using information for this project/assignment?</td>
</tr>
<tr>
<td>Probes for Q1 and 2</td>
</tr>
<tr>
<td>What did you need to know in order to do this?</td>
</tr>
<tr>
<td>How did you learn how to do that?</td>
</tr>
<tr>
<td>Q3. Can you think of a project/assignment when you used information effectively? Why was it effective? How did you learn to do this effectively?</td>
</tr>
<tr>
<td>Q4. Thinking back to a previous project/assignment, would you have done it the same way as you did this one? What’s the same or different? If different, how did you learn to do it differently?</td>
</tr>
<tr>
<td>Q5. Looking back at your years at university, how have you generally learned how to find and use information? What have you learned in the last couple of years that has enabled you to find and use information for this project?</td>
</tr>
<tr>
<td>Q6. Can you provide an example when you have learnt new skills, knowledge or ways of learning to find and use information? What works best for you?</td>
</tr>
<tr>
<td>Q7. Finish this sentence for me. Learning to use information effectively is…</td>
</tr>
<tr>
<td>Q8. Reflecting back on what we have discussed today, are there any other comments you would like to make on your experiences of learning to use information?</td>
</tr>
</tbody>
</table>

The pilot interviews were transcribed and discussed with supervisors to see if the questions elicited the richness and depth of variation of experience. It was agreed with supervisors that the participant responses for both pilot interviews were useful, so these were included in the eventual collective pool. However,
the questions were slightly revised. While the interviews commenced with a focus on a specific assignment, participants often referred to their general orientation and learning style so it was considered worthwhile to seek their reflections on how they felt they learned best and how they tended to approach learning to find and use information.

*The final core questions were:*

| Q1. Can you tell me how you went about this project/assignment? |
| Q2. Can you describe a time during this project/assignment when you found and used information effectively? Why was it effective? |
| Q3. Equally, can you remember a time when you weren’t successful in finding and using information? What happened? How could you have learned to do that? |
| Probes for Q1-3: |
| What did you need to know in order to do this? |
| How did you learn how to do that? |
| Why was this important? Why did you choose to do that? |
| Q4. Thinking back to a previous but similar project/assignment, would you have used information in the same way as you did for this one? What’s different? If different, how did you learn to do it differently? |
| Q5. Looking back at your years at university, what have you learned in the last couple of years that has enabled you to find and use information for this project? How did you learn to do these things? |
| Q6. How would you describe your approach to learning to use information? |
| Q7. Finish this sentence for me. Learning to use information effectively is… |
| Q8. What would have assisted you earlier to learn to find and use information? |
| Q9. Reflecting back on what we have discussed today, do you have any other comments on your experience of learning to use information? |

An extensive number of probes (some prepared others spontaneous and specific to the student responses) were used during the interviews to explore deeper and follow the threads of students’ responses. The main difficulty I encountered in all interviews was extracting student experiences that related to *learning* information literacy. Students were very forthcoming on how they
went about finding and using information for the assignment but less able to reflect on how they learned to do these things. The probes and open questions from question five on were especially important in this regard and were designed to uncover more information on learning. For example in responses to many statements, participants were asked, ‘How did you learn how to do that’?

Interviews were then transcribed verbatim. Conducting the pilot interviews and transcribing and reflecting after each couple of interviews with my supervisors also gave me an opportunity to review my interviewing skills. The need for me to set aside my personal conceptions was also an imperative. My inexperience with in-depth interviewing also made it difficult to ensure I delved deeply enough to ascertain the students’ meaning, rather than what the students were saying. Carefully designed questions, extensive probes and the pilot study helped overcome this potential problem. As a novice interviewer, the other difficulties I encountered were recognising significant responses that required more probing at the time, not leading the participants, and not introducing new concepts that were not mentioned by students (Akerlind, 2005b p. 107).

**Principles of phenomenographic data analysis**

The general principles of phenomenographic data analysis are well documented (see Akerlind, 2003, 2005a, 2005b, 2005c; Bowden & Green, 2005; Bowden & Walsh, 2000; Marton, 1986; Marton & Pong, 2005; Trigwell, 2000). Most commonly, the iterative process of phenomenographic data analysis involves reading the transcripts a number of times, initially with an open mind, then with a specific focus each time.

Phenomenographic researchers do not enter the data collection or analysis phase with predetermined theories, hypotheses or categories. Instead researchers need to bracket their own perceptions in order to look for qualitative differences and relations between people and the phenomenon they are experiencing. Through several readings, researchers iteratively search for meaning and structure, looking for similarities and differences in the
way the phenomenon is experienced (Akerlind, 2005a pp.68-71; 2005b pp. 119-122).

The search for the meaning and structure represents the qualitatively different ways people experience the phenomenon and collectively these meanings make up the experience of the phenomenon for the group (Trigwell, 2000 p. 64). Evidence of meaning and structure comes from both examining a transcript in its entirety and in relation to the other transcripts. So meaning and structure are not determined from statements made by individuals or in isolation from other transcripts. Meaning as expressed in qualitative differences is not a consistent characteristic of a person or the sample population from which the person is drawn. Meaning exists only in the given time, context and place in which the person is in. As such, people may express different meanings or hold different aspects in their awareness at different times or if circumstances change (Akerlind, 2005c p. 331; Akerlind et al., 2005 p. 81; Marton & Booth, 1997 pp. 82-83; Marton & Pong, 2005 p. 346).

Consistent with the phenomenographic tradition, the everyday language of the student may be described using the language of the researcher. This is because the researcher is looking for the meaning underlying the student’s description and so, paraphrases the student’s description of his or her experience. The qualitative differences are reflected in categories of description. These categories represent the collective qualitatively different experiences of the phenomenon, rather than individual students. The categories of description are empirically based insofar as they can be demonstrably justified by evidence from the transcripts (Akerlind, 2005b p. 124).

While the categories represent qualitatively different ways of experiencing the phenomenon, the categories are also connected in a logical way. Akerlind explains,
The structural aspect has two components: how the phenomenon is discerned as a whole, including how it is distinguished from and related to its context; and how different parts of the phenomenon are discerned, including their relationship to each other and their relationship to the whole (2003 p. 48).

The structure is often hierarchical with the higher category subsuming the categories below it. The structure may also have some categories nested and others branching off. A hierarchical or nested structure reflects increasingly more complete ways of experiencing the phenomenon (Akerlind, 2005b p. 120; Akerlind et al., 2005 p. 96). Together the meaning and structure, which are represented in categories of description, make up the way the group experiences a particular phenomenon. Together, the meanings and structure are represented in an outcome space. The outcome space illustrates the relationship within and between categories of description (Akerlind, 2003 pp. 47-50; Marton & Booth, 1997 p. 124; Trigwell, 2000 p. 64).

In this way the outcome space illustrates the relationship within and between the different aspects held in peoples’ awareness of the phenomenon, some aspects of which are in the foreground layer of their awareness, others which are in the background layer, while others may be in the margins of peoples’ awareness. Marton and Booth explain,

A certain way of experiencing something can thus be understood in terms of the dimensions of variation that are discerned and are simultaneously focal in awareness, and in terms of the relationships between the different dimensions of variation (1997 p. 108).

Data are also analysed to reveal themes of expanding awareness (Akerlind, 2003 pp. 89-91). These are critical themes that run through experiences, which illustrate qualitatively different ways people experience the same aspect of learning information literacy. These themes are present but are experienced differently in each category. The way the themes are perceived illuminates the meaning the experience has for the student.
**Analysis process**

Drawing on these principles, I now provide an overview of the process of phenomenographic analysis. In the next section, I document the processes used in this study.

It is recommended that subsets of interview transcripts are selected for initial analysis. The interview transcripts are read numerous times, with each reading having a different focus – for example, on the individual and the group, specific aspects and with attention to similarities and differences. Notes are made and transcripts may be sorted by qualitative differences (Akerlind, 2005a pp. 67-68).

With a focus on meaning then structure, participant statements are interpreted both in the context on the whole transcript and the group of transcripts. Draft categories of description are formed and these are also checked numerous times against the transcripts. Each reading serves a different purpose, equally seeking evidence to support and refute draft categories. As such, there can be much revision of the categories. Key quotes that provide evidence are highlighted (Akerlind, 2003 p. 56; 2005a pp.70-71; 2005c p. 324; Akerlind et al., 2005).

In the search for characteristics that reflect critical differences within and between categories, transcripts may be re-sorted a number of times throughout the whole process. The search for structure within and between categories also involves consistent checking of the categories against each other and the transcripts. There exists a continuous and rotating focus between meaning and structure. If an initial batch of transcripts has been selected for analysis, the remaining transcripts are then considered against the draft categories of description and the evidence in the transcripts, and the categories are adjusted as necessary (Akerlind, 2003 p.56; 2005c pp. 324-326).
**My analysis process**
The process I used is based on the overview above and detailed as follows. After reading each transcript twice, I selected a subset of eight transcripts to work with initially, setting the others aside (Akerlind et al., 2005 p. 91). Three were Technology Education students and the remaining five were text-based students. The transcripts were annotated in pencil to highlight quotes that showed qualitative differences. The focus to this stage was on the group. With a new focus on the individual, further notes and a summary of the main points of the transcript were then made on a separate sheet, which was subsequently attached to the transcript. With a continued focus on the individual, each transcript was read through again, summarising key aspects such as the sources of information that students consulted, and the student’s intentions and strategies in relation to learning information literacy.

Returning to focus on the group and going back to my notes, I listed similarities and differences on how students learned to find and use information. I copied responses to the core open questions (for example – Finish this sentence for me. Learning information literacy effectively is…) from each transcript into a Word document so all the answers were in one document. This document was examined for similarities and differences, although I didn’t find this activity very useful as much of the illumination of meaning came from keeping the whole transcript in mind and from participant’s responses to probes and other questions, rather than just the core questions. Going back to the original transcripts, I then wrote meaning statements to describe how that person experienced learning information literacy. For example *learning information literacy is seen as…* or *learning to use information is seen as…*or *learning to find information is seen as* (Akerlind et al., 2005 p. 84).

The meaning statement for *learning information literacy is seen as* formed a draft set of categories of description. The categories represent the students’ meanings, not what the students literally say. As the meaning is also derived from examination of the whole transcript and not just statements, as I was going through the transcripts, I would ask myself, *what must learning
information literacy mean to the student if he or she is saying this? Students may say similar things but mean different ideas and conversely, express similar ideas using different terms (Bowden, 2000 p. 56). To ensure transcript excerpts that are used as evidence reflect the true meaning of the students, I examined the excerpts in the context of the whole transcript. The structure of awareness for each category was analysed, as was the what and how of learning.

The draft categories were iteratively reviewed with reference to the transcripts and were adjusted several times. Some draft categories remained constant; while other categories were reconfigured or expanded. Themes of expanding awareness and the qualitative differences in these themes as they appeared in each category were identified (Akerlind, 2005b pp. 122-123). Various aspects of the data were examined in tandem with other aspects to illuminate the categories and themes. For example, the draft theme of “interacting with other people” was reviewed in conjunction with both the information sources and approaches to learning that students used. The transcripts were revisited countless numbers of times, both to seek answers to specific questions and to seek critical differences between categories and themes. The remaining seven transcripts were read in a similar fashion to see if they would provide evidence that would result in the categories of description being revised, which resulted in one category being split into two.

While I had written many notes and collated data into a number of different tables and lists, it was at this stage I started to write the first draft of my findings chapter. Categories were re-examined for internal structure and also to clarify the structure between the categories. The transcripts were consulted endlessly, quotes were rechecked to ensure they accurately represented the description and the categories were readjusted as needed. Both the transcripts and my findings were examined repeatedly to check for meaning and structure. Throughout this process too, I had regular meetings with my supervisors to discuss aspects of my study. On two occasions, we jointly read two transcripts to check if my interpretation of the students’ experiences was credible and to seek agreement on critical differences.
**Evaluation of qualitative inquiry and phenomenography**

In this section, I discuss issues of reliability, validity and generalisability of qualitative inquiry, although these concepts are often seen to be problematic and irrelevant, arising from positivist epistemologies (Akerlind, 2005c; Cope, 2004; Kvale, 2007; Kvale & Brinkmann, 2009; Sandberg, 1997).

**Reliability**

Reliability refers to the consistency and trustworthiness of research results and is often judged by whether the results can be reproduced by other researchers (Kvale, 2007 p. 122; Kvale & Brinkmann, 2009 p. 245; Sandberg, 1997 p. 204). The non-dualist ontology of phenomenography promotes multiple realities that are experienced differently by people. With different interpretations of reality, researchers (Cope, 2004 p. 9; Johansson et al., 1985 p. 251; Saljo, 1988 p. 45; Sandberg, 1997 p. 204), argue the reliability of one researcher being able to replicate the same categories of description as another researcher is both unnecessary and unlikely. In addition, with phenomenographic analysis described as a process of ‘discovery’ (Marton, 1986 p. 35; Saljo, 1988 p. 45), the researcher brings their own uniqueness to the study (Cope, 2004 p. 9) and the resulting categories reflect the researcher’s interpretation of the interview data (Sandberg, 1997 p. 208).

Interjudge reliability, which involves different researchers co-judging data then coming together to compare results, has been used to increase reliability in phenomenography (Cope, 2004 p. 9; Saljo, 1988 p. 45; Sandberg, 1997 p. 205). However, the focus on an objective world, the difficulty that arises from researchers’ differing levels of familiarity with data and the lack of reflection on the appropriateness of the research method all cast doubt on interjudge reliability as a reliability check (Cope, 2004 pp.9-10; Sandberg, 1997 pp. 205-208). Hence, it is not widely used in phenomenography. While reliability may be a questionable concept in phenomenography and other qualitative approaches, it is argued that other researchers and readers should still be able to recognise the different ways of experiencing a phenomenon through the rich description and evidence provided by the researcher (Johansson et al., 1985 p. 251).
There are also several checks which are appropriate for use with the phenomenographic research approach, which I have employed to ensure rigour in this study and trustworthiness of results. One such framework is Sandberg’s ‘interpretive awareness’ (1997 p. 209). Through an awareness of one’s own subjectivity and acknowledging the potential impact this has on the research, the researcher can take steps to overcome these effects.

As a librarian with a decade of experience with information literacy education and the delivery of information services to students, I came into the study with preconceived ideas, drawn from my own experiences. By acknowledging the ways my preconceptions and subjectivity might influence my research approach, I have been able to keep a check on my interpretations at each stage of the process. For example, during the interviews I was careful not to introduce terms in follow-up probes that were library-based and which had not been used by students. Similarly, throughout the data analysis, I had to bracket my experiences as a librarian when interpreting what students were reporting – ‘in order to be as faithful as possible to the individuals’ conceptions of reality’ (Sandberg, 1997 p. 209).

Aspects of Sandberg’s interpretive guidelines (1997 p. 210) that I adhered to include:

- **Keeping the phenomenon (learning information literacy) in the foreground** as I designed and conducted the research. This means developing the research question, objectives and the interview questions, selecting the study sample, and analysing the transcripts in a way that would discover the different ways students experience this particular phenomenon. This was hard at times, as it was difficult to separate students’ experiences of information literacy versus learning information literacy.

- **Describing rather than explaining the phenomenon.** For example, in the results chapter, I provide a description that is supported by student quotes, rather than an explanation of the experiences. However, in the
discussion chapter I analyse the results in relation to other studies and curriculum frameworks and recommend the results in terms of implications for practice.

- **Treating all aspects of the experiences as equally important** in the interviews and subsequent analysis. This means being aware of and ensuring that my subjectivity does not influence the degree of importance I initially attach to particular statements.

- **Checking interpretations and categories of description against the data and each other** until the categories are stable. For example, reading transcripts with a particular view each time and checking and re-checking the data and categories for meaning and structure.

So through using a framework of interpretive awareness, researchers can acknowledge their subjectivity and take measures to address this throughout the research process, thus establishing reliability. Kvale also argues that a recognised subjectivity can be constructive in interview data as it may ‘come to highlight specific aspects of the phenomenon being investigated and bring new dimensions forward, contributing to a multi-perspectival construction of knowledge’ (2007 p. 86).

**Validity**

Validity refers to the strength and justification of the research results and involves a continuous process of ‘checking, questioning and theorizing throughout an interview investigation’ (Kvale, 2007 pp. 87,122; Kvale & Brinkmann, 2009 p. 246). Checks for validity that I have used include arguments for phenomenography as an appropriate approach to answer my research question; checking with students for understanding during interviews; continuous checking of my interpretation against the data; and full descriptive accounts of the steps I have taken throughout the research process. These checks, which are used throughout all stages of the research process, are designed to ensure quality and trustworthiness of both process and findings, thus enabling readers to judge that the steps I have taken are

Kvale also proposes two further checks - ‘communicative validity’ and ‘pragmatic validity’ (2007 pp. 125-126; 2009 p. 253-260). Communicative validity involves the researcher explaining, defending and testing his/her interpretations with others. Testing interpretations of results with study participants is not common in phenomenography. However, testing with peers and other audiences is a widely-used form a judging credibility (Cope, 2004; Guba, 1981 p. 85; Kvale, 2007 p. 125; Kvale & Brinkmann, 2009 p. 253). Throughout this study, I have regularly presented to academics and other students on the different stages of my research process. Sharing each step of the process with my supervisors and the joint reading of two of the transcripts to check my interpretation strengthens feedback and acceptance. My draft results were also cited in the book, Informed Learning by Professor Christine Bruce (2008).

Pragmatic validity involves judging the ‘practical consequences’ (Kvale & Brinkmann, 2009 p. 247) of the study – so in this case, how does this study contribute to information literacy learning and teaching? Examiners and readers of this thesis and audiences to which these results will be disseminated, will judge this. Readers will also be the judge of whether this story of students’ experiences of learning information literacy and the approach used to discover and document these experiences is meaningful, credible, coherent, internally consistent and empirically supported by evidence.

Generalisability

Generalisability refers to whether the research results are transferable to other populations and contexts (Kvale, 2007 p. 126). Phenomenography is underpinned by the principle of qualitative, interpretive research that there are multiple realities, rather than one ‘universal knowledge that is valid for all places and times’ (Kvale, 2007 p. 126; Kvale & Brinkmann, 2009 p. 261). As such, the concept of generalisability in qualitative studies is disputed ‘because
phenomena are intimately tied to the times and the contexts in which they are found' (Guba, 1981 p. 80). Guba (1981 p.81) argues that as contexts can be similar, a better concept might be transferability. While phenomenographic studies are context dependent, research outcomes produced in one study may be common to other studies, if populations share similar characteristics or contexts.

To aid transferability, I have purposively sampled students to maximise variation of experiences (Guba, 1981 p. 86). For example, I sought students who had entered the Technology Education program as school leavers and as mature-aged tradesmen and a range of text-based students. I have also richly describing the students and the context to allow reader to gauge similarities and differences sufficiently to judge the transferability of the study to another (Guba, 1981 p. 86).

**Conclusion**

The phenomenographic research approach is best equipped to answer my research question because my aim is to describe and understand the students’ experience of learning information literacy. It is the variation of the students’ approaches and experiences and the meanings that they attribute to this, that form the basis of my findings, which are reported in the next chapter. This variation is best uncovered using phenomenography because it describes the world as seen by the student.
Chapter 4
Ways of Experiencing Learning Information Literacy

Introduction

This chapter describes the ways that learning information literacy is experienced by the 15 education students in my study. Six categories have been identified. I have assigned a brief descriptor that reflects the focus of each category. This appears in parentheses following the experience below. To shorten the description, I will often use the term *experience* rather than *ways of experiencing*.

Learning information literacy is experienced as:

1. Learning to find information (finding information);
2. Learning a process to use information (process);
3. Learning to use information to create a product (product);
4. Learning to use information to build a personal knowledge base in a subject area (personal knowledge);
5. Learning to use information to advance disciplinary knowledge (advancing knowledge);
6. Learning to use information to grow as a person and to contribute to others (community).

This chapter is divided into two parts: an overview of the outcome space and a detailed description of each category.

Outcome space

As described in the methodology chapter, ways of experiencing are encapsulated into *categories of description*, which reflect the researcher’s interpretation of the students’ experiences. It is important to note that each
category does not represent individual students as each category may be informed by multiple students.

Each category describes the meaning and structure of the ways of experiencing learning information literacy. As described in chapter three, the meaning or referential aspect, is what this way of experiencing learning information literacy means in this context. The structural aspect represents the relationship in and between the categories and the way the same facets of learning information literacy are viewed qualitatively differently in each category.

The categories are mapped into an outcome space, which represents the group’s collective awareness and experience of learning information literacy. The outcome space is seen in Figure 3.
Figure 3 Outcome space

- **Category 1**
  Learning to find information

- **Category 2**
  Learning a process to use information

- **Category 3**
  Learning to use information to create a product

- **Category 4**
  Learning to use information to build a personal knowledge base

- **Category 5**
  Learning to use information to advance disciplinary knowledge

- **Category 6**
  Learning to use information to grow as a person and to contribute to others
With the exception of categories five and six, the categories of description are inclusive. This means that the experiences of learning information literacy in the higher categories are underpinned by, and inclusive of, the lower categories. So for example, the skills and capability to find information (category one) and learn subject content (category three) underpin building a personal knowledge base (category four) and advancing disciplinary knowledge (category five). However, by presenting the categories in this fashion, it is not intended to imply that the categories represent stages a student must sequentially pass through or logically progress from one category to another to learn. Rather, the outcome space captures the variation in ways students experience learning information literacy, with the higher categories representing more expansive views.

While represented at the same level of the outcome space, categories five and six are not inclusive of each other. Both are underpinned by categories one to four. However, categories five and six use information and learning in different ways. Category five (advancing knowledge) employs academic and professional knowledge, experience, scholarship and research as an intellectual endeavour to advance knowledge. Category six (community) adopts a value-laden and idealised view of the importance of learning to use information in a socially responsible way, to grow personally and to contribute to others.

In the next section, the six categories of description are described in detail. Each category is described in terms of the:

- Meaning or referential aspect of each experience;
- Relationship within and between the categories or the structural aspect;
- Students’ focus of awareness (which is graphically depicted in a series of concentric circles, with the innermost circle representing the primary focus, then moving out to the secondary or background focus of the students’ awareness. In some categories there can also be seen a
focus that is in the margin and this is represented by a boxed dotted line);

- *What* or the content of learning (direct object);
- *How* of learning (including the act of learning, strategies and intentions (indirect object));

- The themes of expanding awareness:
  - Learning;
  - Information;
  - Information literacy;
  - Affective aspects;
  - Reflection.

The categories are illustrated by quotes from the interviews to support and enrich the description.
Category 1. Learning to find information (finding information experience)

Overview

In category one, learning information literacy is experienced as learning to find information. Learning to find information comprises three intertwined aspects: 1) learning about sources of information; 2) learning to evaluate and select appropriate information; and 3) learning to use information and communication technologies (ICTs) to access and retrieve electronic information.

This category is illustrated by the following quote from David, which was in response to the researcher’s question: What does learning information literacy mean to you?

DAVID: Learning to be able to retrieve information and be able to find it.

When learning about sources of information, students describe learning about the best location for the information they seek. Students report sources of information as:

a) Other people such as their peers, lecturers, experts and networks outside of the university, friends and library staff;
b) Books, journal articles and websites; and
c) Information tools such as the Internet, Google, library databases and the library catalogue.

The second aspect of learning to find information is learning to evaluate and select the information that one finds. In learning to evaluate information, students report developing skills and strategies to assess information for its relevance and appropriateness to the research topic, task or assignment. In some cases this means judging the scholarliness of the information. Students
see the development of evaluation skills as critical to discriminate between the large quantity of electronic information that is retrieved.

In the third aspect of learning to find information – learning ICTs – students describe developing skills to use information tools such as the Internet, library catalogue, library databases, software programs and applications. It is developing this proficiency in using ICTs that enables students to more easily find information that is stored electronically.

**Structure of awareness**

The primary focus of this category and therefore in the foreground of students’ awareness is learning to find information, as seen in Figure 4. The secondary focus of this category is three-fold, reflecting the three intertwined aspects of learning to find information in this experience. As a result, students’ awareness focuses on learning about sources of information; learning skills to evaluate sources for their appropriateness and learning skills to use ICTs in order to access and retrieve electronic information.

Learning to use information is limited in this category, hence in the margin of the students’ awareness.

![Figure 4 Category 1 - Structure of awareness](image-url)
**The what and how of learning**

In category one, students experience the *how* of learning as the act of learning skills and learning about sources of information. The indirect object that this act is directed at is learning to find information. Students see the content (direct object) to be learned is knowledge of, and skills in navigating the world of information. The *what* and *how* of learning is illustrated in Figure 5.

![Diagram of the what and how of learning]

**Approaches to learning**

**Intentions**

Students report their intention is to learn find the best, most relevant information for their assignments and research in the most effective and efficient way. This intention often arises from the realisation that information sources that had been used in the past are no longer satisfactory. For instance, Jeanette realised her strategy on using books as an undergraduate student was not adequate when she became a postgraduate student:

JEANETTE: I think I started off with a lot of undergraduate strategies and so I would go the shelves in the library that were about linguistics and read the titles and think this looks interesting, pick it up, look at the Table of Contents. If I were looking for a particular thing, I’d look in the index, look at the chapter heading, say yes this is interesting and I’d always wander around with about
15 or 20 books. And then I realised with that you can’t get enough specific
detailed information on a very narrow focussed area – only more general
information, so then I thought I have got to use databases.

The intention is in response to a particular need or with a specific assignment
in mind. Kimberley describes needing to have an aim in mind rather than
finding information by browsing:

KIMBERLEY: One of the things that it is absolutely critical is to understand in
the first instance what it is that you are setting out to achieve. You may not
know the end result but you have to have a good idea of what it is about
without that you can go in randomly, not knowing what you are looking for and
it becomes highly ineffective and inefficient way of looking for information. I
tend to use the analogy of the person going into the shopping mall. You can
go into the shopping mall because there is nothing to do and you can spend a
lot of time and at the end of the day, there may have been something that you
needed but didn’t get. On the other hand, if you have a clearer idea of what
you want, you more quickly develop a strategy. Having a sense of what you
want helps you develop a strategy for looking for the information – it becomes
a more efficient process.

**Strategies**

The act of learning skills and learning about sources includes the following
strategies:

**(1) Learning to find information by doing**

Learning by doing involves students engaging with information sources and
tools in an active physical and intellectual way and learning as they go along.
In this category students describe *hands-on activities, trying things out,*
*practising, teaching yourself, gaining experience* and *working one’s way
through a program or application:*

CODY: I saw the library courses that they run sometimes and I always
thought if I did one of those early, it would have helped me learn to gather
information but I always did it myself and did it the hard way. I forced myself
to learn the library system for that and when it came to doing real
assignments I knew how to look up books and hold them.

Students experience learning by doing as learning skills to use computers, the
library catalogue, library databases and the Internet:
INTERVIEWER: So how did you learn to search the Internet?
PERCY: Simply by doing it. Getting on the Internet and doing it. I am a lot slower than most of the other guys. They seem to know exactly where to go on the screen to transfer over to other things where I take it a bit slower but I can basically work my way through most websites now to get the information that I need.

Practising a skill to apply and reinforce learning is seen as a particularly important strategy to learning how to use computers:

SANDY: I’m not so good at computers but sometimes I use the Internet, like Google, to search for information related to my research topic.

INTERVIEWER: What do you think would help you to learn to use the computer?
SANDY: I think the more I use the computer, the better I can handle it so I would not be afraid of it anymore. Practice can make us feel more confident.

(2) Learning to find information by trial and error

Trial and error is a form of learning by doing that students describe which involves experimenting and trying different information sources, tools and keywords. The serendipitous character of trial and error is described by Kimberley when she finds that one information source leads to another, more successful one:

KIMBERLEY: I began by going onto the electronic databases at Griffith University and I found that I wasn’t getting what I would call “hot hits”. I kept finding the same information which I wasn’t finding useful. Then I can’t remember how I chanced upon it but it occurred to me that I might try a more generic search engine so that’s when I went to Google and I typed in some keywords and out it came and Google itself suggested it – there was a thing about Google Scholar so I went there and since then I have been using it primarily because it seems to have most of the information I need, although the full-text of the information is not always available. However, if I find something through Google Scholar which can only be accessed through payment, then I go back to the university databases and look there and see if I can find it. So far that has proved quite a fruitful strategy.

Other times trial and error has a more purposive character as illustrated by the following example from Cody. Here he describes learning a strategy to use information sources. Cody explains that his intention is to find information to develop a personal perspective:
INTERVIEWER: So how did you learn about sources of information?
CODY: Trial and error basically. When I started off in 1st year I was told to go straight to the library and I’d get six or seven books and I’d read through all of them and get bit to put into my reference list and it looks very good but I found that if you go to the Internet first and jump to as many sources as you can you can figure out what your own opinion is on the research and once you have that you can find other authors in the library who agree or disagree with what you are saying.

All students in the study mention trial and error as a strategy for learning to use library databases. While most students acknowledge there were similarities with databases, they often appear to be confused by the different interfaces and they recognise it is important to develop the skills to work out how to use each relevant database.

Trial and error is a strategy that students particularly reported using when learning to identify keywords to form search statements. Students describe using certain keywords in a database and after evaluating the search results, perform new searches using the different terms they find. They also describe frequently starting with general terms before moving to specific ones. Bill and Jeanette exemplify the students’ use of trial and error in learning to search databases and constructing searches:

INTERVIEWER: You talk about learning databases, how did you learn to use those?
BILL: Trial and error – after a bit of advice from a librarian in terms of what I would probably use in ProQuest [a database] and so on. It was just a matter of looking through them and doing keyword searches again, using those words and strings of words and trying to see what it produced for my topic.

JEANETTE: I think you have to learn to define your key words better and so your searches better but it’s difficult because sometimes you have to use general terms to find articles but then you have to be able to refine it down enough so that you can find the articles that you want and because they always they all use different terms, you can sometimes find what you want in a very obscure place. I guess it is being familiar with different databases.

(3) Learning to find information by interacting with other people
In this strategy, students report interacting with other students, lecturers, tutors, experts, professional contacts and friends outside of the university and library staff. Other people are both a primary source of information and a referral to sources of information, as illustrated by Jeanette:
JEANETTE: Other students are good sources of databases, ways of finding information. Lecturers are sometimes helpful. Learning Services [academic skills advisors] are helpful.

Students actively seek assistance in learning to find information. As with the examples provided by Veronica and Cooper below, this sometimes takes the shape of simply observing others while they use a computer or library database, either as a strategy for learning (Veronica) or to use people as a source of information (Cooper):

VERONICA: People [help me learn to find information]. Not always just people at uni. Even observing what other people are doing on computers. I watch the lecturer when he is on the computer. [Strategy for learning]

COOPER: If you are looking for information, this library has been a good source of information. Having to work through my whole degree my spare time to go to library tutorials is non-existent. So the people on the help desk have been good. [Source of information]

Students report that getting assistance from other people is sometimes a circuitous process, which includes being shown how to do something or observing another person doing something, then doing it themselves while the other person watches and provides feedback. In this example, Callam uses people as a strategy for learning to find information:

INTERVIEWER: How would you describe your approach to learning to find information?
CALLAM: Working with someone else who does know and seeing someone do and discussing it, watching someone do it once then doing it myself, getting their feedback, then I can do it – that’s how I learn best.

Regardless of whether interacting with other people is used as a source of information or a strategy for learning to find information, this serves a specific purpose and immediate need. It also is the result of students identifying a deficit of knowledge and skills.
Themes

As mentioned earlier, the themes that are experienced qualitatively differently in each category are: learning; information; information literacy; affective aspects; and reflection.

Learning

Students in this category experience learning as the acquisition of skills and knowledge about the world of information. This includes the acquisition of skills to evaluate information and access electronic information. In this way, learning is additive and has a quantitative focus as seen by Kimberley:

INTERVIEWER: Finish this sentence for me. Learning to find and use information effectively is...
KIMBERLEY: A skill that can be developed.

Students describe learning to find information in response to a specific need such as an assessment item or in the case of doctoral students, a research question or problem. In this way, students take a study view of the context of learning information literacy. Having a study view means the students learn in response to and with a specific study need in mind, rather than perhaps with a view to their future careers, as is seen in some higher categories, such as category four (personal knowledge).

Information

In category one, students see information in the context of seeking or finding it. Information informs specific assessment items and includes facts, background information and research, evidence to develop a personal view or support or refute their arguments, and in the case of Jeanette – current literature on her research topic:

JEANETTE: With the research design it was more a case of looking for what other research people have done in the area, evaluating that and seeing how
it would fit in. For example, what would be applicable in your situation? So from that point of view, you can read books on your topic but basically you really have to find lots of journal articles because that's going to be the most up-to-date and current thinking in the area.

In the practical context of the Technology Education students, information includes design ideas, material and product information as illustrated by Cody, when he describes his search for information on toilet seat openers for a project he was constructing:

CODY: [I use the Internet to find information on]...existing products to start because there is no point making something that already exists. There are already foot-operated toilet seat openers but they aren't as complex or they are too complex, as they use electronics and sensors. I did a lot of research into existing products and the Internet is good like that. You can grab photos and put them into a Word document and say these are examples of products that already exist.

As information is seen in the context of finding it, the focus is on learning the skills to use the ICTs and tools for accessing information – so learning to use the computer, the Internet, library databases and catalogue. Information sources include the Internet, books, other people (lecturers, students, library staff and people outside of the university). Information is also derived from the students’ own approaches to learning – that is, information that comes from the students’ process of learning by doing and trial and error. Information is external to the person, so it is out there, waiting to be found. It is objective as it does not form part of the person.

**Information literacy**

In this category learning information literacy is experienced as learning to find information. Therefore, it follows that information literacy is experienced as the skills and knowledge a person uses to find information. As noted earlier, this encompasses 1) knowledge of sources of information; 2) skills to evaluate information and 3) skills to use information and communication technologies. As such, information literacy is the *what* of learning and is seen as a set of quantifiable skills and knowledge. Thus, students can acquire it, it can be demonstrated and measured. This view of information literacy becomes
more expansive in higher categories. The following quotes provide glimpses of the three aspects of students’ experiences of information literacy in category one:

**KIMBERLEY:** There is a lot of information available... so when I look at finding information effectively then I think that there is a high level of discrimination that becomes employed and that is where the skill becomes important. [Evaluation]

**KARLEE:** [Finding information effectively is] ...being able to identify the actual purpose you want the information for and how authentic the information is. [Evaluation]

**SANDY:** I had to improve a lot about how to use a computer in my research. Now I can use the computer to find information. [ICT skills]

**JEANETTE:** Defining your keywords and so your searches better and being familiar with different databases. [Sources]

**Affective aspects**

Students describe a wide range of feelings in learning to find information, including frustration, anxiety, excitement, pride and confidence. When compared with other categories, this category attracts a lot of negative reactions. Jeanette typifies students who frequently see searching for information as a lot of work for little return: ‘It’s a lot of stuffing around or a lot of effort for not much reward.’ Luck is seen to supplant a lack of knowledge as she continues that ‘more directly in finding information it’s whether you hit the jackpot or not’. Even when other people help you, this presupposes a level of personal knowledge that Jeanette perceives as inadequate or non-existent:

**JEANETTE:** A friend told me about JSTOR [a library database] as I’d never heard of it. Even when other students tell you how to do things, they will give you a bare minimum of information and you either have to be lucky and wing it or you never find it. Say with JSTOR they say ‘look up the databases’, but if you don’t know how to look up the databases, you are stuck.

Students report feeling confusion and anxiety when overwhelmed by things like the size of the library, the plethora of options and the complexity of the
information environment and tools. Even assistance and training in an information literacy class can be a stressful experience for some students as described by Veronica:

VERONICA: We did two nights on databases and there came a point where I could feel myself getting overwhelmed and I knew I couldn’t keep up so I had to choose to disengage. If I had been in front of a computer at that stage, I would have just turned it off.

Frustration is a common feeling that primarily arises from the students’ focus on information access and availability. Keegan recounts an incident from the past when he experienced frustration at not being able to find any information on his topic:

KEEGAN: Last year when I was desperately trying to find information on adolescent leadership in secondary school and I couldn’t find anything. I was just searching and searching and searching and wherever I was turning, I was finding nothing. I was totally frustrated.

In contrast, the source of Bill’s frustration is difficulty and delays tracking down key resources he knows exist but are not held by the library:

BILL: One of the struggles for me is you know when you are on this hunt for key reference points and you think you want to get hold of that book and it’s not available. You know that you have the research bug bad when you sit around waiting for an email saying – yes, it’s arrived.

Information technology is a particular target for frustrations as learning to find information is perceived as being difficult. Students describe believing that they cannot use ICTs very well due to a deficit of skills. Some seek help in learning to use information tools while others give up, relying on friends and existing sources of information. Students report frustration at feeling overloaded or easily sidetracked because of too much information and too little time:

BILL: I know I haven’t been as effective as I could have been in finding things on databases. Having the restriction of doing things part-time, when you get to a weekend when you want to do something that you get so frustrated that it is not doing what you want that you give up.
I’m still involved in and still trying to come to grips with the fact that technology has particularly changed the nature of information access and retrieval. The digital age has made it that you become overwhelmed with it and if you are not selective and careful about how you use your time, it can be frustrating and non-productive.

Further frustrating barriers to learning to find information are the perceived difference between learning something in a library class and then the difficulty when applying that learning on your own, as well as difficulties with remote access to restricted resources:

JEANETTE: Some of the courses, we had tutorial on how to use databases, which were great at the time but I found that when I had to translate it from doing it on the uni computers and doing it on my home computer, that it sometimes didn’t translate. Part of it was we had to set up the VPN client link [to permit remote access to restricted electronic resources] and I think it is not until you try to start doing things and you realise I can’t do that. And there was a time when I was using the computers downstairs and emailing articles home because I couldn’t work out how to find them at home.

BILL: The other thing is making sure I had all those technology links ironed out early on. Being metacognitive now, that has been a struggle for me, being able to access information.

However, positive feelings are also present. Students experience excitement at finding the information they want or when they master a skill:

BILL: Learning to find information is... frustrating but can also be exciting when you find things that fit into your frame of reference.

Students’ growing self-confidence and pride is also seen in the development of their computer skills and their ability to use information tools and sources:

PERCY: I went on the Internet because we had to explain why the vehicle worked and go into all the engineering jargon. You’d be proud of me. I got on the computer and I was on the Internet and I was searching all these sites.

Feelings of comfort and familiarity are also experienced, with many students sharing that they only used sources and tools they were most familiar with and strategies that have proven successful in the past, such as following set readings and citation trails:
KEEGAN: I always start with readings that come out from the university which then refer me to different readings… I then get onto the databases that I was most comfortable with and do a search… Then there was the advice a librarian gave me which is looking at the back of the articles to see if anything catches your eye then backward tracking. Absolutely effective and I use it not only with study but with other professional reading at work and I have also encouraged other people to use it as a method.

**Reflection**

In this category, reflection is limited to reflecting on finding information. While this encompasses aspects such as reflecting on learning skills to use ICTs and tools that are needed to access and retrieve information for their assignments and research, the main focus of the students’ reflection is on their search process and results. As such, the use of the term reflection is misleading. The term *evaluation* is perhaps a more accurate description of the type and level of activity of students in this category, whereas genuine reflection is present from categories three and above.

Students report that they would perform a search using certain keywords then evaluate the results and change their search terms as a result of this evaluation. Students like Karlee describe developing skills in finding and discerning relevant, current information through her time at university:

**INTERVIEWER:** Do you think you are doing things differently now to what you were when you started university, in terms of finding information?
**KARLEE:** I don’t overdose on the information like I used to. I used to grab anything that had something to do with the topic and had this great pile of books on the lounge room floor and now I have learned to recognise what is relevant.

**INTERVIEWER:** How did you learn to recognise what is relevant?
**KARLEE:** I guess looking at the requirements, like this book is too old. I look at the index, read the abstract.

While students do not actively reflect on themselves as learners in this category as they do in the higher categories, some students like Karlee have an awareness of and are able to articulate their preferred way of learning to find information and learning to use ICTs:
KARLEE: My biggest problem when I started university was how to access the information, not being familiar with the Internet. We did an ICT course in 1st year and that helped. A lot of my learning – I tend to learn things differently to most people I know. I am better at sitting down and fiddling with something and working it out myself than being told how to do or reading instructions because I just get fed up but I fiddle until I work it out and then it is stuck in my brain forever. I have to do it myself – I really can’t be shown.

Conclusion

In category one, learning information literacy is experienced as learning to find information. This involves three intertwined aspects of learning about information sources, learning skills to evaluate and select information and learning skills to use ICTs to access and retrieve electronic information.

A summary of the critical qualitatively different aspects of category one is presented in Table 6.
<table>
<thead>
<tr>
<th>Category 1</th>
<th>Learning to find information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meaning</td>
<td>Learning information literacy is seen as learning to find information.</td>
</tr>
</tbody>
</table>
| Structure of awareness | Foreground – learning to find information.  
Secondary – learning about sources, learning skills to evaluate information, learning skills to use ICTs.  
In the margin – learning to use information. |
| Direct object       | World of information.                                                                       |
| Act of learning     | Learning skills and about sources.                                                          |
| Strategies          | Learning by doing – hands-on, teach yourself, practise skills.  
Trial & error – experimenting with different sources, keywords, tools.  
Interacting with other people – seeking assistance, observing. |
| Indirect object (Intention) | Learning to find information.                                                               |
| Learning            | Quantitative – acquiring knowledge & skills in finding information.  
A study view of the context of learning.                                                   |
| Information         | In the context of seeking or finding it. External, objective.                              |
| Information literacy | The knowledge and skills a person uses to find relevant & appropriate information.         |
| Affective aspects   | Frustration, confusion, anxiety, overwhelmed – using technology, information overload, finding the right keywords.  
Excitement – when you find what you want, when you master a skill.  
Comfort, familiarity – using what you know.  
Growing confidence, pride – ICT skills                                                  |
| Reflection          | Limited to evaluating search process and results.  
Awareness of preferred way of learning.                                                    |

Table 6 Category 1 - Summary of qualitative differences
Category 2. Learning a process to use information (process experience)

Overview

In category two, learning information literacy is experienced as learning a process to use information. A process normally might consist of a series of structured steps, stages, activities, strategies or techniques.

This category is illustrated by the following quote from Veronica who describes both a process she developed for structuring essays and a process for managing and organising information through the use of paper files and the bibliographic software program EndNote:

VERONICA: I tend to put things into a particular pile or I might make notes about it or put words into the computer into EndNote. All of my assignments, I have an essay structure – the introduction and so on and then allocate word counts against the criteria of the assignment. So if I have too many words to what I have allocated, then I cut it down or break it up into word counts.

For the Technology Education students, this process also refers to a particular aspect of design or construction, not the whole phase of design or construction of an artefact, or the whole development cycle of producing an artefact. For example, one process for using information provided by Technology Education students is techniques for cutting and joining timber in order to build an artefact.

Technology Education students also see learning to use information as a process for solving problems. This view is derived from both the problem based nature of the curriculum and from the industry experience of the tradesmen, who apply the same problem solving process used in their trades to their university assessment. So having developed a process in one context, students like Cooper are able to deploy it in other settings:

INTERVIEWER: Do you think there was a particular way that you learned to problem solve?
COOPER: I don’t think my method of problem solving has changed a lot through my being here and learning that through university because of my trade experience and because I work in the field of problem solving in a manufacturing environment.

As learning a process is seen as a means to reach a specific outcome or end product, the intention in learning this process is to reach this outcome as effectively and efficiently as possible. In addition to suiting the task at hand, Cooper explains the process also needs to suit the individual:

COOPER: You can read as many books as you like. Having a systematic way of breaking things down is something you can teach to somebody but then everyone has to modify that to suit their personality and how they approach things.

Having developed or refined this generic process, the student then implements this process when encountering a similar situation. So for example, while an essay might present a new topic or subject, the process the student uses for constructing the essay would be the same that was used with previous essays.

**Structure of awareness**

The primary focus of this category and therefore the foreground of the students’ awareness is developing a process to use information (see Figure 6). This process is deployed for a specific outcome, such as writing an essay or solving a problem. In this way the focus is on the means to achieve the product or outcome. This is in contrast to a focus on the product that is apparent in category three.

As seen in Figure 6, there is a secondary focus on the product. There is some evidence in this category that students like Cody below may use this process as a stand-alone strategy, separate from the use of the information in the context of the topic or subject. For instance, this is seen in having a focus on the mechanical aspects of writing an essay:
CODY: I have a delegating technique. I number each paragraph of my assignment and I know what topics they are. Then I label which quotes would fit into which paragraphs and then in brackets and give each entry in the book a number. Then on a second sheet of paper, I have a number in brackets and that would correspond to the book so then I know which book to turn to. When it comes to doing the rough draft, I would write all the quotes out first and reference them and then fill in the rest.

By contrast, the use of information in the context of the subject content is one that emerges in later categories.

![Diagram](image)

**Figure 6 Category 2 - Structure of awareness**

**The what and how of learning**

In category two, students experience the *how* of learning information literacy as the act of learning a process. The indirect object that this act is directed at is developing a process. Students see the content (direct object) of learning as the process. There are several similarities between categories one and two. Both are skills-based, as learning to find information and learning a process to use information are concerned with how you *do* certain things.

The *what* and *how* of learning is illustrated in Figure 7.
Developing a process for using information

How

What (Direct object)

Process

Act

Learning a process

Indirect object (Intention)

Developing a process

Figure 7 Category 2 - The what and how of learning

Approaches to learning

Intentions

In category two, the students’ intention is to develop an effective and efficient process that suits both the student and the task. In this way, the process accomplishes the task requirements and is adapted to fit the individual student. The generic process can then easily be used again. The Technology Education students also intend to develop and adapt techniques as a process for solving problems. Examples of processes the students reported they developed to use information are included in Table 7.

<table>
<thead>
<tr>
<th>Process</th>
<th>Process is directed at…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highlighting</td>
<td>Reading texts</td>
</tr>
<tr>
<td>Post-it notes</td>
<td></td>
</tr>
<tr>
<td>Colour coding</td>
<td></td>
</tr>
<tr>
<td>Paragraph construction and numbering</td>
<td>Writing essays</td>
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<tr>
<td>Paper and electronic filing systems</td>
<td>Managing and organising information</td>
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<tr>
<td>Using bibliographic software e.g., EndNote</td>
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<tr>
<td>Problem solving steps</td>
<td>Solving a problem</td>
</tr>
<tr>
<td>Construction techniques</td>
<td>Designing and constructing artefact components</td>
</tr>
<tr>
<td>Techniques for working with different materials and tools</td>
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</tr>
</tbody>
</table>

Table 7 Processes for using information
Strategies

The act of learning a process includes the following strategies:

(1) Learning a process by doing
In a similar way to category one, students report learning processes by physically undertaking activities and learning by doing. Technology Education students learn techniques for using timber or plastic by working with these materials. They also draw heavily on the processes developed through their years of trade experience:

INTERVIEWER: Have you used information differently this time to what you would have done at other times?
CODY: No, not really. It was a new project… I have learnt how to do things [in my past job] and I know it works for me so I don’t want to change too much now, so I stick to what I know, even if it is slightly different. I use the same strategies.

(2) Learning a process by trial and error
Trial and error may be purposive in that the student intends to establish a process to meet an ongoing need such as essay writing. However, the process maybe also one that is learned and adapted over a period of time as the student undertakes a specific activity such as essay writing or cutting timber. What distinguishes trial and error in this category from that in category one is the focus on making mistakes and the outcome that results from the mistakes. As illustrated by Zachary, students reflect on mistakes and as a result of this reflection, the process for using the information is refined:

ZACHARY: As soon as I read an assignment task, I think back then I would still have had an image in my mind what I wanted to achieve and put into progress whatever it is to get to that goal and the end-product might not be what you first visualised but that is because as you go through a process, you hit stumbling stones that make you re-evaluate what you are going to do and you try something else and if that doesn’t work you might go back and try a different path.

(3) Learning a process by interacting with other people
Interacting with other people facilitates students learning a process. As in category one, students seek assistance from other people. The Technology Education students in particular describe seeking assistance from lecturers,
other students and contacts outside the university, when learning a process to construct an artefact or work with new materials.

In addition, in this category there is a more active two-way process of working with other students. Examples of this type of engagement described by students include learning through working cooperatively and collaboratively with other students, informally through study groups or by working in pairs or group work as part of the assessment requirement. Activities include exchanging ideas, sharing knowledge and expertise, dividing up activities to share the workload, helping each other and learning from each other as Cody and Karlee report:

CODY: It was actually good because we started out with 60 guys and there were 10 straight out of high school so a lot of them were older tradesman and when it came to writing assignments, the younger ones would excel because they had come straight out of school, they were used to writing assignments, they knew how to gather information and process it and the older guys didn’t. As they were taking steps, we were always a step ahead of them so we were looking a bit better. But when it came to the practical, the time for building things, we were on the back foot and they were teaching us how to do things, then when we writing assignments, we were teaching them how to do things.

KARLEE: If we have to cover this many journal articles, we split them up and we write summaries and email them to each other. It works really well because there are only four of us.

Themes

Learning

In category two, students experience learning as developing a sequence of techniques and steps that constitute a process. Like category one, learning has a quantitative focus. Also in a similar way to category one, students learn a process in response to a specific university need such as assessment. As a result, students also have a study view of the context of learning information literacy.

DAVID: Every time you learn you find a new technique that works for you. A new technique of using the information - how to put the information together.
Information

Students experience information in the context of developing a process. Information includes methods and techniques, and so informs this development. Information sources include the Internet, books, coursework, other people (lecturers, students and people outside of the university). Information is also derived from the students’ own approaches to learning – that is information that comes from the students’ process of learning by doing and trial and error. For some Technology Education students, information is also sourced from their trade experience. Like category one (finding information), information is external to the person, so it is out there, waiting to be found. Again, it is objective as it does not form part of the person. Jeanette describes a process she uses to make notes which she intends to refine as a direct result of information obtained in a computer training course:

JEANETTE: When find a quote which might be relevant, I note it and I tend to sit at my computer when I am reading a book and I put my entry in. Now that I have done my EndNote basics course, I will be doing that a bit differently. I will then take notes and I will have a page number and then I will put whatever the idea was from that page and then if I have a quote, I have the page number automatically and I just put it in inverted commas if I quoted it directly. Instead of rereading the article, I can say what did I think about that article or I can remember that article had a good quote in it so I can flick back to my notes and I can print them out in hard copy.

Information literacy

In this category, learning information literacy is experienced as learning a process to use information. Therefore, it follows that students see information literacy as this process. As such, information literacy is the what of learning, as it was in category one and is seen as a set of strategies, steps and techniques that can be acquired and demonstrated. In this way, it is quantifiable and is concerned with what the student is able to do. The following quote from Zachary provides a glimpse of the way he sees information literacy as knowledge of a process:
ZACHARY: [Learning to use information effectively is] ...developing an understanding of how to achieve a required or specific result [my emphasis].

Affective aspects

The affective aspects of frustration, excitement and confidence that are prominent in this category are similar to those reported by students in category one. However, these feelings relate to learning a process to use information, not learning to find information as they did in category one. For example, students experience excitement when they learn a process that works for them and that accomplishes a task. Similarly, students experience frustration when the process doesn’t work or when time constraints and other barriers prevent the student developing a more effective process.

In this category, Technology Education students from a trade background reported they were quite judgemental and fixed in their thinking, feelings and techniques, reflexively drawing on their backgrounds to use processes they were comfortable with:

HOWARD: I do struggle to get around my initial thought patterns. I look at a thing and I think I know how to make that or how to make it work and I struggle to deviate from that too much. I have the process down pretty well until I look at other people and what they are doing and think gee that’s all right.

Reflection

There are two further similarities to category one. Firstly, students' reflection is limited to evaluating what was needed to develop a process that fulfils the need and suits the student. In this way, the term evaluation also better characterises the students’ learning activities, as it did in category one.

Secondly, students also have an awareness of their preferred way of learning but in this category, it is focussed on learning a process that works for them. In this example, Cody reports learning a process for writing essays which
meets his need to write essays and was developed with an awareness of the way he works best:

CODY: If you start with an introduction, like an essay I will say ‘in this essay I am going to discuss this, this and this’. So I know what I am writing about then so I know I have to go and find information specific to these areas so I might go back and get a bit more information. Then I can throw all this new research in and get a rough draft finished and then in the last week, I get my title and contents page sorted out and I know I have a pretty solid assignment.

INTERVIEWER: How did you learn to do that?
CODY: You find you learn to do these things in the first year just out of necessity. I just found out what worked for me.

**Conclusion**

In category two, learning information literacy is experienced as learning a process to use information. A process may consist of a series of structured steps, stages, activities, strategies or techniques. As learning a process is seen as a means to reach a specific outcome or end product, the intention to learn this process is to reach this outcome as effectively and efficiently as possible. In addition to suiting the task at hand, the process is also seen as needing to suit the individual. Having developed or refined this generic process, the student then implements this process when encountering a similar situation.

The main difference between categories one and two is the focus – respectively on learning to find information and learning a process.

There are many similarities between category one and two. In both students experience:

- Learning as quantitative;
- Information as external and objective;
- A study view of the context of learning;
- Similar affective aspects;
- Limited reflection that can be more accurately described as evaluation.
A summary of the critical qualitatively different aspects of category two is presented in Table 8.

<table>
<thead>
<tr>
<th>Category 2</th>
<th>Learning a process to use information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meaning</td>
<td>Learning information literacy is seen as learning a process to use information.</td>
</tr>
<tr>
<td>Structure of awareness</td>
<td>Foreground – developing a process. Secondary – learning to create a product.</td>
</tr>
<tr>
<td>Direct object</td>
<td>Process.</td>
</tr>
<tr>
<td>Act of learning</td>
<td>Learning a process.</td>
</tr>
<tr>
<td>Strategies</td>
<td>Learning by doing – Experiencing. Trial &amp; error – experimenting with different techniques, designs, materials, methods of construction. Make mistakes &amp; change the process. Interacting with other people – working collaboratively, sharing expertise, helping each other.</td>
</tr>
<tr>
<td>Indirect object (Intention)</td>
<td>Developing a process.</td>
</tr>
<tr>
<td>Learning</td>
<td>Quantitative – developing a series of steps or activities that constitute a process. A study view of the context of learning.</td>
</tr>
<tr>
<td>Information</td>
<td>In the context of developing a process. External &amp; objective.</td>
</tr>
<tr>
<td>Information literacy</td>
<td>A process for using information.</td>
</tr>
<tr>
<td>Affective aspects</td>
<td>Excitement &amp; confidence when the person develops a process that works for them. Frustration when the process doesn’t work or when time constraints prevent the person developing a more effective process.</td>
</tr>
<tr>
<td>Reflection</td>
<td>Evaluate the process.</td>
</tr>
<tr>
<td></td>
<td>Awareness of preferred style of learning.</td>
</tr>
</tbody>
</table>

Table 8 Category 2 - Summary of qualitative differences
Category 3. Learning to use information to create a product (product experience)

Overview

In category three, learning information literacy is experienced as learning to use information to create a product. Therefore, learning to use information is directed at a particular outcome and it is this outcome or product that is the focus in this category. Learning to use information to create a product is underpinned by learning to find information in category one and learning a process for using information in category two.

In a text environment, students’ experiences of learning to use information involves many aspects of academic endeavour, including learning to synthesise and critique information, develop an argument and write in an academic style. In this context, the product will often be an assessment item such as an essay. Technology Education students also report that learning to use information involves designing, constructing and testing artefacts. In this context, the product or artefact might also be an assessment item such as a piece of furniture, a model aircraft or a pulley.

However, the product does not have to be something as tangible as an essay or an artefact. The product might be the argument that a student develops which is then used in an essay or a design concept that a Technology Education student develops and then uses to construct the artefact. For Technology Education students the product might also be the solution to a problem. Either way, the product represents an outcome and the result of learning to effectively use information, as best illustrated by Howard:

HOWARD: Learning to use information effectively is... being able to effectively use that information in some way, whether in an artefact or a program. You have to use it in some way to make it effective.

Category three sees several distinctive and qualitatively different shifts in character from categories one and two. The first of these is that students
begin to engage with *learning subject content* when creating products. Learning to use information produces a specific outcome and unlike category two, focuses on the product, rather than the process for reaching the product. Learning information literacy now sees students begin to focus on learning about their subject matter by learning to use information to create a product. As a result, students learn about the subject content of their education courses through learning to use information. For example, in researching and writing essays, students learn subject content through such activities as reading, analysing or writing about the subject matter. In a practical context this would be learning about material properties through using particular materials such as plastics.

**Structure of awareness**

The primary focus of this category and therefore in the foreground of the students’ awareness, is creating a product. Students are for the first time focussing on learning the subject matter and this forms a secondary focus as seen in Figure 8. In a further qualitative shift from category one and two, there is for the first time an emerging awareness of learning information literacy as an enabler – in this case, an enabler to learning aspects of the content of their subject through the act of creating the product. This is in the margin of the students’ awareness in this category but grows in prominence in later categories.

By learning to use information to design and construct artefacts, Technology Education students describe learning about the theory and practice of design, materials, methods, equipment and how to facilitate their own students’ learning in the workshop. Equally, by learning to use information to think critically, synthesise and write an essay, students learn about specific education subject content and the pedagogy of this content.
The what and how of learning

Students experience the how of learning information literacy as the act of creating. The indirect object that this act is directed at is learning to create a product. As previously mentioned, students begin to experience learning information literacy as a vehicle to engage with learning their subject content. As a result, in this category the content (direct object) of learning is the subject content; in this case the assessment task, topic or specific education course content that the student engages with to create the product.

The what and how of learning is illustrated in Figure 9.
Approaches to learning

Intentions

Students report their intentions are to learn to create products, which are assessment items. In the following example, Zachary describes an assessment item that required Technology Education students to design and construct a board game. While he felt the resulting product satisfied the assessment requirements, he acknowledges it may have been better had he researched the task more:

ZACHARY: We had to come up with our own board game or expand on one that was pre-existing and modify it to suit ours. I took it pretty literally – it was just a board game. It looked alright and it served the purpose and the context... You [were given extra information] and where to get it and how to create a board game, but I didn’t look at it. I had an idea of what I wanted to do and I just did it. It may not have worked out as good as if I had researched it.

Strategies

The act of creating includes the following strategies:

(1) Learning to create by doing
As with the previous categories, students describe learning information literacy through using information to create a product as very action oriented. For example, students like Bill report they learn to read and write critically by doing it:

INTERVIEWER: You mentioned reading and writing in relation to using information. How do you learn reading and writing?
BILL: By doing it.

The difference in this category is that in creating the product, students learn about their subject. A further difference is that while learning by doing implies learning in action, therefore the student learns as they go, students in this category may also learn afterwards. In this case, it is suggested that students may not know the product has not worked well until they receive feedback from the lecturer, and in most cases this feedback is delayed. For example,
Percy reports his use of boxes for the egg drop was successful in terms of the solution it provided to the problem, but clearly was not as successful as he first thought, as the lecturer did not mark his assignment very highly:

PERCY: In our engineering subject, we had to do an egg drop. I tried three different vehicles and they didn’t work when I tested them. It got to three days before we had to do the test and I thought ‘What am I going to do?’ So I went back to the idea of using boxes. It was a quick process that came together. I tested it and it worked really well. But the lecturer doesn’t like boxes and the mark reflected that.

(2) Learning to create by trial and error

Trial and error has a more intentional and critical reflective edge in this category as Technology Education students in particular learn principles of design and construction that can be used when creating artefacts. If one idea doesn’t work, then students have to work out why and then change the idea or change what they are doing to design or construct the artefact differently. Throughout the design and construction phases, Technology Education students talk about needing to evaluate and justify their choices, so there is a different focus and intention to trial and error in this category. It is less haphazard and more a part of a planned approach to using information and learning.

For Technology Education students, what precedes construction is the design phase – a practice of ideation students describe that involves developing ideas by initially trying different things, picking the best one then developing it to a final stage, again often with an element of trial and error as seen in the following lengthy quote from Howard. The process Howard refers to in this quote is not the same as the process in category two. Category two relates to developing a process for one aspect of using information such as cutting the timber to construct the vehicle to house the egg. However, using information in category three refers to the broader development of the product through the design, construction and testing phases. It moves beyond developing a process to developing a whole product:
HOWARD: In engineering, we had to do an egg drop. It would have been easy to get a lot of sponge and drop it in but they wanted things that had elasticity and that had a breaking point, rigid materials. Could be woods or plastics but it had to be rigid and you had to look into the deceleration of it so however you had it housed when it hit the ground at full speed it wouldn’t break. So you had to look at how you were going to get the egg to decelerate after the initial impact of the artefact you had the egg housed in. I found that pretty good. Unfortunately my egg broke! I did a lot of trial and error with smaller ones and the basic design came out and I thought that’s good, I developed that.

It was very in the process of how we are supposed to teach students in their initial ideas and how you develop those ideas and then you pick the best one and then you develop that one and you come up with a final product that works. Or maybe it doesn’t, and then you have to look at it and think well if I did it again, maybe I would do this. It was a good process which is what we are teaching, so students understand the process they have gone through and the knowledge and understanding that you pick up through the process.

As Howard illustrates, he is learning about materials, motion, impact, design and construction by using information, learned through employing a strategy of trial and error and doing. What he refers to as a process is actually using the information in a complete development cycle of design, construction and testing, with the emphasis on the end product and the learning about the subject content that results from using information.

A further qualitative difference is the process in category two is one that would be deployed in any similar situation whereas this development of a product is one that can be used in novel situations.

(3) Learning to create by interacting with other people
In category one, students interact with other people to obtain assistance in finding information and using information tools, while in category two, they also get assistance and work with other students to share work, ideas and expertise to develop a process.

In contrast to categories one and two, where there is no focus on subject content, students in category three engage with information through interacting with other people. This develops further in later categories. This reflects a greater intellectual involvement and active engagement with the information. It also reflects learning about the subject content as a result of
Learning to engage with information, which is seen for the first time in this category. For example, students such as Karlee interact with other people, with a focus on using people as a sounding board to bounce ideas and discuss information, then use the information:

KARLEE: My mother is by default studying education. I will have been reading all of these journal articles for an assignment and we sit at the kitchen table sipping coffee and I’ll be telling her all about it. I think that is where a lot of my stuff actually works its way out. I bounce ideas off her.

Other people in this category might include other students, friends or family members but might also include key contacts outside of the university gained through teaching practicum or work. Importantly in this case, people are both a source of information and a means to engage with it.

This category sees students create and construct text-based work and artefacts through engaging with information – critiquing, synthesising and presenting their view to others, backed by evidence. In the practical context, this category also sees the Technology Education students weighing up choices and justifying their design and construction choices to others.

**Themes**

**Learning**

Students experience learning as creating a product. Like the two earlier categories, students report doing something differently as a result of their learning. However, there is not the additive development of skills and techniques as in the finding information and process categories. Rather, the students are creating or constructing something and as a result, are relating to the subject content in a qualitatively different way.

As seen by Howard, the focus is not on the process of creation but on the use of information to create the product - in this case a piece of furniture:
INTERVIEWER: Can you give me an example of a time when you have had to find and use information and it all came together really well?

HOWARD: Last year, we had to make a piece of period furniture. That was a research one, we had to research different periods of furniture and what was typical of the design of those periods. I picked the art deco period and I decided on a bedside table and pretty much drew it up and it all came together.

Learning also shifts to a more qualitative focus, as distinct from the two earlier categories. However, students in this category continue to have a study view of the context of learning due to their focus of assessment tasks and course content.

Information

Students experience information in the context of creating a product. Information informs the creation of the product and includes facts, background information and current research and evidence to develop a personal view or support or refute their arguments in assignments. For Technology Education students it also includes product and materials information, construction methods and principles and design ideas. In the following example, Callam describes an instance where he uses and learns from different information, as he creates a product using a particular machine in the workshop:

CALLAM: An example would be the nature of materials, how metal works or how timber works or how synthetics work and the properties of them. So when we using these materials, we learn to consider cutting speeds, the type of cutters we use, what effect the material will have on the cutters – whether it will blunt them very quickly, block it up and stop the machine.

Information sources include the Internet, books, journal articles, coursework, and other people (lecturers, students, other university service providers and people outside of the university). Information is also derived from the students’ own approaches to learning – that is, information that comes from the students’ process of learning by doing and trial and error (as it does in the previous example from Callam). For some Technology Education students, information is also sourced from their trade experience. In a second shift from the finding information and process categories where information was
external, information is *internal* and *subjective* in that it is used by the student in order to create the product. In this example, Karlee describes the way she works with information to determine what is required in an assignment and to develop a personal viewpoint:

KARLEE: I whip through the assignment question and dissect it. I find out exactly what they want me to do. I look at those connector words, like there might be something that says you need to go beyond the readings or beyond the stated quote. Whether you jump on their party line and say that’s all good and find supporting evidence or not.

**Information literacy**

In this category learning information literacy is experienced as learning to use information to create a product. Therefore, it follows that information literacy is experienced as engaging with subject specific information to create a product. As such, information literacy moves beyond being the *what* to also being the *how* of learning. This engagement is through activities such as synthesising, critiquing or designing. Students’ capacity to link information and theory with practice, use evidence to support a viewpoint, justify design decisions and present this to others – all with a view to creating a product – is facilitated by learning information literacy. The following quotes provide glimpses of the students’ experiences of information literacy of using information:

CALLAM: [Learning to use information effectively is] …being able to use it. Otherwise information is useless.

DAVID: You have to say why you did and find and use sources that back up what you are saying so what you are doing is giving the reasons why you think that is right and saying this is the person that backs me up.

Technology Education students continue their focus on learning to use information to solve problems as is seen in the former process category. In the process category however, students see using information to solve problems as engaging a process. Thus, the focus of problem solving in category two is on the process. Learning a process is a means to an end,
which can be used each time a problem is encountered. In contrast, students in this category see using information to solve problems as the end in itself. Therefore the focus of problem solving is the solution. In this case, the solution to the problem is the product in this category:

COOPER: [Learning to use information effectively is] …being able to find and use the right information to solve the problem.

Affective aspects

Once again, the affective aspects experienced by students in this category are similar to those experienced in categories one and two. However, this is directed at the use of information and the resulting product, rather than the process. So as seen in Howard’s quote below, frustration when the product doesn’t work out as a result of how students use the information:

HOWARD: A lot of people had problems with plastics last semester. I think the information that we had and the way it was explained to us didn’t work out. The lecturers struggled to tell us what was going wrong with our artefacts. They didn’t know enough themselves to know whether it was going to work or not. We did things the way we were told and taught but the injection mouldings weren’t turning out. It was really frustrating.

When students use trial and error to learn a process in category two, the feedback on success or failure is immediate and intrinsic. However, in category three, students create products and then submit them in the form of an assessment item. As such, they may not realise they have not used information well until they receive delayed and extrinsic feedback, in the form of marks from lecturers. Therefore, it is suggested that frustration or even excitement can come long after using the information. Percy’s earlier example in the learning by doing section, where he successfully used boxes in his egg drop but did not receive a very good mark, reflects this form of delayed response.
Further evidence of the engagement with the subject content in this category is the frustration directed at the literature, which is perceived as boring or hard to understand due to either the technical or scholarly nature of the content:

CODY: In some subjects I had a hard time grasping the language used or the subject used new language. So when I find books and I am starting to read them, I don’t know what the information is saying so I don’t know how to use it. You get frustrated sometimes. So engineering subjects like forces and vectors and different things that are new to you and you are trying to write an assignment and form your own opinion but you are still learning about what they mean.

KARLEE: I generally find academics pretty boring or they are when they write journal articles. I think they should be made to write children’s stories before they attempt to write journal articles. Then it would be interesting and they wouldn’t repeat the same thing 50 million times.

Reflection

Reflection has a qualitatively different character to that in categories one and two, where it was limited and more akin to evaluation than reflection. In this category, there is a new focus on students reflecting on their use of information in creating the product. Students describe being more reflective about how they used information. This was in order to explain and justify their decisions:

PERCY: We have to reflect on every decision that we make on the design process. We have to justify everything. So you have to reflect on every single decision you make all the way through.

Conclusion

In category three, learning information literacy is experienced as learning to create a product. Therefore, learning Information literacy is directed at a particular outcome and it is this outcome that is the focus of this category.

Several qualitatively differences emerge in this category including:
• Information is internal and subjective;
• Learning is qualitative;
• A focus on learning subject content;
• Reflection on subject content;
• Engagement with subject content through interacting with people.

A summary of the critical qualitatively different aspects of category three is presented in Table 9.

<table>
<thead>
<tr>
<th>Category 3</th>
<th>Learning to use information to create a product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meaning</td>
<td>Learning information literacy is seen as learning to use information to create a product.</td>
</tr>
<tr>
<td>Structure of awareness</td>
<td>Foreground – create a product. Secondary – learning about subject. In the margin – awareness of information literacy as an enabler to learning about subject.</td>
</tr>
<tr>
<td>Direct object</td>
<td>Subject.</td>
</tr>
<tr>
<td>Act of learning</td>
<td>Creating.</td>
</tr>
<tr>
<td>Approach to learning - Strategies</td>
<td>Learning by doing – focus on engaging with &amp; using the information. Trial and error – more planned approach to design &amp; construction by experimenting with different things then picking one &amp; developing it. Interacting with other people – engaging with information through interacting with others.</td>
</tr>
<tr>
<td>Indirect object (Intention)</td>
<td>Learning to create a product.</td>
</tr>
<tr>
<td>Learning</td>
<td>Creating a product. Qualitative. A study view of the context of learning.</td>
</tr>
<tr>
<td>Information</td>
<td>In the context of creating a product. Internal &amp; subjective.</td>
</tr>
<tr>
<td>Information literacy</td>
<td>Engaging with subject specific information to create a product</td>
</tr>
<tr>
<td>Affective aspects</td>
<td>Frustration when things don’t work or when the vocabulary is a barrier to using information.</td>
</tr>
<tr>
<td>Reflection</td>
<td>Reflect on using information and subject content in relation to the product. Use of reflection to be more strategic in use of information &amp; how they use their time.</td>
</tr>
</tbody>
</table>

Table 9 Category 3 - Summary of qualitative differences
Category 4. Learning to use information to build a personal knowledge base in a subject area (personal knowledge experience)

Overview

In category four, learning information literacy is experienced as learning to use information to build a personal knowledge base in a subject area. This category is underpinned particularly by both categories one and three, that is building personal knowledge and understanding is dependent on developing skills and capabilities in finding and using information and in learning subject content. For Technology Education students building personal knowledge is also importantly underpinned by developing a process to use information in category two, as the techniques for constructing artefacts form an integral component of Technology Education students’ knowledge base.

Knowledge is that which is new to the person; as such it is knowledge that is known to others and which the student has learned. The subject area refers not only to specific aspects of the students’ respective curriculum areas but also the broader discipline of education and teaching. The students’ intention to build a knowledge base is underpinned by their perception that their knowledge base is important to their future profession as teachers. This category is illustrated by the following quote from David who equates learning to use information with having expertise and knowing when and how to use it:

DAVID: To get expertise you need to know how and why you are doing things. I need to know how information is being used and why it is being used and then I know when to use it. If you know when to use information and why you use it, you understand what it is.

Structure of awareness

In this category, building personal knowledge and understanding in a subject area is the focus and therefore is in the students’ foreground of awareness. As such, learning is personal and internal to the person. Learning to use
information is seen as a key vehicle by which knowledge is developed. Learning to use information is also seen as knowing what to use, when and why, both at university and as a teacher.

As seen in Figure 10, in the background of the students’ awareness is an increasing awareness of the importance of learning information literacy as an enabler, in this case to build personal knowledge and understanding in the discipline of education. In this way, the glimpses that emerged in category three (product) of students’ awareness of learning information literacy as an enabler to learning about their subject area is more prominent in this category.

The what and how of learning

Students experience the how of learning information literacy as the act of knowledge building processes. This indirect object that this act is directed at is building a knowledge base. The content (direct object) of learning is both personal knowledge and understanding of the subject or disciplinary area.

The what and how of learning is illustrated in Figure 11.
A significant difference in this category is the students’ intentions. In category three (product) students learnt subject content when creating products in order to complete assessment. In category four, students have a greater focus on the importance of learning this subject content as the key to building a personal knowledge base. In this way, the students seek to:

1) Know and understand their subject content;
2) Develop as teachers;
3) Understand in order to teach for understanding

To elaborate:

1) In seeking to know and understand their subject content, students such as Keegan recognise the importance of understanding rather than simply recalling:

KEEGAN: When I was an undergraduate student here, you just wrote it all down and off you went, no understanding. I don’t want to just learn something, I want to understand it – I think that’s the difference. Yes, it is understanding, not just recalling. I could memorise six pages
and just regurgitate it – no worries. Half an hour later, you ask me what I wrote, wouldn’t have a clue. Now that’s not the case.

2) In seeking to develop as teachers (both at University and throughout their lives), students like Karlee see teaching as a vocation, with building knowledge important for the future. With this focus on the future, Karlee also displays an awareness of the importance lifelong learning, which emerges for the first time in this category:

KARLEE: I look at my future career as a teacher not just as a job. I think it really is a vocation. I think you have to be motivated to always be learning. It informs your processes, your teaching and everything. That’s a lot to do with my upbringing. Everyone in my house is always studying.

INTERVIEWER: That’s very influential in your own learning?

KARLEE: Absolutely. Nobody is “at a level”. They are always learning. Not as an ambition thing but improving your own knowledge.

3) In seeking to understand in order to teach for understanding, students such as Percy acknowledge they needed to be able to understand subject content themselves in order to explain things in different ways to their own school students. Students report this is necessary to cater for different learning styles, backgrounds and levels of understanding:

PERCY: If someone came up to me on a computer and said to me press that button and I say why and they say, you don’t have to know that, just press it because if I come across another problem I want to know what button to press. I want to know the reasoning behind pressing that button. Who came up with that button here to solve that problem and what does it do to solve the problem?

INTERVIEWER: Does knowing why help your learning?

PERCY: Absolutely. If I stand up in front of a group of 25 kids and I know that I know what I am talking about, I can get it across and if Johnny down here isn’t getting it then I haven’t explained it the right way. That way I can go what is another way that I can explain it because I have the reasoning, the knowledge and understanding, then I can turn it around a look at it from a different angle. If I know it is just because I just press the button, then that is not going to help Johnny.
Strategies

Knowledge building strategies include:

(1) Knowledge building processes
As with other categories, students describe engaging in particular activities such as reading or writing an essay. However, simply using the information by doing specific activities is not enough to form knowledge. In order to learn, students must act and critically reflect and abstract meaning, though not necessarily in such a linear fashion. For example, a student might attend a class on effective reading or note taking with a learning advisor. The student might reflect on this in relation to his or her own past experience, try it out themselves and reflect again on this new experience. As Percy explains, a personal perspective is gained when he internalises this interaction, making links with his prior knowledge:

PERCY: When you are given a subject you have to write or get information about, you write down what you already know about that subject before you read anything else. Then start doing some reading and whatever stands out in with the information that you already have. What I find is that when you are putting it altogether is that you stand back and think ‘How does this relate to that and that relate to this?’ So you are getting like a matrix of information and you see the inter-relationships.

This information assumes meaning and is transformed into new personal knowledge. Learning in this category extends beyond learning subject content through producing products, to forming an understanding that underpins a personal knowledge base. As a future teacher, Howard states that working something out himself aids his understanding and ability to recall and reuse this at a later date:

HOWARD: Giving the students the answers doesn’t work but helping students to solve problems for themselves without giving them the answer and steer them in the right direction and I have found that a good thing myself. If I have racked my brain over something then I go that’s this, then I will never forget it but if someone jumps in and says ‘it’s that little sensor down the bottom there that plays up’ and in 3 months time it plays up again, you think gee what was that again. But if it you found it yourself, you can go back in 6 or 12 months and know.
It is the iterative interaction between doing, reflecting and integrating with existing knowledge that facilitates understanding and new personal knowledge. Bill provides an example of this constant and iterative interaction when he uses writing as a vehicle for clarifying and developing his thinking and learning:

INTERVIEWER: Looking back at your years at university, what has enabled you to be more effective in your learning?  
BILL: That comes back to the writing thing. If you are ever reading and not writing then you are ineffective. You have to balance between how much you read and then how much you write.

One of the strategies to build knowledge and understanding that several of the students describe is asking questions, both of the lecturer and of the literature. This enables them to develop a more critical awareness and see the inter-relationships between information, which facilitates knowledge building:

KIMBERLEY: I have to keep asking questions. That is absolutely critical and the more questions I can ask and the better that my questions are, and then the better I can see the pictures.

Kimberley explains that asking questions of the information helps her look at information in a new way. This leads her in new directions, based on her changed understanding of the subject:

KIMBERLEY: I source the information in the first place in order to help me answer certain questions. So I have been using the information to help me to answer some of these questions in the first instance or to point me in the direction from which I can get more information and better answers and deeper understanding of the questions I had been thinking about. I am also using the information to extend my knowledge base because citations within the information will point me to other areas. Then I have been using it to help me put my thoughts together in writing. I have been using the information to ask more questions.

Learning through knowledge building processes also refers to applying knowledge in new situations and contexts in order to build knowledge and understanding. Percy explains that applying knowledge is a key step in
building understanding and also identifies the importance of learning information literacy as an enabler of this:

PERCY: Learning to use information effectively is...applying it. Applying what you have done straight away and applying it into something different.

(2) Building a knowledge base through making mistakes
As in category three (product), making mistakes does not have the same character as it does in categories one (finding information) and two (process). As with category two (process) and three (product) in particular, mistakes are analysed. However, what is different in this category is the focus is on building new knowledge and understanding as the outcome of reflecting on errors. So, a change occurs in the person’s knowledge and understanding, not just in the process or the way information is used to create a product. Percy describes his growing appreciation that making mistakes assists his understanding:

PERCY: One thing I have found here actually is making mistakes is a really good thing. It goes against everything I was always taught. I have worked out that it is okay to make mistakes but when you do make mistakes, you have to sit down and look at it and observe it and see where the mistakes are and see what happens because of the mistakes. So I am saying you analyse the mistakes. Rather than just throw it in the bin. When you go through it this way you can piece it back to something you might have read. It might just click with something that you read that you didn’t take any notice of and it will come back – this is what they meant by that. You’ll follow it up.

(3) Building a knowledge base through interacting with other people
In order to build knowledge students describe interacting with other people in many ways. As in category three (product), there is further evidence of students engaging with information through interacting with other people, however with the distinct intention to build personal knowledge and understanding. While interactions of this nature may serve a specific need such as an assessment item as they do in category three, in this category the interactions also serve the long-term development of the student. For example, students describe building knowledge about new areas from experts such as lecturers or people outside of the university. In this way, students like David selectively engage with people who have the knowledge he seeks:
DAVID: This year I have gathered information off marine engineers for engineering. I knew what I wanted but I didn’t know about it. I didn’t understand but that’s what I am saying, if you can find someone that does that’s smarter than sitting there saying ‘I don’t know how to do it.’

INTERVIEWER: So you have been looking up specialist people who can help your understanding?
DAVID: Yeah, I know a lot of people and I’m lucky in that area. If it’s marine engineer I need some help, if it’s a carpenter I need some help, if it’s a mechanic I need some help. I know a lot of tradies.

**Themes**

**Learning**

Students experience learning as building a personal knowledge base, which involves understanding how to do things, why things are as they are and knowing when and how to use knowledge.

In applying knowledge, students describe linking theory to their practice and realising the implications that their new understanding brings to their teaching practice. Students see building a knowledge base as critical to their future careers as teachers. With this eye to the future, the students’ view of the context of learning extends for the first time in this category, from the university to also include the workplace. Percy illustrates this forward focus on learning in the following quote that is reported in full in the affective aspects section:

PERCY: I take my study seriously because I really want to do well at this and I am looking at the next 20 years of my life being a teacher.

**Information**

Students see information in the context of building personal knowledge. Information informs this knowledge building. This is described by students in terms of relating it to what you know, seeing the relevance and inter-relationships of information, like pieces of a puzzle coming together. Information is subjective as it takes on meaning by constructing or interpreting
it. This is part of the knowledge building processes that constitutes the act of learning. Kimberley refers to light bulb moments when everything clicks into place and understanding follows:

KIMBERLEY: Those light bulb moments are simply exquisite because what happens at that moment – so many things that have been hiding or in part shadow or in the periphery, suddenly the light shines on all these things and a beautiful clear picture is there… I am sure this is true for everyone that is studying; your knowledge is not exclusive to any one context. I had been following so many different information threads and knowing that somehow they were all linked… Ah brilliant!

Information includes facts, background information, current research and evidence to develop a personal view and develop understanding. For Technology Education students it also includes product and materials information, construction methods and principles and design ideas. Information sources include the Internet, books, journal articles, coursework, other people (lecturers, students, library and other university service providers and people outside of the university, including professional networks). Information is also derived from the students’ own approaches to learning – that is information that comes from the students’ knowledge building processes and trial and error. For some Technology Education students, information is also sourced from their trade experience.

For the first time, information may also be seen as transformational, as the person uses information to build a knowledge base, and transforms as a result of this expanded knowledge. In this way, learning to use information to build personal knowledge and understanding is transformative and involves some change in the person, as students see building a knowledge base as a personal way to move forward. Students such as Cody describe learning to use information to build a knowledge base in terms of moving forward, self-development and improving themselves:

CODY: Learning to use information effectively is…necessary because that is the way you learn. Learning to use information no matter where it comes from is necessary because that is how you grow. If you are not gathering information or absorbing information, you are not moving forward, you are staying where you are.
Information literacy

In this category learning information literacy is experienced as learning to use information to build a personal knowledge base. Therefore, it follows that information literacy is experienced as engaging with subject specific information to build this personal knowledge base. As such, information literacy is also the *how* of learning, as it was in category three (product).

While students engaged with subject specific information in category three (product), the emphasis in category four is on building personal knowledge and understanding. The following extracts provide glimpses of the students’ experiences of information literacy in category four:

KEEGAN: I don’t want to just learn something, I want to understand it – I think that’s the difference.

KIMBERLEY: I have been using the information to help me to answer some of these questions in the first instance or to point me in the direction from which I can get more information and better answers and deeper understanding of the questions I had been thinking about. I am also using the information to extend my knowledge base.

HOWARD: I sit down at a lecture and take it all in and if I don’t understand something, I can’t let it go until I go ‘ah I’ve got it’.

Affective aspects

While affective aspects are present in all categories, they are strongest and most prominent in this category. This reflects the deeply personal nature and internal focus on learning and knowledge building. Expressions such as *joy*, *anticipation* and *enjoyment* reflect the emotions of learning while *enthusiastic* and *energetic* are terms that describe the students’ active participation in their own learning. *Discovery*, *journey*, and *exploration* echo the students’ development and personal change in their quest to build knowledge and understanding. *Love of learning* reflects a natural curiosity that surpasses boundaries and draws the various contexts of the students’ lives together. When asked to describe her approach to learning to use information, Kimberley exemplifies this category’s highly affective nature:
KIMBERLEY: Enthusiastic, very natural and enthusiastic. I think it is an attitude about wow – there is something here that I can understand or get to know better and that to me is always a joy. There are very few things that I am not interested in. I think it is an attitude more than anything else. The attitude in discovery – it is a love for discovery... it is more a labour of love. Why would it even be called a labour for goodness sake? It's the association with the word labour. It is a wonderful exploration more than anything else. It is different because of that affective component I am convinced but not just because of that, it makes my searching and use of information so much more effortless.

Percy speaks about the pleasure and satisfaction he experiences when he discovers the content he learned at university, which he originally thought might not be relevant, suddenly became useful in the classroom:

PERCY: I'm a teacher aide now and I find now that even things like educational psychology that I found totally boring and irrelevant, I am finding that bits fit in. So I think maybe I was being judgmental. Knowing that something that you have learnt is actually relevant and you can actually apply it – there is a bit of a buzz that goes with that.

In contrast to categories one to three, where frustration is experienced when tools, technology, processes and products do not work, here frustration is commonly felt when students perceive they are not learning:

PERCY: I take my study seriously because I really want to do well at this and I am looking at the next 20 years of my life being a teacher so I want to know as much as I can. So I get frustrated when I don't feel like I am learning.

Further, Howard feels cynicism when he feels he is being taught how to teach one way but assessment and teaching practice is modelled another way:

INTERVIEWER: How do you learn best do you think? HOWARD: Rote learn (laughs). You mean how do I rote learn best? That's what we have had to do this lot of exams. They teach you to teach for understanding and not teach kids by rote learning and they do that during the semester but at the exams it is very hard not simply to become a rote learning exercise. If they can't do it here how can they expect me to put an exam together for students where they don't have to rote learn something as well? There was no reasoning or understanding there at all.
**Reflection**

In developing a personal knowledge base in education and teaching, students in this category describe extensively reflecting on themselves as learners. This is the foremost experience of reflection and is seen for the first time in this category. Students recognise the importance of reflection and self-awareness and actively use reflection as a strategy for self-monitoring and learning. Students describe reflecting on being more strategic in the learning activities they participate in and strategies they engage. This is so they could become more effective learners. Keegan explains:

KEEGAN: An awareness of your own learning helps you. You become more time efficient, knowing you can make better choices about what you are participating in. You also feel that as you pursue knowledge and you try to think about ways to apply that knowledge. I think by knowing how you learn best, you increase the potential for that to occur.

Students believe the practice of reflection develops over the years at university and is facilitated by assessment that requires them to reflect on their own learning and how others learn. In this way, education students like Jeanette (below) both reflect on and display an awareness of how others learn and this in turn, causes them to reflect on their own learning:

JEANETTE: It's not until recently that I have been more explicitly aware of the strategies I have used and reflected on my own learning and my own writing and what I do and what I don't do, so what's useful, what isn't useful. And that's really because of learning about language learning strategies which then can carry over to other learning strategies. My research project is on self-monitoring strategies which is a learning strategy – a metacognitive one so it is an overall organisational learning strategy. So it is only now that I am beginning to be aware that to be more effective as a learner, as a writer, you need to be more strategic so I am starting to reflect on what strategies do I use.

Students in this category describe frequently choosing assessment topics which afford the best learning opportunity. The goal is an enhanced knowledge base that can be applied in university and their future role as teachers. In the following example, Callam and Cooper worked together on their major 4th year Technology Education project, choosing a more
demanding venture, rather than a perceived simpler option chosen by other students:

CALLAM: My interest in this project was generated because with many of the other projects, students aren’t learning anything from it; they are just making a product they want. They are supposed to be projects which haven’t been created before. There are always about five trailers made and while I can make one, I'm not learning anything out of that so I thought this is an opportunity where I can learn about these machines, which I don’t know much about. I can create ideas for using this machine which I can then use in the classroom.

COOPER: The major project isn't big for someone with a trade background - that is the making of the article isn't hard but coming up with the design is. If you look at many of the projects, many of the students are making trailers and I could do that in a few days but without any effort at all and it wouldn't be a learning curve. When the lecturer told us about this project, I thought that is something that I can experience and increase my learning in and teach ourselves.

As was seen in category three (product), Technology Education students had to be reflective about how they used information in order to justify decisions they made in creating products. In this category, students also reflect on the way they use information and apply their knowledge. Percy reports this has a personal transformative effect on him:

PERCY: We have to reflect on every decision that we make on the design process. We have to justify everything. So you have to reflect on every single decision you make all the way through.

INTERVIEWER: So you think this justification and reflection has enabled your learning?  
PERCY: Yes…I am a lot more reflective now than I have ever been in my life. It has had a major impact on the way I view and do things.

**Conclusion**

In category four, learning information literacy is experienced as learning to use information to build a personal knowledge base in a subject area. This knowledge base in education and teaching is seen as being critical to the students’ future careers as teachers.
Several qualitative differences emerge in this category including:

- Information is transformational because the person uses information to build a knowledge base and transforms as a result of this knowledge base, so there is a change in the person;
- A high awareness on oneself as a learner and reflection on how others learn;
- The context of learning extends from the university to the workplace and their future role as teachers.

A summary of the critical qualitatively different aspects of category four is presented in Table 10.
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Table 10 Category 4 - Summary of qualitative differences
Category 5. Learning to use information to advance disciplinary knowledge (advancing knowledge experience)

Overview

In category five, learning information literacy is experienced as learning to use information to advance disciplinary knowledge. Unlike category four (personal knowledge), this knowledge is not just new to the person but new to the discipline of education. This category reflects part of the doctoral students’ experiences of learning information literacy, in the course of creating new disciplinary knowledge through the research process. No undergraduate students’ experiences are represented in this category.

Category five is particularly underpinned by categories one, three and four, that is advancing knowledge is dependent on capabilities in finding and using information and on having an extensive knowledge base in the subject area. In an excerpt from a quote which is reported in full in the strategies section of this category, Keegan’s use of the metaphors of building blocks and bridges best illustrates learning to use information through the research process:

KEEGAN: You have to be able to jump from here to here and if there is no bridge, you are going to have to build a bridge, which helps you get to the other side. You have a number of building blocks, which you put in place. One is your literature base, one is your research base, one is your experience and you have your bridge.

As seen from Keegan’s quote, students report that the act of research involves linking their existing knowledge in the discipline area with that in related domains and making further links with the knowledge that comes from their experience and professional practice. The research process comprises a series of academic activities from the identification of the research problem and formulation of the research question to the completion of the thesis and dissemination of results. Examples of using information provided by students include reading, synthesising divergent views and information from different
domains, writing, assuming a viewpoint based on evidence and making inferences and hypotheses based on research.

**Structure of awareness**

In this category, advancing disciplinary knowledge is the focus and therefore in the students’ foreground of awareness (see Figure 12). An increasing awareness of the importance of learning information literacy as an enabler to underpin enquiry and a credible research process forms a secondary focus.

![Diagram showing the structure of awareness](image)

**Figure 12 Category 5 - Structure of awareness**

**The what and how of learning**

Students experience the *how* of learning information literacy as the act of research. Research in this context refers to the research process undertaken by doctoral students. The indirect object that this act of learning is directed at is advancing disciplinary knowledge. In order to advance knowledge, students need a high-level knowledge base in their subject and discipline area and in information literacy and research to underpin the inquiry process. The new disciplinary knowledge is the content of learning (direct object).

The *what* and *how* of learning is illustrated in Figure 13.
Figure 13 Category 5 - The what and how of learning

Approaches to learning

Intentions

Students’ intentions are to advance knowledge. More specifically, students intend to answer a research question or address a research problem. In learning to use information to advance knowledge, students describe needing to draw on divergent domains of knowledge and make leaps and assumptions based on reliable and recognised methods of investigation and evidence.

Strategies

Research strategies include:

(1) Advancing knowledge through the research process
Students report undertaking specific activities related to learning information literacy and the research process as seen in other categories. For example, students learn to find information, synthesise and write by “doing” as they do in other categories. However, these “doing” activities are not dominant in the students’ awareness. In the same way as category four (personal knowledge), advancing knowledge does not occur by independently doing specific activities; rather it occurs through making links between these activities and other elements.
Students identified these other elements as being their knowledge base, their experience, the literature of the discipline and their research. In this way students make links between their already substantial knowledge base in the discipline area and with their professional practice and experience. This body of knowledge combines with the scholarship contained within the literature and their own research. These elements come together in the research process of inquiry, reflection, analysis, integration and extension to propose new concepts and knowledge as illustrated in the quote below:

KEEGAN: You have a number of building blocks, which you put in place. One is your literature base, one is your research base, one is your experience and you have your bridge. Seeing what is out there as an alternative path and then coming up with a synergy of this research information with that research information and then take the plunge, make a statement and then be able to support it. I have been doing that. In the last 12 months in a couple of the papers that I have written, I have come up with my own little model and if I was challenged on why I thought that model would work I can find literature to support that.

(2) Advancing knowledge through interacting with other people
The foremost experience of interacting with other people in this category as reported by students is the mentoring relationship between postgraduate students and their academic supervisors. Students reported the supervisor serves as a guide to learning about the discipline and the information and literature in the discipline and a means to challenge the students’ thinking and ongoing development as a researcher. Both Elizabeth’s and Keegan’s relationship with their supervisors personify this:

ELIZABETH: I asked this lecturer to be my supervisor and what happened was she took time with me. We went to the coffee shop and made a pact. It becomes a personal thing. We communicated excellently and I would talk to her and she would throw it back to me. It was just little thoughts and ideas and I wrote them down. She knew how to click into my personality and way of thinking and from there I just built on that and really did research very hard and I loved it. The more she would say to me to provoke my thoughts on different matters, the more I would research.

INTERVIEWER: How would you say you have learned this approach to using information in your postgraduate studies?
KEEGAN: By [my supervisor] challenging me – what I am doing and why I am doing it.

Engaging with others is seen as a way of learning to critically engage with the information within the discipline and while engaging with others facilitates their learning, it becomes an almost independent intellectual activity. Students report that linking theory to their practice and seeing the implications for their teaching practice in the previous category four (personal knowledge). In this category, there is a broader more critical edge to this exercise:

KEEGAN: What I find is if I am listening to a keynote speaker at a conference, my mind races all the time. I think about how is this relevant to work, my study, how can I rework this and how is this challenging what I am doing already? I am constantly thinking those things and when I come back from a conference there is a whole two or three pages of ideas that I want to pursue at school or something that has been said relevant to my study and I put in away on my pile.

Students describe undertaking various activities that involve interacting with other people, for example, individual consultations with librarians or workshops on research methods. As with category four (personal knowledge), students report that interaction with people is select and generally limited to a small number of people who can provide key information literacy, research methods or subject information.

A number of the postgraduate students like Bill also talk about their desire to have a learning mentor, who can facilitate their learning at appropriate intervals and in an ongoing manner:

BILL: What you really need – your supervisor who gives you your theoretical advice but you also need to have someone who becomes a learning mentor who as a group or individually – can say ‘how are you going in terms of the learning connection’ along the way. I guess that is a role a librarian has but it’s different. It’s actually someone who can look over your shoulder and say – I think you need to go off and have a look at this other course we have over here. I guess it gets done with undergraduates but as postgraduates you supposed to know all that anyway.
Themes

Learning

Students experience learning as creating disciplinary knowledge. This involves relating to subject content, possibly from different domains, in different ways. Like category four (personal knowledge), students in this category have a study and workplace view of the context of learning. This is because students describe making links between their profession as part of the act of research – both drawing on their professional experience as well as seeing the implications their research might have on the profession. Keegan describes his journey of learning to find and use information as a doctoral student:

KEEGAN: It has been a matter of accepting the limitations of what I can find. This has required me to move in my understanding of my own learning into being prepared to make assumptions and justify those assumptions and then coming up with a statement that I think I can defend instead of just taking everyone else’s ideas and saying that is okay.

Information

Students see information in the context of advancing knowledge. Information informs the research process. Students build bridges between the literature, their experience and research and draw from many knowledge domains and use these links to make assumptions. In this category, students express using information to advance knowledge in terms of divergent sources, approaches and thinking, going off on tangents, alternative paths, synergies, taking a plunge, taking risks and making assumptions or jumps and leaps. Keegan explains:

KEEGAN: My supervisor asked me to speak at something and I said I don’t know anything. He said, tell them what you do know, tell them what you don’t know, tell them what you think you might know and tell them the reason why you might know that. So I did. I took that on board and I took the plunge, making a statement and being able to defend it. Not because this author and this author say it but if you assume this from this author and you assume this from this author and this author then, it would make sense that it would lead
to this particular scenario... That's what I am saying – making jumps and
leaps.

Information includes current research and evidence to develop a hypothesis.
Information sources include the Internet, professional reading, books, journal
articles, citation trails and other people (lecturers – especially academic
supervisors, students, library staff and people outside of the university,
including professional networks and conference speakers). Information is also
derived from the students’ own approaches to learning – that is information
that is generated from the students' research processes.

As with category three (product) and category four (personal knowledge),
information is subjective and internalised by the student in order to assume a
personal perspective and use it in the research process. Like category four
(personal knowledge), information is also transformational when it is used to
create knowledge. Students describe their experiences as changing them as
a person – particularly changing their beliefs and assumptions about the
subject content. The students’ personal knowledge base is extended as the
students think differently about the subject:

KEEGAN: Learning to use information effectively is an essential component
for one's growth. Information and knowledge challenges where you stand
and what you believe in and to be able to use information properly and
appropriately and to be able to see the value of gathering information and
gaining information it will change the way you are. Not necessarily who you
are but what you think.

However, unlike category four (personal knowledge), it is also the information
itself that is transformed through the research process into knowledge that is
new to the discipline and this is what characterises information in this
category.

Information literacy

In this category learning information literacy is experienced as learning to use
information to advance disciplinary knowledge. Therefore, it follows that
information literacy is experienced as engaging with information to advance disciplinary knowledge. As such, information literacy is the how of learning.

Students report that engaging with information through the research process involves drawing divergent information sources together, perhaps from different disciplines in order to critique it and assume a viewpoint. Students explain they use existing knowledge and scholarship in combination with experience and research to create new knowledge. The following quote from Bill demonstrates this constant iterative interaction of information drawn from his experience as a school principal, his research and the literature:

BILL: I am trying to write from a practitioner’s perspective and to give an insight on practice and hopefully inform theory. I start off with what I see as my grounded theory from practice, and then I have gone back to the literature to test if this grounded theory is true or doesn’t make sense and then back into the field again. The field is where I started with my own intuition and ideas. I’ve looked at the literature, so now I am now back to see whether this is in fact, is really what I think it was at first. One of the things that I have as a strength is that I can see things in the research field because I have that practice in it and so having a critical overview as a practitioner and looking back at my practice.

Affective aspects

Affective aspects described by students in this category include initial frustration at not being able to find literature that neatly brings together all the aspects of the students’ research. However, students report this becomes acceptance with the realisation that this is what the research process involves – that in order to advance new knowledge, one has to draw from divergent sources, critically synthesise, make inferences, and espouse assumptions that can be supported by evidence from professional practice, scholarship and research. This divergence shifts from merely looking for information from different domains and sources, to also thinking about and approaching the problem differently. Keegan talks about this evolution:

KEEGAN: Last year when I was desperately trying to find information on my topic, I couldn’t find anything. I was just searching and searching and
searching and wherever I was turning, I was finding nothing. I was totally frustrated.

INTERVIEWER: So what would have helped you with that?
KEEGAN: Just coming to an acceptance that that was the situation that I had to go accept the fact that I had to go off on tangents and track down. I suppose by developing a divergent way of tackling the problem that you couldn’t find anything. The other thing was just accepting the fact that there might not be anything out there in your area so think divergently.

Risk taking is an important element seen by students in this experience – that is going out on a limb, taking a position counter to others in the discipline and presenting it – being open to criticism, questioning and counter arguments. With this, students like Keegan report growing in self-confidence as a researcher and scholar, which complements their existing self-confidence as professional educators:

INTERVIEWER: How would you encapsulate how you learnt to do things differently?
KEEGAN: Risk taking a little bit and growing in self-confidence that it is okay to make assumptions so long as you can defend them and I haven’t been prepared to do that until recently.

Reflection

Students describe critically reflecting on their use of information and on subject content, with a particular focus on how the information affects their research and their thinking about their research. Reflecting on the implications their research has on the discipline and practice of education is an aspect of reflection that is new in this category. As seen in this quote, Keegan, who is a school principal, is highly aware of the influence that his learning and study has on his professional practice and on the strategic direction of his school:

KEEGAN: The direction of the school is being influenced by what I am reading and studying. For example, I am not only looking at personal leadership development but looking at the relationship between leadership development and academic development in our school, so it is just infiltrating everywhere.
As in category four (personal knowledge), students describe having a high level of awareness of themselves as learners and recognise the importance of self-awareness, often employing reflection as a strategy for learning on a regular and ongoing basis, and as the doctoral student below illustrates, frequently advocating it to others as a trait of a successful professional:

BILL: It’s hard to be self-analytic. It should be a hallmark of an effective professional. I would have to say it is one of the things I would constantly say to colleagues while commenting on teacher’s capacity. If you can’t be self-reflective as part of your own process and practices and whatever you are doing, then go away and take long walks along the beach.

**Conclusion**

In category five, learning information literacy is experienced as learning to use information to advance disciplinary knowledge.

Several qualitative differences emerge in this category including:

- Information is transformed as a result of the advancing of disciplinary knowledge;
- Reflection on the implications the students’ research has on the discipline and practice of education.

A summary of the critical qualitatively different aspects of category five is presented in Table 11.
<table>
<thead>
<tr>
<th>Category 5</th>
<th>Advancing disciplinary knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meaning</td>
<td>Learning information literacy is seen as learning to use information to advance disciplinary knowledge.</td>
</tr>
</tbody>
</table>
| Structure of awareness | Foreground – advancing knowledge.  
Secondary – awareness of learning information literacy as an enabler to advancing disciplinary knowledge. |
| Direct object      | New disciplinary knowledge.                                                                      |
| Act of learning    | Research.                                                                                         |
| Strategies         | Learning through the research process.  
Interacting with other people – engage with key people selectively. Supervisor – challenges students’ thinking. |
| Indirect object (Intention) | Capability to advance disciplinary knowledge.                                                  |
| Learning           | Qualitative –  
Creating new disciplinary knowledge.  
A study and workplace view of the context of learning. |
| Information        | In the context of advancing disciplinary knowledge. Internal, subjective & transformational – the person transforms but the information also transforms into new disciplinary knowledge. |
| Information literacy | Engaging with information to advance disciplinary knowledge.                                    |
| Affective aspects  | Frustration initially when the person can’t find information linking all concepts of interest together becomes acceptance.  
Risk taking- taking a position.  
Growing confidence in self as a researcher. |
| Reflection         | Reflect on the implications their research has on the discipline and practice of education.  
High-level awareness of self as a learner.  
Reflect on how others learn.  
Recognise the importance of reflection & self-awareness & actively uses reflection to be a more strategic learner & teacher/principal. |

Table 11 Category 5 - Summary of qualitative differences
Category 6. Learning to use information to grow as a person and to contribute to others (community experience)

Overview

In category six, learning information literacy is experienced as learning to use information to grow as a person and to contribute to others. Category six is underpinned by category one, three and four, that is students in this category need to learn to find information, the capability to use it and the personal knowledge and understanding to use information and apply their learning.

There is no direct relationship between categories five (advancing knowledge) and six, although they are structurally at the same level in the outcome space. The experiences of learning information literacy in categories five and six are the most sophisticated but have a different emphasis and are not inclusive. The category five experience is intellectual and cognitive and set in an academic context. The category six experience is more subjective, comparative, social and almost moral and is set in the context of the wider world. The difference between categories five and six might also be informally expressed as the head ruling the experience in category five, whereas the heart rules the experience in category six.

Category six is the least formed of all of the categories. While it represents a qualitatively different experience to the other categories, there is not enough evidence in the transcripts to form a clear or complete picture of the experience. While category six is largely based on the experience of one student (Elizabeth), it is also informed by the experiences of other students. No Technology Education students are represented in this category. As such, this category does not have the same elaborated description and supporting evidence as the others.

Like categories four (personal knowledge) and five (advancing knowledge), there is a focus on a change or growth in the person in this category. Through
learning and growing as a person, there is a suggestion that a person is able to use information in a just and socially responsible way and it is by using information in this way that the person has the potential to contribute to others. This concept of learning information literacy to be able to contribute to others is the characteristic feature of this experience. Elizabeth explains that people are part of a much larger community, a community that exists on many levels. As people grow, the potential to contribute to others ripples outwards: ‘If we use ourselves as a central point and we build our families, our communities and our countries and we build our world’.

As Elizabeth reveals in the following longer excerpt, it is because people do not learn to use information appropriately, that misunderstanding and possible detriment to others can occur:

ELIZABETH: Learning to use information effectively is... one of the imperatives of growing as a person. Professionally it helps me as a teacher and as a student. Learning to use information is so important to everyone in the world to understand not just his or her place in the world but the concept of what is involved in the world.

We are lucky, here in the western countries, we will always assume that we have education – it is a given. When we look at other countries that don’t have that education, what do we do? When there is a disaster, we gather up books and pencils and we send them to these countries because we know that learning is vital to mankind. If they don’t have that choice or freedom to learn, then it is sad state. So we are lucky to know we have that freedom and choice. So having known and accepted that, for me having to build on it as we go through and seeing all the children have it. If we use ourselves as a central point and we build our families, our communities and our countries and we build our world. So how devastated are we when we see people are trying to blow up something, we think – ‘they haven’t learned what mankind is about or they may have learned what they think but we think that in our safe world – that they haven’t learned the right thing’, because they haven’t learned about peace or security or love so I suppose learning is hopefully going to bring peace.

While it is variable and relative as to what constitutes using information in a way that contributes to others, this experience can be characterised on different levels. On a larger scale, one might describe this contribution the way Elizabeth does, through descriptions such as tolerance, security and peace. In the quote on the next page Elizabeth also refers to this contribution
on a smaller scale, as a teacher with her students – learning together, teaching each other and sharing experiences.

**Structure of awareness**

As with category four (personal knowledge) and five (advancing knowledge), there is a focus on the learner, with learning being internal and involving change and growth for the person. However, similar to category five, the focus once again moves beyond the learner. The primary focus seems to be on others and the outside world and there appears to be an awareness of the person’s role in learning to use information responsibly to contribute to others in the community. This outward focus on contributing to others in the community is at the forefront of Elizabeth’s awareness as seen in Figure 14. In the category, the concept of community encompasses various levels – the classroom, the local community and the wider world.

It is suggested that the student’s awareness of the recognition of the importance of learning information literacy as an enabler of the responsible use of information and contribution to others forms a secondary awareness in this category.

![Figure 14 Category 6 - Structure of awareness](image)

This recognition began to emerge in category three (product) and is seen in category four (personal knowledge) and category five (advancing knowledge).
While this awareness appears in the same position of background as it does in these other categories, this awareness has a different focus. The student in this category appear to be capable of abstracting learning information literacy as being an agent of change, not just for the individual or knowledge generally but also perhaps for the greater good of others. Elizabeth expresses growing as a person and contributing to others in terms of understanding the world and others in it, your place in the world and the importance of learning to mankind.

**The what and how of learning**

Elizabeth experiences the how of learning information literacy as the act of socially responsible use of information. The indirect object that this act appears to be directed at is contributing to others. It is suggested therefore that the content (direct object) to be learnt is the concept of community. As described earlier, the concept of community reflects the notion of others and exists on many levels.

The what and how of learning is illustrated in Figure 15.

![Diagram: Contributing to others

<table>
<thead>
<tr>
<th>Contributing to others</th>
</tr>
</thead>
<tbody>
<tr>
<td>How</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Act</td>
</tr>
<tr>
<td>Socially responsible use of information</td>
</tr>
<tr>
<td>Indirect object (Intention)</td>
</tr>
<tr>
<td>Contributing to others</td>
</tr>
<tr>
<td>What (Direct object)</td>
</tr>
<tr>
<td>Concept of community</td>
</tr>
</tbody>
</table>

**Figure 15 Category 6 - The what and how of learning**
Approaches to learning

**Intentions**

It is suggested that the student’s intention is to use information in a socially responsible way to contribute to others. However, like the strategies for learning in this category, this is not explicit.

**Strategies**

The approach to learning in this category is distinctly different to the other categories in that there appears to be no explicit strategy in approaching learning as there is in all other categories. Students may undertake many activities to learn to find and use information in the same way as they do in the other categories but these are not indicative of the experience of this category. Students seem to become immersed in learning and they experience it in every part of their life and being. Learning is not a separate activity and students are not always conscious of a strategy or an intention to learn as explained by Kimberley:

KIMBERLEY: Learning is happening all the time. I could be in a conversation with a stranger for the first time and I am learning. I could be sitting here so I can write and I am learning. I could be working at my keyboard and suddenly discover there is shortcut here and I am learning. Every moment is potentiated with a learning opportunity. There is nothing that you can tell me that I am not going to be interested in because to me it is all part of life.

(1) Learning to use information to contribute to others through interacting with other people

In this category we also see Elizabeth engaging with information through interacting with other people as is seen in categories three to five, however there seems to be a greater focus on the relationship with the people as a means to learn to use information appropriately and a means to learn to understand others. In this way, Elizabeth appears to see interacting with other people as a two-way learning opportunity. Other people are both a source of learning for the student and characteristically, the recipient of the benefits of the student using information, learning and knowledge. In this
way, Elizabeth seems to see interacting with other people as a facilitator of her own learning and an opportunity to give back and teach others. Elizabeth refers to giving to others in relation to their own students at school as the following lengthy example illustrates:

ELIZABETH: The generations today, they teach me stuff. It is really quite interesting. I love going to work as a relief teacher. I never know what I will learn today and they will show me new things and new ways... For instance, yesterday I was with year seven and this was my second day with them. We researched people of significance in Australia so we watched videos their teacher had organised and we talked and discussed it. I have a very broad general knowledge and I could throw lots in. We were watching these videos on Dame Enid Lyon and McArthur and I would be able to throw in my experiences. ‘I have been to that sheep station at Parramatta’. ‘Really’ they said, they didn’t believe these places actually still existed.

Yesterday the students wanted to know if they could print out what they had found at school and they are not allowed to do that too much. So I said ‘I have this USB stick – have you seen it’? Now, three in the class of 25 knew what I was talking about, the rest didn’t. So I take it out of my bag and I have stuff on it and I put it in and put it up on the screen. Well they were amazed, they were stunned. ‘Oh we have to have one for Christmas’ and then they could talk about iPods, which I know nothing about so for me it’s an exchange and learning from each other... Standard classroom teachers have one group throughout the year and they love to see the result and they are satisfied with that. For me, I can come in and I like change. I love challenges. I can come in and every day is a challenge so as much as I can give out to them I give out. That is my style of teaching and as much as I can learn and gather, I learn.

**Themes**

**Learning**

Elizabeth appears to see learning as using information in a socially responsible way so that others may also benefit. In this way, it is desirable to the development of individuals and of humankind. It also seems to be seen as occurring across the lifespan and all contexts of a person’s life. As learning does not focus on subject or disciplinary content, this experience uniquely moves beyond the study environment or workplace to assume a **worldview**. Like categories three to five, learning has a qualitative focus.
**Information**

Elizabeth appears to see information in the context of benefiting others, thus information informs this contribution. As in categories four (personal knowledge) and five (advancing knowledge), information is subjective and internalised so it assumes personal meaning. Like category four and five, there is a suggestion that information can also be transformational. However, the information itself does not transform, as in category five. While the person grows, it is suggested that the potential that others have to transform is what characterises this category. This potential transformation of others is the result of the person learning to use information in a socially responsible way.

**Information literacy**

In this category learning information literacy is experienced as learning to use information to grow as a person and contribute to others. Therefore, it follows that information literacy may be experienced as using information in a socially responsible way so that others benefit. As such, information literacy is also the how of learning.

**Affective aspects**

Some of the affective aspects that were present in category four (personal knowledge) and category five (advancing knowledge) are also present in this category. Elizabeth describes being enthusiastically and energetically engaged in her own learning and being equally actively engaged in the learning of others. What is unique in this category is that there is strong sense of generosity and altruism that reflects personal values as evidenced by the quote in the overview section. It also seems to reflect the realisation of the outcomes of giving to others and encouraging others in their own learning. In this experience, there seems to be a genuine love of teaching and learning that crosses all contexts:

ELIZABETH: We are all different and I am teacher that believes totally in that individual difference. That’s why it is good for me to go in and out of classes.
I have an energetic style when I teach and the kids love that and I’m exhausted at the end of the day.

The following excerpt of Elizabeth’s lengthier quote in this category exhibits bewilderment and almost sadness that some people do not see that using information irresponsibly has the potential to harm others and the lack of awareness by people of the importance of education:

...How devastated are we when we see people are trying to blow up something, we think – ‘they haven’t learned what mankind is about or they may have learned what they think but we think that in our safe world – that they haven’t learned the right thing’, because they haven’t learned about peace or security or love.

**Reflection**

As seen in the quote in the section introducing this way of experiencing, there is a suggestion that Elizabeth reflects on the impact that using information and learning has on other people and the broader benefits that socially responsible use brings. As such, there is a unique focus on the importance of others learning to use information and their knowledge responsibly and the impact of this not happening. Elizabeth also has a high-level of awareness of herself as a learner (and as a teacher) and reflects on her own learning. As in categories four (personal knowledge) and five (advancing knowledge), Elizabeth also reflects on other people’s learning:

**INTERVIEWER:** Do you think an awareness of your own learning has made it easier for you to learn?
**ELIZABETH:** Yes, I reflect on that all the time. I don’t think my learning has changed. Reflecting on my style as a teacher and a learner is very important because that makes me aware of how students also do it.

**Conclusion**

In category six, learning information literacy is experienced as learning to use information to grow as a person and to contribute to others.
Several qualitatively differences emerge in this category, including:

- While the person transforms, others also have the potential to transform;
- The experience is values-based;
- Transcends study and workplace to assume a worldview;
- Reflects on the importance of others learning to use information;
- Lack of explicit strategy or intention to learn.

A summary of the critical qualitatively different aspects of category five is presented in Table 12.
<table>
<thead>
<tr>
<th><strong>Category 6</strong></th>
<th><strong>Learning to use information to grow as a person and to contribute to others.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meaning</strong></td>
<td>Learning information literacy is seen as learning to use information to grow as a person &amp; to contribute to others.</td>
</tr>
<tr>
<td><strong>Structure of awareness</strong></td>
<td>Foreground – Contributing to the community. Secondary – awareness of learning information literacy as an enabler to the responsible use of information.</td>
</tr>
<tr>
<td><strong>Direct object</strong></td>
<td>Concept of community.</td>
</tr>
<tr>
<td><strong>Act of learning</strong></td>
<td>Socially responsible use of information.</td>
</tr>
<tr>
<td><strong>Strategies</strong></td>
<td>No explicit strategy. Immersed in learning, part of the person’s life and being, not a conscious or separate activity. Interacting with other people – others are a source of learning &amp; a recipient of the benefits of using information responsibly.</td>
</tr>
<tr>
<td><strong>Indirect object (Intention)</strong></td>
<td>To contribute to others.</td>
</tr>
<tr>
<td><strong>Learning</strong></td>
<td>Qualitative – learning to use information in a socially responsible so others benefit. Worldview of the context of learning.</td>
</tr>
<tr>
<td><strong>Information</strong></td>
<td>In the context of benefiting others. Internal, subjective &amp; transformational – the person transforms but others also potentially transform.</td>
</tr>
<tr>
<td><strong>Information literacy</strong></td>
<td>Using information in a socially responsible way so that others benefit.</td>
</tr>
<tr>
<td><strong>Learning to use information</strong></td>
<td>Using learning &amp; knowledge in a responsible way that contributes to others.</td>
</tr>
<tr>
<td><strong>Affective aspects</strong></td>
<td>Personal – Altruistic, generosity, energetic, enthusiastic, active participation in learning of self &amp; others, love of learning, personal values.</td>
</tr>
<tr>
<td><strong>Reflection</strong></td>
<td>Reflect on the impact that using information and learning has on other people and the broader benefits that socially responsible use brings. Reflect on importance of how others learn to use information. High-level awareness of self as a learner. Reflect often on how others learn.</td>
</tr>
</tbody>
</table>

**Table 12 Category 6 - Summary of qualitative differences**
Summary

For the students in this study, learning information literacy is experienced in six ways:

1. Learning to find information (finding information);
2. Learning a process to use information (process);
3. Learning to use information to create a product (product);
4. Learning to use information to build a personal knowledge base in a subject area (personal knowledge);
5. Learning to use information to advance disciplinary knowledge (advancing knowledge);
6. Learning to use information to grow as a person and to contribute to others (community).

Collectively, these ways of experiencing form the phenomenon of learning information literacy. The key characteristics of each way of experiencing is summarised in Table 13.
<table>
<thead>
<tr>
<th>Category 1: Finding information</th>
<th>Category 2: Process</th>
<th>Category 3: Product</th>
<th>Category 4: Personal knowledge</th>
<th>Category 5: Advancing knowledge</th>
<th>Category 6: Community</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meaning</strong>&lt;br&gt;Learning information literacy is seen as...&lt;br&gt;Learning to find information.</td>
<td>Learning a process to use information.</td>
<td>Learning to use information to create a product.</td>
<td>Learning to use information to build a personal knowledge base in a subject area.</td>
<td>Learning to use information to advance disciplinary knowledge.</td>
<td>Learning to use information to grow as a person &amp; to contribute to others.</td>
</tr>
<tr>
<td><strong>Strategies</strong>&lt;br&gt;Learning by doing – hands-on, teach yourself, practise skills. Trial &amp; error – experimenting with different sources, keywords, tools. Interacting with other&lt;br&gt;Learning by doing – Experiencing. Trial &amp; error – experimenting with different techniques, designs, materials, methods of construction. Make mistakes &amp; change the process.</td>
<td>Learning by doing – focus on engaging with &amp; using the information. Trial and error – more planned approach to design &amp; construction by experimenting with different things then picking one &amp;</td>
<td>Learning by doing – focus on engaging with &amp; using the information. Learn through knowledge building processes – reflect, internalise &amp; construct knowledge. Making mistakes – focus on analysing them to learn from mistakes &amp; build understanding.</td>
<td>Learning through the research process. Interacting with other people – engage with key people selectively. Supervisor – challenges students’ thinking.</td>
<td>Learning through the research process. Interacting with other people – others are a source of learning &amp; a recipient of the</td>
<td>No explicit strategy. Immersed in learning, part of the person’s life and being, not a conscious or separate activity. Interacting with other people – others are a source of learning &amp; a recipient of the</td>
</tr>
<tr>
<td>Category 1: Finding information</td>
<td>Category 2: Process</td>
<td>Category 3: Product</td>
<td>Category 4: Personal knowledge</td>
<td>Category 5: Advancing knowledge</td>
<td>Category 6: Community</td>
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<td>---------------------</td>
</tr>
<tr>
<td>people – seeking assistance, observing.</td>
<td>Interacting with other people – working collaboratively, sharing expertise, helping each other.</td>
<td>developing it.</td>
<td>Interacting with other people – engaging with information through engaging with others to build knowledge e.g. learns from experts.</td>
<td>benefits of using information responsibly.</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>In the context of seeking or finding it. External, objective.</td>
<td>In the context of developing a process. External &amp; objective.</td>
<td>In the context of creating a product. Internal &amp; subjective.</td>
<td>In the context of building personal knowledge. Internal, subjective &amp; transformational to the person.</td>
<td>In the context of benefiting others. Internal, subjective &amp; transformational – the person transforms but others also potentially transform.</td>
</tr>
<tr>
<td>Information literacy</td>
<td>The knowledge and skills a person uses to find relevant &amp; appropriate information.</td>
<td>A process for using information.</td>
<td>Engaging with subject specific information to create a product.</td>
<td>Engaging with subject specific information to build knowledge base.</td>
<td>Using information in a socially responsible way so that others benefit.</td>
</tr>
<tr>
<td>Affective aspects</td>
<td>Frustration, confusion, anxiety.</td>
<td>Excitement &amp; confidence when the things don't work or</td>
<td>Frustration when things don't work or</td>
<td>Personal – Joy, anticipation,</td>
<td>Personal – Altruistic, generosity,</td>
</tr>
<tr>
<td>Category 1: Finding information</td>
<td>Category 2: Process</td>
<td>Category 3: Product</td>
<td>Category 4: Personal knowledge</td>
<td>Category 5: Advancing knowledge</td>
<td>Category 6: Community</td>
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<tr>
<td>---------------------------------</td>
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</tr>
<tr>
<td>overwhelmed – using technology, information overload, finding the right keywords. Excitement – when you find what you want, when you master a skill. Comfort, familiarity – using what you know. Growing confidence, pride – ICT skills</td>
<td>person develops a process that works for them. Frustration when the process doesn't work or when time constraints prevent the person developing a more effective process.</td>
<td>when the vocabulary is a barrier to using information.</td>
<td>pleasure, enjoyment, love of learning, discovery, journey, exploration, curiosity, enthusiastic, energetic, active participation in own learning. Frustration when seen to be not learning.</td>
<td>find information linking all concepts of interest together becomes acceptance. Risk taking- taking a position. Growing confidence in self as a researcher.</td>
<td>energetic, enthusiastic, active participation in learning of self &amp; others, love of learning, personal values.</td>
</tr>
</tbody>
</table>

**Reflection**

| Reflection | Evaluating search process and results. Awareness of preferred style of learning. | Evaluate the process. Awareness of preferred style of learning. | Reflect on using information & subject content in relation to the product. Reflect to be more strategic in use of information & how they use their time. | Reflect on using information & subject content in relation to future role as a teacher. High awareness of self as a learner. Reflect on how others learn. Recognise the importance of reflection & self-awareness & actively uses reflection to be a more strategic learner. | Reflect on the implications their research has on the discipline and practice of education. High-level awareness of self as a learner. Reflect on how others learn. Recognise the importance of reflection & self-awareness & actively uses reflection to be a more strategic learner & teacher/principal. | Reflect on the impact that using information & learning has on other people and the broader benefits that socially responsible use brings. Reflect on importance of how others learn to use information. High-level awareness of self as a learner. Reflect on how others learn. |

**Table 13 All categories - Summary of qualitative differences**
Chapter 5
Overview of the Categories of Description

Introduction

While the similarities and differences in each category and the structural relationship in and between the categories are described throughout the previous chapter, this chapter brings together a comparison of the qualitatively different ways that critical aspects of learning information literacy are viewed. In this way, it also provides a summary of the relationship between the categories of description, highlighting where significant structural shifts occur. The overview is organised around the students’ experience of the following:

- Learning, information and information literacy
- The what and how of learning
- The structure of awareness
- Affective aspects
- Reflection

Learning, information and information literacy

In the previous chapter, it was noted that learning information literacy comprises the dimensions of learning and information literacy, with information literacy able to be further discriminated into information and literacy. It is the way that students engage with information that shapes their experience of information literacy. Similarly, it is the way they experience learning information literacy that influences the approach they take to learning. Learning, information, and information literacy are closely intertwined and students’ experiences of these dimensions are crucial to understanding the meaning of each category.

In both category one (finding information) and two (process), learning is seen in quantitative terms, that is the acquisition and development of skills in finding
information or a process is additive. Learning in both of these categories is about how you do things and this involves the development of procedural knowledge, which is largely skills-based (Biggs, 2003 p.42). In contrast, in categories three through six, students assume a qualitative view of learning. Students in categories three to five relate to their education subject content in a different way through learning to use information.

This division continues in the way students see information. In categories one and two, students see information as external to them, in that it is out there waiting to be found. Information is also viewed as objective as it does not become part of them. However, in categories three to six, the information is internal and subjective as it becomes part of the students. Students internalise the information to gain a personal perspective and learn.

A further shift in the students’ view of information occurs from categories four through to six. Not only is information internal and subjective, it becomes transformational as it is used to create knowledge and therefore, change in a person. In category four (personal knowledge), it is the student who transforms as a result of a personal knowledge base and a different way of relating to the subject content. Through the research process, students’ beliefs and assumptions about the subject change in category five (advancing knowledge). In a further transformation, the information also transforms to become new disciplinary knowledge. When students experience personal change in category six (community), it is suggested that they grow as a person and students' understanding of themselves, the world, and their position and that of others in the world also change. However, in category six there is a hint of yet a further transformation as it is intimated that others primarily also have the potential to transform. This is the result of the transformative nature of information as it relates to a way of knowing and being, when people grow and use information in a socially responsible way that potentially contributes to others.

The ways learning, information and information literacy are experienced in the experiences is summarised in Table 14.
If learning is viewed in the ways just described, what do the students see they are learning and how do they approach learning? As described in the previous chapter, in any learning situation there is a what and how of learning. The what of learning refers to the content of learning – the direct object. The how of learning has two elements: 1) the act of learning; and 2) the indirect object of learning.

With a focus on the mastery of skills, tools, technology, processes and techniques, there is no focus on learning subject content in category one (finding information) or two (process). Learning information literacy is seen as the what of learning, isolated from learning subject content.

In a significant shift, categories three to five see the content of learning focus on subject and disciplinary knowledge. So for example in category three...
(product), students learn about a topic while creating a product such as an essay. The subject content of the essay topic is the content of learning while the act of learning is directed at learning to create the essay. So in these categories, students begin to experience learning information literacy as a vehicle to engage with learning their subject content. In this way, learning information literacy shifts from a what of learning to also become a how of learning. As a how of learning, learning information literacy is an enabler to learning. While learning does not have a subject focus in category six (community), learning information literacy continues to be an enabler.

The what and how of learning in the six categories are represented in Figure 16. Category six is displayed above category five only for the purposes of simplifying the outcome space. Normally they are represented on the same level (refer to the outcome space in Figure 3).
Category 6: Contributing to others

How

What (Direct object)
Concept of community

Act
Socially responsible use of information

Indirect object
Contributing to others

Category 5: Advancing disciplinary knowledge

How

What (Direct object)
New disciplinary knowledge

Act
Research

Indirect object
Advancing disciplinary knowledge

Category 4: Building a personal knowledge base

How

What (Direct object)
Subject knowledge

Act
Knowledge building processes

Indirect object
Building a personal knowledge base
Category 3: Learning to create a product

- How
- What (Direct object) Subject content

Acts: Creating
- Indirect object Learning to create a product

Category 2: Learning a process for using information

- How
- What (Direct object) Process

Acts: Acquiring & applying techniques to form a process
- Indirect object Developing a process

Category 1: Learning to find information

- How
- What (Direct object) World of information

Acts: Learning skills & about sources
- Indirect object Learning to find information

Figure 16 All categories - The what and how of learning
Indirect object: intentions

There are distinct differences in the students’ intentions between categories one (finding information) and two (process) and the higher categories. There is an external focus on the task or process, which reflects an extrinsic intention to meet the demands of the assessment, topic or course. While students in category three (product) also respond to assessment demands, it is characterised by students beginning to engage with subject content, which is absent in categories one and two.

In the two lower categories, there is also a focus on the parts rather than the whole. For example, in category one (finding information), students display a lack awareness of the information environment and how it is structured. While they may acquire skills to use specific library databases, they often seem to lack the conceptual knowledge of different types of information and tools, for example, getting confused between library databases and the library catalogue. Similarly in category two (process), students focus on the structure of the essay as separate parts of the task. Technology Education students focus on the techniques for working with artefacts, not the whole design or production of the artefact.

In contrast, learning becomes personal in the higher categories, as students seek meaning from their learning, seeking to know and understand what they learn. In categories three through to five, this meaning comes from learning the subject content. However, in category six (community), meaning does not derive from subject content but the students’ interpretation of the world and their role in the community. In contrast to the other categories, there appears to be no explicit intention to learn in the community category six, other than a general desire to continue to learn and learn from and teach others.

In the higher categories, students see the relationship between the parts and the whole, actively seeking connections with their existing knowledge and between information in other courses and domains and the university and other contexts. In learning to use information, students question how it is
useful; how it relates to what they know and to other areas and how it can be used.

**Act of learning: strategies**

While students appear to use similar strategies in their approach to learning information literacy, there are subtle qualitative differences that reflect different intentions. Students use a mixture of learning strategies except in category six (community), where students do not appear to use any explicit strategies.

**Learning by doing**

Learning by doing is an active approach to learning that provides students in categories one to three with an opportunity to experience working with information. When students learn by doing, they learn in action – learning while undertaking activities. Students speak in terms of *having a go or doing it yourself* and learn in a hands-on manner. With an emphasis on acquiring skills and techniques in categories one (finding information) and two (process), students need repeat practice to develop competence.

“Doing” reinforces learning, enhances recall and understanding and facilitates transfer of learning. In this way, learning by doing often occurs outside of the classroom, with Technology Education students in particular drawing on their know how of materials and methods, developed through their years in a trade. This is especially prominent in categories two (process) and three (product).

**Learning “by doing” in the higher categories**

While students in the higher categories also learn from undertaking activities, they do not build or extend knowledge through a focus on “doing” activities. For example, in category four (personal knowledge), students use internal knowledge building processes such as reflection, abstraction, interpretation, making links with their existing knowledge and experience and as a result, the information assumes personal meaning.
Students in categories three to six also learn after doing – that is, after the activity is over. In part, this may reflect a delayed response to their learning, in the form of feedback from lecturers. However, it also may reflect the qualitatively different nature of learning in these higher categories, as students gain a deeper understanding and insight into both the content of learning and themselves as learners. It also reflects the students’ intentions in seeking meaning.

While students report that learning information literacy develops across their years of university through doing activities, there is no suggestion that this occurs in the higher categories through repetition and practice. While students in categories three to five listed learning by doing activities such as critically reading, critiquing, synthesising, writing and presenting to others, they had difficulty explaining why this development occurred. *You just learn, you pick it up* – were common remarks that imply development comes with exposure and experience. However, some students did identify assessment that requires them to reflect on their learning processes facilitates their awareness of learning information literacy being an enabler to learning subject content or building or extending knowledge. This in turn prompts their intention to improve their information literacy capability and provides an opportunity to learn information literacy while learning subject content.

In summary, the focus on learning by doing in category one (finding information) and two (process) are on *learning to do*, whereas the focus in the higher categories is not primarily on “doing”, but on *learning to know and understand*. There is also a suggestion that the focus in category six (community) moves further to *learning to be*.

**Trial and error and making mistakes**

Trial and error is a form of learning by doing that involves experimenting till a satisfactory or successful outcome is reached (or not). Students use trial and error in different ways. For some, the approach of trial and error is
haphazard. For example, in category one (finding information) many students wantonly try different search terms and databases till they find what they are looking for or find one that is the easiest to use. At other times, students demonstrate a more planned approach to trial and error, which evidences greater control and organisation, as students evaluate their actions and results and plan what steps they would take next.

Further evidence of students using a more deliberative approach to trial and error is a greater emphasis on refining the approach as a result of analysing mistakes. Making mistakes is a key component of trial and error in categories one (finding information) and two (process) as mistakes afford the immediacy of seeing something does not work. This enables students to change their actions on the spot to change the outcome. Technology Education students in category three (product) also have this immediacy as they intentionally experiment with several designs and construction methods and evaluating what works and doesn’t work before deciding on one to develop to a final product.

**Interacting with other people**

Interaction with other people forms an approach to learning information literacy and is experienced by all students in all categories. However, there are qualitative differences in this interaction, which again reflect the students’ intentions. All students in this study seek assistance for various purposes and from people they perceive as possessing the required knowledge. So for example, in category one (finding information) students seek assistance in learning to use computers or databases from library staff but equally from peers.

Seeking assistance can be passive and one-way, such as asking for help and observing others. However, many students indicate they learn more effectively when this assistance is interactive and circuitous – where they ask for help, observe the other person doing an activity, then do it themselves while the other person watches and provides feedback. Students also help
each other. Helping each other involves learning from each other and recognises the different expertise people have. Technology Education students in particular acknowledge and draw on the expertise of those students with trade backgrounds.

There is a significant shift from categories three to five, where students interact with other people as a means to engage with subject content. In this way, other people are both a source of information and a means to engage with it. Other people in these categories might include other students, lecturers or people outside of the university, such as family members or contacts in schools, industry or at events like conferences.

In categories four to six, we see a further shift with students viewing their interactions with others as an opportunity to teach others. In category six (community), there is a very strong focus on interaction with others, who are both a source and recipient of the socially responsible use of information and learning.

**Structure of awareness**

As reported in the previous chapter, when students experience the phenomenon of learning information literacy, they only discern certain aspects of the phenomenon at any one time. This is why students have different experiences of the same phenomenon. Those aspects that are dominant are considered to be in the foreground of the students’ awareness. Some aspects will be less dominant, so perhaps secondary, while others will be in the background or in the margin of the students’ awareness. The aspect the student primarily focuses on constitutes what this experience means to students. This meaning forms the basis for each category of description and the outcome space depicting the meaning in each category has been previously presented in Figure 3 in chapter four.

In this study, it is the *indirect object* that is in the *foreground of the students’ awareness in each of the categories*. With the exception of the disconnection
between categories five and six, the categories of description are hierarchical, so students in the higher categories progressively discern more sophisticated aspects of learning information literacy. This does not mean that students who present with higher level experiences are experts in finding or managing information. In fact, the research students in category five (advancing knowledge) all lacked confidence in their skills in using databases and organising information. The hierarchical nature of the outcome space simply means students are able to experience learning information literacy as learning to find information (category one) or learning a process (category two) but equally are able to experience it as learning to use information to advance disciplinary knowledge category five). So they have a more expansive view of learning information literacy.

Learning to find information and learning a process for using information that are present in the foreground of awareness in categories one and two are the main object of reflection. At the same time, there is no awareness of learning subject content in these two lower categories.

In contrast, categories three to five increasingly focus on learning aspects of the discipline of education and on learning to use information to accomplish this mastery of the discipline. The increasing awareness of information literacy as an enabler in categories three to six, is also consistent with the greater emphasis on metalearning. This is evidenced by the students’ increasing use of self-reflection and self-monitoring of themselves as learners and on the learning strategies they use. The awareness of learning information literacy as an enabler is directed at different foci in each of these higher categories. In three to five, it is perceived respectively as an enabler to enhancing learning subject content and completing assessment; building knowledge and developing as a teacher; and creating knowledge and growing as a scholar.

In categories four to six, learning information literacy is also seen as an enabler to continuing to learn. In category six (community), it is suggested learning information literacy is an enabler to growing as a person, which
results in the person knowingly using information in a socially responsible way to contribute to others. The structure of awareness in each category is summarised in Table 15.

<table>
<thead>
<tr>
<th>Category 1 Finding information</th>
<th>Category 2 Process</th>
<th>Category 3 Product</th>
<th>Category 4 Advancing knowledge</th>
<th>Category 5 Personal knowledge</th>
<th>Category 6 Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreground</td>
<td>Learning to find information</td>
<td>Developing a process</td>
<td>Creating a product</td>
<td>Building a knowledge base</td>
<td>Advancing disciplinary knowledge</td>
</tr>
<tr>
<td>Secondary</td>
<td>Learning about sources &amp; skills to evaluate information and use ICT</td>
<td>Learning to create a product</td>
<td>Learning about the subject</td>
<td>Information literacy as an enabler</td>
<td>Information literacy as an enabler</td>
</tr>
<tr>
<td>Background</td>
<td></td>
<td></td>
<td></td>
<td>Information literacy as an enabler</td>
<td></td>
</tr>
<tr>
<td>In the margin</td>
<td>Learning to use information</td>
<td>Information literacy as an enabler</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 15 A comparison of the structure of awareness

**Affective aspects**

As mentioned in the results chapter, there are several themes of expanding awareness that are experienced qualitatively differently in each category: learning, information and information literacy, which have been discussed in this chapter. The two remaining themes are affective aspects and reflection.

The strong affective aspects which emerge in this study acknowledge the important role feelings play in the learning process. Feelings can facilitate student learning and at the same time, can also form a barrier. Both positive and negative feelings are present in each category.

Negative feelings are particularly prominent in category one as most students appear to struggle to learn to find relevant information in the most efficient and effective way. As noted above, few of the students in this study felt they did this well, with most citing inadequate skills and self-doubt in their ability to acquire the necessary skills. Most of this difficulty appears to stem from a
lack of understanding of the structure of the information environment; unavailability and inaccessibility of materials; problems identifying the right keywords to search and refine searches; finding too much or too little information; confusion over different search tools and interfaces; and problems generally with technology. Some students identify a lack of computer skills and because of their consequential diffidence, they avoid using computers. Younger students and mature aged students, and Technology Education and text-based students alike experience extreme frustration when learning to find information.

While feelings such as frustration are also present in the higher categories, there is no focus on information and communication technologies. Instead, it is directed at barriers to information use and learning subject content, such as the style of academic language found in scholarly journal articles or being assessed on content that requires rote learning.

Students in all categories experience the frustration of time constraints, which hinder their participation in learning. At the same time, some students recognise the importance of learning to find and use information in order to make the best use of their time. The need to be more strategic in the use of their time is more evident in categories four to six, as students see the development of learning strategies as a way of enhancing learning to use information and subject content. This confirms the finding of the increasing awareness students have in the higher categories of learning information literacy as an enabler to learning subject content. In a similar way, when students have a better understanding of their subject, this appears to make it easier for them to be more strategic in learning to use information.

At the same time, many positive feelings emerge in all categories. Students in categories one and two feel excitement and feelings of competence when acquiring skills to find information and processes for using information. Pride in their accomplishments at overcoming the perceived barriers of using computers and technology is also evident. In the higher categories, this same
feeling of budding confidence originates from the students’ growing capability to use information and build knowledge and understanding of their subject. Strong emotions are evidenced in the higher categories four to six, which reflect the personal transformation and journey that students experience in these categories. Perhaps too this is a reflection of the enjoyment and pleasure that comes from relating to learning in a qualitatively different way, which is found in these higher categories and which is absent in categories one and two? This also reflects an interest in learning subject content, which students identify as being an important intention in their learning.

**Reflection**

The final theme that is experienced in a qualitatively different way in each experience is reflection. As discussed earlier, the object of reflection in each category mirrors the capability the act of learning is directed at (i.e., the indirect object of learning). As suggested in chapter four, the use of the description “reflection” in relation to the activities in category one (finding information) and two (process) is perhaps too strong. I suggest that the term “evaluation” is more appropriate and more representative as students evaluate their search terms, search results, strategies and techniques rather than reflect on the subject content or their own learning?

Most students in category one and two possess an awareness of their preferred ways of learning, that is, they are aware of how they generally prefer to learn about computers or library databases or learn techniques or processes. Many indicate they recognise that they are visual or kinaesthetic learners and prefer flowcharts, diagrams or a hands-on activity. Much of this awareness comes from their studies, where education students are taught about learning styles. However, there is not the same explicit and intentional reflection on themselves as learners that is seen in the higher categories.

Students reflect on their subject content in categories three to five, albeit with a different focus in each. In categories four to six, students have a high level awareness of themselves as learners and their learning strategies. As future
teachers building a knowledge base in education, students in category four (personal knowledge) also actively reflect on student learning. Much of this is the direct outcome of their studies and particular assessment. Similarly, the doctoral students in category five (advancing knowledge) are experienced teachers and reflect on student learning, in relation to the implications this has for their research and in turn, that their research might have on student learning in their practice as teachers. Once again, the reflection on how other people learn in category six (community) shifts outside of the university and workplace context, to focus on the broader implications that learning to use information has on others.

The nature of reflection in each category are summarised in Table 16.

<table>
<thead>
<tr>
<th>Category 1</th>
<th>Category 2</th>
<th>Category 3</th>
<th>Category 4</th>
<th>Category 5</th>
<th>Category 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finding Information</td>
<td>Learning to find information</td>
<td>Learning a process</td>
<td>Building a knowledge base</td>
<td>Advancing disciplinary knowledge</td>
<td>Contribute to others</td>
</tr>
<tr>
<td>Process</td>
<td>No reflection on subject content</td>
<td>Reflect on subject content in relation to the product</td>
<td>Reflect on subject content in relation to future teaching role</td>
<td>Reflect on subject content in relation to research and professional practice</td>
<td>No reflection on subject content</td>
</tr>
<tr>
<td>Product</td>
<td>Awareness of preferred learning style</td>
<td>Some awareness of self as a learner</td>
<td>High level awareness of self as a learner</td>
<td>High level awareness of self as a learner</td>
<td>High level awareness of self as a learner</td>
</tr>
<tr>
<td>Personal knowledge</td>
<td>No reflection on others</td>
<td>Reflect on how others learn</td>
<td>Reflect on how others learn</td>
<td>Reflect on how others learn</td>
<td>Reflect on how others learn</td>
</tr>
<tr>
<td>Advancing knowledge</td>
<td>Use of evaluation to be more effective</td>
<td>Use of reflection to be more strategic in using information &amp; creating products</td>
<td>Active use of reflection for self-monitoring &amp; learning &amp; to be a more strategic learner</td>
<td>Active use of reflection as a scholar and teacher &amp; to be more a strategic learner &amp; teacher/principal</td>
<td>Use of reflection to view the broader impact of learning to use information on others</td>
</tr>
<tr>
<td>Community</td>
<td>Limited</td>
<td>Limited</td>
<td>Moderate reflection</td>
<td>High level of reflection</td>
<td>High level of reflection</td>
</tr>
</tbody>
</table>

Table 16 A comparison of the theme of reflection
Conclusion

This chapter has highlighted similarities and differences in critical themes and significant structural shifts in and between the categories. In the next chapter, these findings will be discussed in relation to both phenomenographic empirical information literacy studies and key curriculum models.
Chapter 6
Discussion of Results

Introduction

In this chapter I compare the experiences of the students in my study with the experiences of learning information literacy I have analysed in the empirical information literacy studies and curriculum models discussed in chapter two. I then discuss the implications for information literacy education.

As noted previously, the research question this study seeks to address is ‘What are the different ways students experience learning information literacy?’ Learning information literacy is a complex and abstract phenomenon. While there are no other studies that explore students’ ways of experiencing learning information literacy, in chapter two I discuss the experiences of information literacy that are represented in key empirical studies that use a relational perspective and three information literacy curriculum models. Through juxtaposing my results with these studies and models, ways of experiencing information literacy, learning and learning information literacy are illuminated.

Learning information literacy – empirical studies

As reported in chapter four, the students in my study experienced learning information literacy as:

1. Learning to find information (finding information);
2. Learning a process to use information (process);
3. Learning to use information to create a product (product);
4. Learning to use information to build a personal knowledge base in a subject area (personal knowledge);
5. Learning to use information to advance disciplinary knowledge (advancing knowledge);
6. Learning to use information to grow as a person and to contribute to others (community).

All six experiences affirm the view of information literacy as seen by students and higher educators in the empirical studies. In the next section, I will highlight key similarities and differences between my study and the others.

**Learning to find information**

Learning to find information is a key experience in almost all of the studies. In my study, learning to find information comprises three intertwined aspects – 1) *learning about sources of information* 2) *learning to select and evaluate information* and 3) *learning to use information and communication technologies (ICTs) to access and retrieve electronic information*.

As many studies (Boon et al., 2007; Bruce, 1997; Maybee, 2007; Webber et al., 2005) reveal information literacy is experienced as sources, learning information literacy is therefore *learning about sources of information*. This can involve understanding the content, characteristics and structure of information sources (Bruce, 1997 p. 457; Maybee, 2007) – for example, knowing that the type of information found in books can be different to that found on the Internet. It can encompass evaluating the credibility of the information found in sources (Limberg, 1999; 2000 p. 196; Lupton, 2004 pp. 56-61; Maybee, 2007 p.457).

Similarly, students and educators in other studies also used a variety of sources of information – print, digital and human (Bruce, 1997 pp.125-128; Maybee, 2007 p. 457). Of note, Bruce (1997 pp.125-128) makes the distinction between knowing sources and using them independently and knowing who to ask for assistance or information as a defining feature of learning to be information literate. With people as both a source of information and a referral to sources of information, students in my study also report knowing where to go to find information means knowing who to ask.
Successful retrieval of information is also dependent on having the skills to access the sources (Boon et al., 2007; Bruce, 1997; Webber et al., 2005). With so much information available digitally, students and educators in many studies experience learning information literacy as *learning skills to use information and communication technologies* (ICTs) (Boon et al., 2007; Bruce, 1997; Maybee, 2007; Webber et al., 2005). Learning skills to use ICTs allows people to more quickly and easily access online information as well as making a greater range of information more accessible. Like Bruce, my study found learning to use ICTs can both enhance and form a barrier to information access.

My analysis of learning information literacy in the empirical studies that reflect my category one is captured in Table 17.

<table>
<thead>
<tr>
<th></th>
<th>Students’ experiences</th>
<th>Higher educators’ experiences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limberg (1999, 2000)</td>
<td>Learning to find information</td>
<td>Learning to use technology to find information</td>
</tr>
<tr>
<td>Lupton (2004)</td>
<td>Learning to find information</td>
<td>Learning about sources to find information</td>
</tr>
<tr>
<td>Maybee (2007)</td>
<td>Learning to use technology to find information</td>
<td>Learning a process to find and use information</td>
</tr>
<tr>
<td>Bruce (1997)</td>
<td>Acquiring and developing skills to find information</td>
<td>Learning skills to find information</td>
</tr>
<tr>
<td>Webber, Boon, Johnston (2005)</td>
<td>Learning to use IT to find &amp; manage information</td>
<td>Learning to find information</td>
</tr>
<tr>
<td>Boon, Johnston, Webber (2007)</td>
<td>Learning to use tools to find information</td>
<td>Learning to find information</td>
</tr>
</tbody>
</table>

Table 17 The view of learning information literacy in the empirical studies in comparison to my category one

**Learning a process to use information**

Learning information literacy is experienced by students in my study as learning a process to use information. In some studies (Bruce, 1997; Limberg, 1999, 2000; Maybee, 2007; Webber et al., 2005) information literacy is a process that is developed to *find and use* information while in others
Regardless of the intention, all studies report a process that typically consists of a series of generic structured steps, stages, activities, strategies or techniques. The process that has been developed can then be applied to a learning task or problem. The application of the process enables the person to more effectively and efficiently achieve a specific outcome (Bruce, 1997 pp. 129, 131). So in this way, learning a process is ‘seen as acquiring the skills and techniques that can be applied again’ (Lupton, 2008 p. 71). Bruce reveals processes vary between individuals, as they are developed to suit the person, which is consistent with my own study (1997 p. 129). So while processes might consist of similar techniques or steps, each person adapts the process to suit her/himself.

Students deploy a process to complete assignments and solve problems (Maybee, 2007 p. 458). Higher educators (Bruce, 1997 p. 129) also use processes to solve problems and make decisions. Like the students in my study, the educators in Bruce’s study develop processes to manage information (1997 p. 132). Developed for this purpose, the process facilitates the retrieval of information.

My analysis of learning information literacy in the empirical studies that reflect my category two is captured in Table 18.
Table 18 The view of learning information literacy in the empirical studies in comparison to my category two

Learning to create a product

Learning information literacy is experienced by students in my study as learning to use information to create a product. The product is usually an assessment item, such as an essay or an artefact but can be something less tangible – such as an argument that a student develops to use in an essay or a solution to a problem.

Results from other studies also reveal that students focus on information literacy as end products or outcomes. In Lupton’s study, music students focus on creating sounds, which were the product (2008 p. 79). Students use information to complete assignments and solve problems (Maybee, 2007 p. 459), while academics also focus on ‘understanding a problem and understanding how information can be used to solve the problem’ (Webber et al., 2005 p. 11). In this way, the focus is not on the process to solve problems but on the solution to the problem, which is the product.

My analysis of learning information literacy in the empirical studies that reflect my category three is captured in Table 19.
Table 19 The view of learning information literacy in the empirical studies in comparison to my category three

Learning to use information to build a personal knowledge base in a subject area

A personal knowledge base is a major experience of information literacy in all of the studies. Learning to use information to build a personal knowledge base serves a variety of purposes. On one level students strive to understand a topic, seeking to understand different viewpoints. This enables them to form a personal viewpoint (Limberg, 1999; 2000 p. 197; Maybee, 2007 p. 459) that underpins knowledge. Students also seek to understand this subject content in a broader context (Limberg, 1999; 2000 p. 197; Lupton, 2008 p. 131). For example, Lupton’s (2008 p. 133) tax students sought broader subject knowledge, rather than simply focus on learning about the narrower topic of the assignment.

On another level, students and higher educators alike also see building a knowledge base as necessary to fulfilling future professional roles, like the students in my study, who aligned the development of their knowledge base with their future careers as teachers. In this way, the knowledge base moves beyond the university to the workplace. In seeking to understand the tax law system, Lupton’s students make clear links with professional practice (2008 p. 133). The marketing academics in Webber, Boon and Johnston’s study (2005 p. 12), also see learning information literacy as contributing to professional practice. In this way the focus shifts from simply knowing, to being able to draw on one’s knowledge base and apply knowledge, as it does in my study.
Of note, Lupton’s (2008 p. 90) music students see their knowledge as part of their identity as a composer, in the same way my students see their knowledge base as integral to their identity and role as a teacher.

Similarly, several studies reveal that an enhanced knowledge base is perceived as transformational (Lupton, 2008 p. 96; Webber et al., 2005 pp. 9,12). English academics see learning to use information as a means to becoming a ‘confident, autonomous learners and critical thinkers’ (Boon et al., 2007 p. 218). Lupton’s music students (2008 p. 96) also clearly articulate self-development and growth that is the result of a change in perspective.

My analysis of learning information literacy in the empirical studies that reflect my category four is captured in Table 20.

<table>
<thead>
<tr>
<th>Learning to use information to build a knowledge base in a subject area: My Category 4</th>
<th>Learning to use information to form a professional identity</th>
<th>Learning to find and use information to learn about a subject</th>
<th>Learning to use information to build a knowledge base in a discipline</th>
<th>Learning to use information to become an effective professional</th>
<th>Learning to use information to become a critically reflective learner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students’ experiences</td>
<td>Lupton (2008)</td>
<td>Learning to use information to form a professional identity</td>
<td>Learning to use information to build a knowledge base</td>
<td>Learning to find and use information to learn about a subject</td>
<td>Learning to use information to build a knowledge base in a discipline</td>
</tr>
<tr>
<td>Lupton (2004)</td>
<td>Learning to use information to build a knowledge base</td>
<td>Learning to find and use information to learn about a subject</td>
<td>Learning to use information to build a knowledge base in a discipline</td>
<td>Learning to use information to become an effective professional</td>
<td>Learning to use information to become a critically reflective learner</td>
</tr>
<tr>
<td>Limberg (1999, 2000)</td>
<td>Learning to use information to build a knowledge base</td>
<td>Learning to find and use information to learn about a subject</td>
<td>Learning to use information to build a knowledge base in a discipline</td>
<td>Learning to use information to become an effective professional</td>
<td>Learning to use information to become a critically reflective learner</td>
</tr>
<tr>
<td>Maybee (2007)</td>
<td>Learning to use information to build a knowledge base</td>
<td>Learning to find and use information to learn about a subject</td>
<td>Learning to use information to build a knowledge base in a discipline</td>
<td>Learning to use information to become an effective professional</td>
<td>Learning to use information to become a critically reflective learner</td>
</tr>
<tr>
<td>Bruce (1997)</td>
<td>Learning to use information to build a knowledge base</td>
<td>Learning to find and use information to learn about a subject</td>
<td>Learning to use information to build a knowledge base in a discipline</td>
<td>Learning to use information to become an effective professional</td>
<td>Learning to use information to become a critically reflective learner</td>
</tr>
<tr>
<td>Webber, Boon, Johnston (2005)</td>
<td>Learning to use information to build a knowledge base</td>
<td>Learning to find and use information to learn about a subject</td>
<td>Learning to use information to build a knowledge base in a discipline</td>
<td>Learning to use information to become an effective professional</td>
<td>Learning to use information to become a critically reflective learner</td>
</tr>
<tr>
<td>Boon, Johnston, Webber (2007)</td>
<td>Learning to use information to build a knowledge base</td>
<td>Learning to find and use information to learn about a subject</td>
<td>Learning to use information to build a knowledge base in a discipline</td>
<td>Learning to use information to become an effective professional</td>
<td>Learning to use information to become a critically reflective learner</td>
</tr>
</tbody>
</table>

Table 20 The view of learning information literacy in the empirical studies in comparison to my category four

**Learning to use information to advance disciplinary knowledge**

In my category five, learning information literacy is experienced by students as learning to use information to advance disciplinary knowledge. This category reflects part of the doctoral students’ experience of learning information literacy. As there are no undergraduate students’ experiences represented in
this category, it is not surprising that there is no similar corresponding category in those empirical studies with undergraduate student participants.

Higher educators’ experience of information literacy in Bruce’s knowledge extension category strikingly mirrors my advancing knowledge category. Here higher educators draw on their experience and scholarship to enhance their knowledge base (Bruce, 1997 p. 143). In my study, students describe the interaction between their knowledge base, their professional experience and their scholarship in learning information literacy.

In both studies, the outcome is ‘novel insights’ (Bruce, 1997 p. 145) or new knowledge. In a further similarity, information that is internal and subjective, is also transformational as it forms knowledge. In this case, it is information that is transformed into new knowledge (Bruce, 1997 p. 143).

My analysis of learning information literacy in the empirical studies that reflect my category five is captured in Table 21.

| Learning to use information to advance disciplinary knowledge: My Category 5 |
| Bruce (1997) Higher educators’ experience |
| Learning to use information to create new knowledge |

Table 21 The view of learning information literacy in the empirical studies in comparison to my category five

**Learning to use information to grow as a person and to contribute to others**

Through learning and growing as a person, there is a suggestion that a person is able to use information in a just and socially responsible way and it is by using information in this way that the person has the potential to contribute to others. It is through this notion of contributing to others that the concept of community is foregrounded.

While there are slightly different emphases and contexts, there are several similarities with other studies. Some information literacy experiences share
the dominant and characteristic focus on others and the community (Bruce, 1997; Lupton, 2004). Some share an awareness of the impact of using information and learning in a socially responsible way (Bruce, 1997; Lupton, 2004, 2008). For example, Lupton’s (2008 pp.131-134) students demonstrate some awareness of the social implications of the tax law system. In her study of environmental studies undergraduate students, Lupton (2004 pp. 67-68) found students wanted to solve environmental problems, effect change and help the community.

A key commonality is the sense of values that underpin the socially responsible use of information (Bruce, 1997; Limberg, 1999, 2000). Others also note this experience moves beyond knowing what is right, to also doing what is right (Bruce, 1997 pp.149-150; Lupton, 2008 p. 133). Wisdom (Bruce, 1997 p. 148; Lupton, 2008 pp.133,137), is a term frequently used to describe this “right” way of acting, as people apply their learning and knowledge.

A small point of difference is the importance of the knowledge base, which Bruce notes is built up through ‘processes of scholarship and personal experience’ (1997 p. 148). While personal experience is a component of this experience in my study, the students’ academic knowledge base and scholarship are not. This leads to a bigger point of difference. This category in my study transcends the boundaries of the assignment, topic, subject, workplace and the university. The experience of this category takes a distinctive world view. While the experiences of other studies also move outside to the broader world, it is usually in response to or a result of a particular assignment or field of study. Exceptions to this are the English academics, whose focus is on the ‘individual’s role in and engagement with the wider information society… becoming an information literate citizen’ (Boon et al., 2007pp. 218-219). Bruce’s (1997 p. 149) higher educators also have this broader focus.

My analysis of learning information literacy in the empirical studies that reflect my category six is captured in Table 22.
Learning to use information responsibly to grow as a person and contribute to others: My category 6

<table>
<thead>
<tr>
<th>Students’ experiences</th>
<th>Higher educators’ experiences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning to use</td>
<td>Learning to use</td>
</tr>
<tr>
<td>knowledge in a</td>
<td>information in a</td>
</tr>
<tr>
<td>socially aware &amp;</td>
<td>socially responsible way</td>
</tr>
<tr>
<td>responsible way</td>
<td></td>
</tr>
<tr>
<td>Limberg (1999,</td>
<td>Learning to find &amp; use</td>
</tr>
<tr>
<td>2000)</td>
<td>information to</td>
</tr>
<tr>
<td>Bruce (1997)</td>
<td>critically understand</td>
</tr>
<tr>
<td>Boon, Johnston,</td>
<td>the implications of</td>
</tr>
<tr>
<td>Webber (2007)</td>
<td>a topic</td>
</tr>
<tr>
<td>Learning to use</td>
<td>Learning to use</td>
</tr>
<tr>
<td>information wisely</td>
<td>information for the benefit</td>
</tr>
<tr>
<td>for the benefit of</td>
<td>of others</td>
</tr>
<tr>
<td>others</td>
<td>Learning to use</td>
</tr>
<tr>
<td></td>
<td>information to develop as a</td>
</tr>
<tr>
<td></td>
<td>more critically reflective</td>
</tr>
<tr>
<td></td>
<td>citizen</td>
</tr>
</tbody>
</table>

Table 22 The view of learning information literacy in the empirical studies in comparison to my category six

Summary

The results of my study affirm the breadth and range experiences of information literacy reported in the empirical studies. My study has also revealed that there is considerable variation in experiences of learning information literacy. These experiences range from learning skills and techniques to learning to use information for the greater benefit of others. My study reveals that there appears to be little difference between students’ and higher educators’ experiences of learning information literacy. It also reveals the only distinction between the experience of undergraduate and postgraduate students is the postgraduate’s focus on creating new disciplinary knowledge through the research process. Table 22 summarises the experiences of learning information literacy of the students in my study in comparison to those I have analysed in the empirical studies.
<table>
<thead>
<tr>
<th>Students’ experiences</th>
<th>Higher educators’ experiences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>My categories</strong></td>
<td><strong>Lupton (2008)</strong></td>
</tr>
<tr>
<td>Learning to find information</td>
<td>Learning to find information</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning a process for using information</td>
<td>Learning skills &amp; techniques</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning to use information to create a product</td>
<td>Learning to use information to create sounds to compose</td>
</tr>
<tr>
<td></td>
<td>Learning to use information to develop an argument</td>
</tr>
<tr>
<td>Learning to use information to create a knowledge base in a subject area</td>
<td>Learning to use information to form a professional identity</td>
</tr>
<tr>
<td></td>
<td>Learning to use information to understand the discipline &amp; context</td>
</tr>
<tr>
<td>Learning to use information to advance disciplinary knowledge</td>
<td>Learning to use information to create new knowledge</td>
</tr>
</tbody>
</table>
Table 23 A summary of the view of learning information literacy in the empirical studies in comparison to my categories

In this section I have discussed the experiences of learning information literacy of the students in my study in comparison to those I interpreted in the empirical studies. In the next section I will map the experiences of learning information literacy against the three information literacy curriculum models and analyse the view of learning information literacy in each model.

**Learning information literacy – curriculum models**

As reported in chapter two, I have chosen to limit the scope of my study to reviewing three information literacy curriculum models. The Standards model has been chosen because it is a dominant paradigm in higher education and the Six Frames and GeST models because they provide a relational lens to view information literacy education.

**The Standards model**

As described in chapter two, the Australian and New Zealand Information Literacy Framework (Bundy, 2004) lists the attributes, aptitudes and knowledge an information literate person would possess. With a focus on individual skills and competencies, information literacy can be assessed or measured as a discrete set of attributes that is external to the person. Curriculum can be designed to incrementally stage the development of attributes.
As the experience of information literacy in the Standards range from more limited to more expansive, so too do the experience of learning information literacy that are implicit in the Standards. When viewed through the first three Standards, learning information literacy may be seen as *acquiring and developing skills to find and evaluate information*, as it is in my category one. Similarly, the view of learning information literacy in Standard four may be seen as *developing a process for managing information*, although the processes referred to in my category two are not restricted to managing information.

When viewed through Standard five, learning information literacy may be seen as *learning to use information to build knowledge*. Knowledge in this context refers to both new personal knowledge and disciplinary knowledge, so incorporates both my categories four (personal knowledge) and five (advancing knowledge).

Lastly, Standard six most closely matches my category six (community) in that it identifies the ethical and social issues of using information, a use which the Standards acknowledge is underpinned by values and beliefs, as was the experience in my community category. While learning information literacy may be seen as *learning to use information responsibly*, the Standard is quite vague and all of the learning outcomes of this Standard relate to the appropriate conventions of information use, information storage and dissemination. There is a lack of focus on the broader concept of the collective socially responsible use of information and the benefits learning information literacy may provide to communities of people, which was evident in my category six.

The Standards provide a valuable framework for information literacy education. However, with all the learning outcomes of the first four Standards and half of those from Standards five and six devoted to identifying, finding and organising information, there still is a strong focus on the skills and behaviours of individuals, which are more limited, rather than the distinctly more expansive use of information to benefit others, as seen in my study and
that of Bruce (1997) and Lupton (2004). In future reviews of the Standards model, greater attention could be paid to the broader concepts of socially responsible use of information and to community (Harris, 2008).

My analysis of learning information literacy in the Standards model is captured in Table 24.

<table>
<thead>
<tr>
<th>My categories</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learning to find information</td>
<td>1-3. Acquiring &amp; developing skills to find &amp; evaluate information</td>
</tr>
<tr>
<td>2. Learning a process for using information</td>
<td>4. Developing a process for managing information</td>
</tr>
<tr>
<td>3. Learning to use information to create a product</td>
<td></td>
</tr>
<tr>
<td>4. Learning to use information to build a personal</td>
<td>5. Learning to use information to build knowledge</td>
</tr>
<tr>
<td>knowledge base</td>
<td></td>
</tr>
<tr>
<td>5. Learning to use information to advance disciplinary</td>
<td></td>
</tr>
<tr>
<td>knowledge</td>
<td></td>
</tr>
<tr>
<td>6. Learning to use information responsibly to grow as a</td>
<td>6. Learning to use information responsibly</td>
</tr>
<tr>
<td>person and contribute to others</td>
<td></td>
</tr>
</tbody>
</table>

Table 24 The view of learning information literacy in the Standards model

The Six Frames for Information Literacy Education

In the Six Frames for Information Literacy Education model, the authors view information literacy education through six lenses, each of which represents a different perspective on information literacy, learning and teaching. These lenses are termed the content, competency, learning to learn, personal relevance, social impact and relational frames (Bruce et al., 2006). The Six Frames do not represent individual attributes or sequential stages. Rather, each is underpinned by a different theoretical basis. Curriculum can be designed to bring one frame to the fore, to use it as a lens to achieve specific educational outcomes.

When viewed through the content frame, learning information literacy is experienced as knowing more about information tools, sources and context – so knowing more about the ‘world of information’ (Bruce et al., 2006 p. 4 my emphasis) – the way information literacy is described by the Six Frames authors. This frame closely matches my category one (learning to find information). Notably, the direct object of learning in my category one is also
the world of information. Students in my category one see the content (direct object) to be learned is knowledge of, and skills in navigating the world of information. Learning about the world of information encompasses learning about sources and types of information, learning how to select and evaluate information and learning skills to use ICTs to access and retrieve electronic information.

My category one can also be viewed through the second competency frame. Through this frame, learning information literacy is seen as acquiring and developing skills. Hence, these skills can be acquired to find information or to develop a process, as seen in my category two (process), so the competency frame also maps well to my second category.

Through the learning to learn frame, learning information literacy is seen as learning to use information to think like a practitioner. As was the case with the Standards model, there is no clear frame to view my category three (product).

The learning to learn view of learning information literacy is also characteristic of my category four (personal knowledge), as the education students in my study learn information literacy to develop as teachers. Through the personal relevance frame, learning information literacy is seen as learning an awareness of what information literacy can do for the individual. Although the concept of personal relevance is broader than a personal knowledge base, the authors report that ‘learning is about finding personal relevance and meaning’ (Bruce et al., 2006 p. 5). In my personal knowledge category, information is subjective as it takes on meaning by constructing or interpreting it. In this way, it assumes personal meaning and relevance and forms part of the students' personal knowledge base.

Relevance and meaning is also constructed by students in my category five (advancing knowledge), when they transform information to create new disciplinary knowledge. Similarly, with this focus on engaging with subject
content, there are elements of the personal relevance frame that encompass my category five.

With the same broad focus on the social impact of using information to assist others, the social impact frame closely mirrors my sixth category (community). Through this frame learning information literacy is seen as learning an awareness of what information literacy can do for society.

As with the Standards, the first five frames of this model demonstrate a broad range of experiences of learning information literacy – from the learning skills to finding personal meaning and social change. The final sixth relational frame acknowledges this complexity and the increasing sophistication of experiences of information literacy.

Through this frame, learning information literacy is seen as learning awareness that information literacy can be experienced in different and increasingly complex ways. It is through this awareness that people ‘discern more powerful ways of seeing… [and learn to] see the world differently’ (Bruce et al., 2006 p. 5).

My study affirms the range of experiences of information literacy and learning information literacy that is seen in the Six Frames. It is this recognition of the range and complexity of information literacy and learning information literacy that makes the Six Frames a valuable framework for information literacy education. However, in future reviews of the Six Frames model, the authors could consider greater elaboration of each frame. This would assist staff involved in information literacy education to interpret and apply the frames, thus making it an even more useful curriculum model. My analysis of learning information literacy in the Six Frames model is captured in Table 25.
<table>
<thead>
<tr>
<th>My categories</th>
<th>Six Frames</th>
<th>Relational frame: Learning awareness that information literacy can be experienced in different &amp; increasingly complex ways</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learning to find information</td>
<td>Content frame: Knowing more about information tools, sources &amp; context</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competency frame: Acquiring &amp; developing skills</td>
<td></td>
</tr>
<tr>
<td>2. Learning a process for using information</td>
<td>Competency frame: Acquiring &amp; developing skills</td>
<td></td>
</tr>
<tr>
<td>3. Learning to use information to create a product</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Learning to use information to build a personal knowledge base</td>
<td>Learning to learn frame: Learning to use information to think like a practitioner</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Personal relevance frame: Learning an awareness of what information literacy can do for the individual</td>
<td></td>
</tr>
<tr>
<td>5. Learning to use information to advance disciplinary knowledge</td>
<td>Personal relevance frame: Learning an awareness of what information literacy can do for the individual</td>
<td></td>
</tr>
<tr>
<td>6. Learning to use information responsibly to grow as a person and contribute to others</td>
<td>Social impact frame: Learning an awareness of what information literacy can do for society</td>
<td></td>
</tr>
</tbody>
</table>

**Table 25 The view of learning information literacy in the Six Frames model**

**The GeST Window**

Lupton (2008) has developed the Six Frames further by incorporating aspects of literacy models to form the GeST (Generic, Situated and Transformative) model.

Through the *generic* window, learning information literacy is seen as *acquiring and developing a set of skills and processes for finding and managing information*. The generic window directly relates to my categories one (finding information) and two (process). With a focus on individual skills and processes, information literacy is the *what* or the direct object of learning. Information is external and learning is quantitative, observable and measurable.

In contrast, when viewed through the *situated* window, learning information literacy is seen as *learning to find and use information in different authentic contexts*. My categories three (product), four (personal knowledge) and five (advancing knowledge) may be viewed through this situated window. Through the situated window, information literacy is ‘a range of contextualised information practices’ (Lupton, 2008 p. 171) which encompass the creation of products, learning subject and professional content and the creation of new...
disciplinary knowledge. Information is internal and subjective and learning is qualitative as one learns to think differently. In this way, information literacy shifts to being the what and how of learning – an enabler to the activities cited above.

Learning information literacy is viewed in an increasingly complex way through the transformative window – that is, learning to critically use information to empower individuals and society. There are some transformative elements in my categories four (personal knowledge) and five (advancing knowledge) as individuals transform as a result of their expanded knowledge base and both individuals and knowledge transforms through the research process in category five. However, the transformative window is particularly useful when viewing my category six (community). Here, individuals grow as a person and through their transformation, they have the potential to transform the community. Information is internal, subjective and transformational and learning is qualitatively viewed as using information in a socially responsible way so that others may also benefit. Information literacy continues to be both the what and how of learning – an enabler to this transformation.

The view of learning information literacy in the GeST model largely mirror those of the Six Frames and range from learning a set of skills and processes to information practices that benefit individuals and society. My study affirms this increasingly sophisticated range of information literacy and learning information literacy.

My analysis of learning information literacy in the GeST model is captured in Table 26.
<table>
<thead>
<tr>
<th>My categories</th>
<th>GeST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learning to find information</td>
<td><em>Generic</em></td>
</tr>
<tr>
<td></td>
<td>Acquiring &amp; developing skills &amp; processes for finding &amp; managing information</td>
</tr>
<tr>
<td>2. Learning a process for using information</td>
<td></td>
</tr>
<tr>
<td>3. Learning to use information to create or construct</td>
<td><em>Situated</em></td>
</tr>
<tr>
<td></td>
<td>Learning to find &amp; use information in different authentic contexts</td>
</tr>
<tr>
<td>4. Learning to use information to build a personal knowledge base</td>
<td><em>Situated</em></td>
</tr>
<tr>
<td></td>
<td>Learning to find &amp; use information in different authentic contexts</td>
</tr>
<tr>
<td></td>
<td><em>Transformative</em></td>
</tr>
<tr>
<td></td>
<td>Learning to critically use information to empower individuals &amp; society</td>
</tr>
<tr>
<td>5. Learning to use information to advance disciplinary knowledge</td>
<td><em>Situated</em></td>
</tr>
<tr>
<td></td>
<td>Learning to find &amp; use information in different authentic contexts</td>
</tr>
<tr>
<td></td>
<td><em>Transformative</em></td>
</tr>
<tr>
<td></td>
<td>Learning to critically use information to empower individuals &amp; society</td>
</tr>
<tr>
<td>6. Learning to use information responsibly to grow as a person and contribute to others</td>
<td><em>Transformative</em></td>
</tr>
<tr>
<td></td>
<td>Learning to critically use information to empower individuals &amp; society</td>
</tr>
</tbody>
</table>

Table 26 The view of learning information literacy in the GeST model

Summary

The focus of the Standards model is on the individual who develops particular characteristics to engage with information. In contrast, the focus of the relational models is on the collective and diverse range of ways people experience information literacy. As described in chapter two, the non-dualist ontology of the phenomenographic approach, which is underpinned by a relational view of learning, proposes the person and their world are not separate; therefore the person and the phenomenon of learning information literacy are not separate. Learning information literacy exists as people experience it; thus it is not simply part of the person. As seen in my study, students experience learning information literacy in a range of increasingly complex and inclusive ways.

A summary of my analysis of learning information literacy in the three curriculum models in comparison to my categories is captured in Table 27.
<table>
<thead>
<tr>
<th>My categories</th>
<th>Standards</th>
<th>Six Frames</th>
<th>GeST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learning to find information</td>
<td>1-3. Acquiring &amp; developing skills to find information</td>
<td>Content frame: Knowing more about information tools &amp; context</td>
<td>Generic: Acquiring &amp; developing skills &amp; processes for finding &amp; managing information</td>
</tr>
<tr>
<td>2. Learning a process for using information</td>
<td>4. Developing a process for managing information</td>
<td>Competency frame: Acquiring &amp; developing skills</td>
<td></td>
</tr>
<tr>
<td>3. Learning to use information to create a product</td>
<td></td>
<td></td>
<td>Situated: Learning to find &amp; use information in different authentic contexts</td>
</tr>
<tr>
<td>4. Learning to use information to build a knowledge base</td>
<td>5. Learning to use information to build knowledge</td>
<td>Learning to learn frame: Learning to use information to think like a practitioner</td>
<td>Situated: Learning to find &amp; use information in different authentic contexts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Personal relevance frame: Learning an awareness of what information literacy can do for the individual</td>
<td>Transformative: Learning to critically use information to empower individuals &amp; society</td>
</tr>
<tr>
<td>5. Learning to use information to advance disciplinary knowledge</td>
<td></td>
<td>Personal relevance frame: Learning an awareness of what information literacy can do for the individual</td>
<td>Situated: Learning to find &amp; use information in different authentic contexts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Transformative: Learning to critically use information to empower individuals &amp; society</td>
</tr>
<tr>
<td>6. Learning to use information responsibly to grow as a person and contribute to others</td>
<td>6. Learning to use information responsibly</td>
<td>Social impact frame: Learning an awareness of what information literacy can do for society</td>
<td>Transformative: Learning to critically use information to empower individuals &amp; society</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Relational frame: Learning an awareness that information literacy can be experienced in different way &amp; increasingly complex ways</td>
<td></td>
</tr>
</tbody>
</table>

Table 27 A summary of the view of learning information literacy in the three information literacy curriculum models
**Implications for information literacy education**

My study reveals several important findings regarding students' experiences of learning information literacy that have implications for all educators:

1. Students experience learning information literacy in a diverse range of ways;
2. If students hold a particular view of learning information literacy they will approach learning information literacy in a particular way;
3. Learning information literacy is both a *what* and a *how* of learning. As a *how* of learning, learning information literacy is an enabler;
4. Learning subject content can also be enabler to learning information literacy;
5. Students use a variety of approaches to learning information literacy;
6. Reflection is central to learning information literacy; and
7. Feelings and emotions are important factors in learning information literacy.

These aspects are discussed more fully in the next section.

1. **Students experience learning information literacy in a diverse range of ways**

My study reveals that students experience learning information literacy in a diverse range of ways. The categories that are represented in the outcome space (see Figure 3) are nested and hierarchical and represent increasingly sophisticated experiences. Through awareness of students’ different experiences, educators can design a curriculum that fosters more powerful learning.

One approach educators can use is to explicitly expose students to variation. As explained in chapter two, some authors (Bowden & Marton, 2004; Marton & Booth, 1997; Marton & Ramsden, 1988) propose that for someone to learn, they have to discern variation in something they previously knew or experienced. While exposure to variation does not automatically result in
students holding more expansive views, students can become aware of aspects they had not previously been attentive to, and learning may take place. So for example, through a strategy as simple as students sharing their experiences with the group, educators can assist students to become aware of their own experiences and of the differences of those of other students.

As students can only discern certain aspects of a phenomenon at one time, certain aspects of the phenomenon are held in the foreground of the student’s awareness, while other aspects are in the background (Prosser & Trigwell, 1999a p. 32). As Prosser and Trigwell explain, ‘for some students, aspects of awareness brought to the foreground will be substantially greater and broader than it will be for other students’ (1999a p. 33). Students who are able to hold more aspects in their awareness simultaneously have more complex and inclusive experiences. So through designing teaching and learning activities that explore variation, particular aspects of learning information literacy can intentionally be brought to the foreground of the students’ awareness. Continuing the previous example, through students sharing experiences in a class or through the educator directing attention to particular aspects, these aspects of information literacy can become more prominent for the students.

To elaborate on this example and draw on my own findings – through discussing the ways information may be used in their relevant profession, students may become aware that information has many applications – so can be used to satisfy a query, solve a problem, empower an individual or benefit a community for instance.

Educators can design curricula to also target specific experiences or explicitly facilitate students’ experiences of more complex phenomena over time. This could be undertaken in one subject, a particular year level such as first year or over an entire program of subjects through a student’s degree. In this way, information literacy is learnt in an iterative, incremental way and curricula could be designed to facilitate this progressive development. Though development need not be linear, there are educative benefits to creating opportunities that developmentally leads students towards more expansive views.
2. If students hold a particular view of learning information literacy they will approach learning in a particular way

Like other studies which have revealed a relationship between students’ views and approaches to learning (see Ellis, 2004; Limberg, 1999, 2000; Marton & Saljo, 1997; Prosser & Trigwell, 1999b; Van Rossum & Schenk, 1984), my study has also affirmed this. While an approach to learning incorporates the strategies the student adopts and the reason for adopting the particular strategies, it is this reason or intention that is most critical in the learning process.

A comparison of my students’ ways of experiencing and intentions in learning information literacy is captured in Table 28.

<table>
<thead>
<tr>
<th>Ways of experiencing</th>
<th>Intentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning to find information</td>
<td>To learn skills to find information</td>
</tr>
<tr>
<td>Learning a process to use information</td>
<td>To learn a process</td>
</tr>
<tr>
<td>Learning to use information to create a product</td>
<td>To create a product (in order to complete assessment)</td>
</tr>
<tr>
<td>Learning to use information to build a personal knowledge base in a subject area</td>
<td>To build a knowledge base</td>
</tr>
<tr>
<td>Learning to use information to advance disciplinary knowledge</td>
<td>To create new knowledge</td>
</tr>
<tr>
<td>Learning to use information to grow as a person and to contribute to others</td>
<td>To contribute to others in the community</td>
</tr>
</tbody>
</table>

Table 28 A comparison of my students ways of experiencing and intentions in learning information literacy

Limberg concludes ‘differences as regards students’ conceptions of information seeking and use influenced both how they searched and used information and what they learnt about content’ (1999 p. 30). Thus, if the approach students choose is influenced by their views of learning information literacy and this approach influences the success of the students’ learning outcomes, then broadening the students’ views through the strategies suggested in point one becomes paramount to the educator.

So for example, if an academic wanted his or her students to develop skills in using library databases in order to successfully find information for
assignments, the academic might make this skill development explicit by integrating an information literacy class on databases into the curriculum. However, if the academic wanted students to think about ways information might be used to enact change in their professions, they might create authentic learning and teaching activities and assessment that require students to research, reflect on, write about or discuss relevant professional information use.

However, in a study of students’ experiences of learning science through writing, Ellis reports ‘a poor understanding of what can be learnt through writing tends to be closely associated with a poor approach to the writing process and a lower level of achievement’ (2004 p. 1852), hence the need to make students explicitly aware of the purpose and value of such information literacy activities, so students can relate learning information literacy to learning their subject content.

3. Learning information literacy is both a what and a how of learning

In category one (finding information) and two (process), the content of learning is information literacy – that is the skills, knowledge and processes to find and use information are what the students learn. An example of information literacy education as the what of learning might be a class that is open to all students on acquiring techniques for searching databases. In contrast, the content of learning in my other categories indicates that information literacy shifts to also become the how of learning. As the how of learning, information literacy becomes the process of learning. An example of information literacy education as the how of learning might be a class that teaches a particular cohort of students about relevant databases but also focuses on the subject information that is found and what it signifies for the topic.

As reported in chapter two, Bruce argues that ‘learning always has a content as well as a process – that is students should be learning about something (discipline content) as they engage in learning to be effective information users’ (1997 p. 174), therefore ‘coming to see both the content and the
information use in more powerful ways’ (2008 p. 13). This study would also propose that students are learning to find and use information about “something”, so learning information literacy provides an inextricable link and opportunity to learn subject content. In her recent study, Lupton also found that students experience information literacy as a what and how of learning, which she illustrates with her curriculum model, ‘the GeST windows where the Generic window sees information literacy as the what, while the Situated and Transformative windows see information literacy as both the how and what’ (2008 p. 148).

In my categories three to five, learning information literacy is the enabler of learning or advancing subject content and knowledge. Thus, in order for students to experience these more inclusive views, information literacy must be taught and learnt in the context of this subject content, rather than as separate stand-alone generic courses. An early study by Ramsden, Beswick and Bowden (1986) discovered students who were taught generic study skills outside of the context of their subjects did not achieve successful learning outcomes. This was because students saw the study skills as the what of learning – rather than the process or how of learning, so instead of being an enabler to learning subject content, the study skills that students were taught became the focus of learning.

As students view learning information literacy as a what and a how and as subject content and learning processes are deeply intertwined (Booth, 1997 p. 146; Bruce, 2008 p. 4; Marton & Ramsden, 1988 p. 271), then it is clear that instances of information literacy learning that are devoid of subject content and that are not embedded in the curriculum, are counter to students’ experiences. This finding is also consistent with the literature on learning graduate attributes and generic or study skills, which report a strong relationship between learning the skill or attribute and learning subject content. These studies also recommend that learning skills and attributes should be contextualised, discipline specific and embedded (see Barrie, 2006, 2007; Bath, Smith, Stein, & Swann, 2004; Elander, Harrington, Norton, Robinson, & Reddy, 2006; Ellis, Taylor, & Drury, 2005; Hattie, Biggs, &
Purdie, 1996; Hinchliffe, 2002; Paivitynjala, 1998; Phillips & Bond, 2004; Ramsden et al., 1986). It is further suggested that information literacy as a generic attribute is a highly situated practice that varies across disciplines, therefore should be viewed within specific contexts and/or disciplinary content (see Candy, 2000; Jones, 2009; Limberg, 2008; Lloyd, 2006; McDowell, 2002; Smith & Oliver, 2005). In recognition of the growing research base on this interrelationship, Bruce has recently devised the term informed learning to describe ‘using information to learn’ (2008 p. 5).

My study affirms the relationship between learning information literacy and learning subject content, demonstrating that learning information literacy can enhance the understanding and extension of disciplinary knowledge. As information literacy is experienced as a what and how of learning, then it follows that students’ experiences of subject content and of information literacy can be deepened through the design of activities which prompt reflection on both the subject content and on information literacy as a process for learning content.

4. Learning subject content can also be enabler to learning information literacy

As discussed in point four, my study affirms that learning information literacy can be an enabler to learning subject content. In exploring the relationship between learning and information literacy, Limberg (1999; 2000) and Lupton (2004) focussed on the students’ experience of learning subject content as a result of the qualitatively different ways they found and used information.

However, in chapter two, I also proposed that my study may uncover how students might learn information literacy through engaging with their subject content, so how they might use the requirements of the subject to learn to become effective information users. There is a suggestion in my findings that this is the case, as seen in the following example from Jeanette:

JEANETTE: It's not until recently that I have been more explicitly aware of the strategies I have used and reflected on my own learning and my own writing and what do and what don't I do, so what's useful, what isn't useful.
And that’s really because of learning about language learning strategies which then can carry over to other learning strategies.

INTERVIEWER: So how did you learn this?

JEANETTE: Through my courses basically. Quite a few of my courses had you do reflective case studies where you reflected on your teaching practice but also on what you were learning in the readings and that sort of thing. I found that to be really helpful. You had to write reflective journal entries regularly and then at the end, put it all together into a framework. I found that was good because I could then track how I developed my thinking about different issues over time. We learnt about language learning strategies, which was good because I kind of thought people were either good learners or not good learners. I didn’t realise the strategic nature of learning that even if you are not a particular good learner, you can learn strategies that will enhance your learning or enhance your ability to access information.

In this example, it is through learning subject content via her course work and through the design of assessment and teaching and learning activities such as reflective logs, which facilitate Jeanette’s reflection on the strategies that she employs to use information and furthermore, the link between these strategies and successful learning outcomes.

Notably, in a longitudinal study of the development of higher degree research students’ information searching skills, Chu and Law also found students’ search expertise reflected their growth in subject knowledge – ‘while they were advancing from one stage to another in their subject knowledge expertise, they were also developing their information search skills’ (2008 pp. 168-169). For academics in particular this has potent implications for the design of activities and assessment. Through explicit design, students can learn subject content and in turn be led to more powerful experiences of information literacy.

5. Students use a variety of approaches to learning information literacy

As noted, the strategies that the students in my study use reflect their learning intentions and include learning by doing, trial and error and interacting with other people.

5.1 Learning by doing

Learning by doing is an active approach to learning to engage with information. Through this active physical and intellectual involvement, students learn in action, while they are undertaking hands on activities, rather
than learn before doing. Learning by doing is closely related to learning how to do things skilfully (Kivinen & Ristela, 2002). Learning by doing involves the students doing things for themselves, and while this learning may often be self-directed, Dewey and Schön see the role of the teacher as a ‘coach, guiding students’ learning in order to ‘help him [or her] see what he [or she] needs to see’ (Dewey as cited in Schön, 1983 p. 17).

As learning by doing is prominent in my categories one, two and three, educators need to create opportunities for this action oriented learning to occur. So for example, for students to be able to learn to use information tools such as library catalogues and databases or learn processes to manage or use information or learn to write essays, then opportunities need to be created to facilitate this development. So to develop skills, an educator might allow class time for a skill building session, or set assignments with explicit learning outcomes that require students to demonstrate they have used a variety of sources that require skills to find and use information. As learning of this nature is reinforced with practice (Gibbs, Rust, Jenkins, & Jaques, 1994 p. 20), students need repeat opportunities to practise and demonstrate skills and processes.

5.2 Trial and error
Trial and error is a form of learning by doing and the dominant strategy for learning to find information and developing processes to manage and use information. As reported in chapters four and five, trial and error appears to be characterised in two ways – 1) a haphazard trying of different processes, keywords, information tools and sources; and 2) a more planned and thoughtful experimentation that involves evaluating results and actions and subsequently modifying attempts.

Educators can acknowledge the value of trial and error as a legitimate approach to learning while encouraging a more reflective and deliberative strategy. Again by structuring opportunities for students to reflect on each stage of the trial and error process rather than just at the end, educators can assist students to think about their learning strategies and develop an
approach of ‘reflection in action’ (Schön, 1983 pp.26-29). Trial and error can also be explicitly used to get students to experiment, in order to try different strategies and ways of working, and therefore opening students up to new possibilities (Gibbs et al., 1994 p. 20; Kivinen & Ristela, 2002 p. 421).

5.3 Interaction with other people
My study has revealed the significance of interacting with other people as an approach to learning information literacy. While the nature and intention of this interaction is different in each of the categories, it stresses the importance of the collaborative, co-operative nature of learning information literacy and the ‘social distribution of knowledge… where knowledge and skills are distributed amongst various people and that no single person has all the needed information’ (Candy, 2000 p. 142).

From seeking assistance, observing others, soliciting feedback to sharing tasks and knowledge – students commonly interact with both peers and people who they believe have the expertise and knowledge to assist them. Their choice of person reflects the immediacy, ease of access and the perceived expertise to the person, in addition to the level of comfort and familiarity of the students in the interaction.

While experts such as lecturers, librarians and people outside of the university are sought out, peers are generally the first and preferred point of contact. For educators, this creates an opportunity to acknowledge and encourage people as particular sources or information and assistance. It also provides an opportunity for educators to more fully utilise peer networks. For example, using strategies such as peer assisted study sessions, assessment that requires collaborative work, group learning circles and peer assessment. Creating a classroom culture that values participation and sharing of knowledge and experiences also facilitates interactions with other students and peer learning.

Learning from these approaches
Students use all of these approaches in experiencing learning information literacy. However, as Dewey states ‘mere activity does not constitute
experience’ (1916 p. 8). Activities such as those used by the students form the basis of their experience, but the experience itself is not sufficient to result in learning.

In his seminal theory of experiential learning, Kolb reports there are four stages a student must undergo (although they may enter at any stage and move back and forth between stages) – concrete experience, reflective observation, abstract conceptualisation and active experimentation (1984). These stages provide the important links between the experience and learning – so the experience does not simply remain an activity. Rather it is an experience ‘with meaning’ (Boud, Keogh, & Walker, 1985 p. 6) as the student interprets and constructs and learns from the experience and is then able to transfer it. This concept of reflective practice to underpin learning information literacy is also apparent in three models of information use reported in the literature (designed for reviewing research literature, searching the Internet and using online information). These three models describe an iterative cycle of plan, act, record and reflect, mirroring the cyclical and dynamic nature of student learning (Hughes, Bruce, & Edwards, 2007).

A further useful and relevant model from the learning and teaching literature involves: encountering the content to be learned, getting to know more about it, trying it out for oneself, getting feedback, reflecting, making adjustments and trying again (Toohey, 1999 p. 153). This is a model for learning information literacy, that students in this study report they are intuitively using. Students such as Callam and Cody indicate that it is their preferred way of learning information literacy:

Interviewer: How would you describe your approach learning to use information?

CALLAM: Working with someone else who does know and seeing someone do and discussing it, watching someone do it once then doing it myself, getting their feedback, then I can do it – that’s how I learn best.

CODY: I learn best by watching other people. If they do it first and I copy them I find it is a lot easier to do. That's the best way because if they are watching you they can give you feedback on what you are doing wrong.
Teaching yourself is good because the knowledge is pressed into you a bit more.

From the models described and the evidence provided by the students in my study in particular, it is clear that educators need to provide students with opportunities to experience, practise and experiment with ways of finding and using information; provide feedback on their progress; and reflect on what and how they have learned.

6. Reflection is central to learning information literacy

Throughout my study, reflection is a consistent theme and a powerful influence in the learning process. Dewey characterised reflective activity as ‘active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it leads’ (1933 p. 9). More simply, Boud, Keogh and Walker describe it as ‘an important human activity in which people recapture their experience, think about it, mull it over and evaluate it’ (1985 p. 19). Reflection gives students the opportunity to abstract experiences. The process of abstraction is a key step in using reflection to learn information literacy. Abstraction allows students to extract meaning from the experience and learn from it.

In his seminal work, Schön (1983) further delineates reflection in action and on action. The students in my study demonstrate instances of reflecting while doing (in action), testing outcomes against their prior understanding and immediately experimenting and changing the situation in response. In my categories three to six, students also demonstrate instances of reflecting after doing (on action), metacognitively exploring the link between the way they use information and the outcomes. Recognising the importance of reflection as a tool for self-monitoring and learning, students in these categories actively reflect on themselves as learners and use reflection as a learning strategy.

Thus, in order for educators to design a curriculum that enables students to have more inclusive experiences, educators must build reflection and
abstraction into learning – both while doing and after doing. However, Markless warns this ‘cannot simply be grafted onto existing frameworks or inserted after a particular element of a linear model’ (2009 p. 33). Instead it must be encouraged at every stage and opportunity, in keeping with the dynamic nature of student learning. The reflective information use (Hughes et al., 2007), Kolb (1984) and Toohey (1999) models cited in point five all provide concrete examples for librarians and academics to achieve this.

Reflective activities that involve others incorporate both the social aspects of learning and recognise reflection as an interactive process of dialogue. As mentioned in point one, reflecting with others also presents an opportunity for students to experience variation, becoming aware of their own experiences and those of others. However, as noted in point one and other studies (see Linder, 1993; Linder & Marshall, 2003; Pong, 1999) the awareness of variation in itself is not sufficient for learning. ‘What is also needed is reflection on, or mindfulness of, this variation in order to develop explicit contextual appreciation (Linder & Marshall, 2003 p. 27).

So while it is important for students to reflect on what they learn, it is equally important for them to reflect on how they learn (Booth, 1997 p. 137). While it is natural for education students to learn about different learning styles and approaches, and discuss learning as an object of study; there is no reason why students from other disciplines can not be similarly exposed, however briefly, to such content – to become more self-aware and appreciate the link between learning approaches and outcomes. By explaining the rationale for using reflection, educators explicitly foreground metalearning development, helping students to be aware of their own learning processes. However, by acknowledging the importance of learning in context, support for self-monitoring also needs to extend to developing students capability to abstract which learning strategies are appropriate for the learning context (Markless, 2009 p. 34; Markless & Streatfield, 2007 p. 23).

As well as providing opportunities to learn from reflection, the educator’s role in assisting and supporting the learner through the reflective process can be
achieving through various strategies such as effective listening, giving encouragement, clarifying intentions, setting the context or providing heuristic techniques or devices to scaffold learning (Boud et al., 1985 pp. 36-38). By encouraging self-assessment and monitoring through reflection and abstraction, educators can provide students with the skills and strategies to help achieve successful outcomes (Hounsell, 1979; Thiede, 2002).

7. Feelings and emotions are important factors in learning information literacy.

A strong link between reflection, learning and affective dimensions is proposed by Boud, Keogh and Walker (1985 p. 11). Other studies report on the importance of the affect domain in information behaviour and the interplay between thought, feelings and actions (see Kuhlthau, 2004; Nahl & Bilal, 2007; Parker & Berryman, 2007). As reported in chapter five, the strong affective aspects which emerge in this study also affirm the important role feelings play in the learning process. Positive feelings can enhance student learning while negative feelings can form a barrier.

Freire states that one can not separate feelings and emotions from cognition and learning, explaining ‘we teach, learn and know with all of our body’ (1998 p. 3). This concept of students as “whole people”, who bring knowledge, attitudes, beliefs and emotions into a learning situation, is congruent with the relational perspective of learning described in chapter two. While an educator will not know what emotions individual students carry into the classroom, he or she can gauge feelings by exploring the success of the students’ previous experiences and acknowledging feelings that might serve as a barrier to learning.

Recognising and addressing negative emotions such as anxiety and frustration, allows educators to present alternate strategies when students encounter unproductive approaches or unsuccessful outcomes (Farmer, 2007; Julien, 2007). Given the contextualised nature of learning information literacy, suggestions for alternate strategies need to be accompanied by
explicit advice on which ones to use in which situation (Hepworth, 2003 p. 229).

In building strategies to respond to inevitable problems and frustrations in finding and using information, students also build resilience (Farmer, 2007; Given, 2007). In these examples, negative feelings can be viewed as an impetus for change. Carlile also reports that ‘if library-anxious students are made aware that others are feeling the same way, their own anxiety may be reduced’ [and recommends] ‘including the concept of library anxiety in library instruction and information literacy classes’ (2007 p. 137).

Positive feelings arise from previous successful experiences (Boud et al., 1985 p. 22; 2007 p. 137) and expectations of a successful outcome, which are generated by a sense of competence and confidence in one’s skills and knowledge. One of the most effective ways that an educator can support students’ self-efficacy is to construct learning situations that require knowledge building and skill development, then provide opportunities within the curriculum for this development to occur. Repeat opportunities can make the unfamiliar become familiar and enhance the students’ level of comfort (Given, 2007). Validation of learning, in the form of feedback or marks from an educator also increases students’ self-confidence and sense of themselves as competent learners (Christie, Tett, Cree, Hounsell, & McCune, 2008 p. 574).

As well as an expectation of success, students are motivated to learn something if they feel it has value to them (Biggs, 2003 p. 203). As such, educators can explicitly promote the value of learning information literacy. While the educator can not guarantee the success of individual students as students bring many factors to a given learning situation, he/she can support students, both through the curriculum and teaching approaches, in order to maximise learning experiences.
Differences between text-based and Technology Education students

Acknowledging that information literacy is equally important but potentially diverse across practical and text-based programs, I solicited participants from two distinct areas. As described in chapter three, the first came from the Bachelor of Technology Education program while the second group of students were recruited from education courses that require them to prepare more traditional text-based assignments and research.

In the end, the results indicated that there was very little difference between the two cohorts, with the Technology Education students’ experiences represented equally in my categories one to four (category five was only based on postgraduate students and six largely on the experiences of one text-based student). In part, this is because Technology Education students also complete text-based assessment like the other students in my study.

An earlier study revealed the ways Technology Education students experience information literacy is through:

- interactions with others, especially peers;
- using their past experiences and existing knowledge;
- doing activities, including the use of trial and error;
- formal coursework and studies;
- linking their experiences with the real world; and
- incidental non-purposive occurrences (Locke, 2005).

These experiences are also consistent with the Technology Education and text-based students in my study. The differences that are apparent between the two groups can be understood by the structure of their academic program, much of which is applied and a large proportion of the instruction and assessment is practical, comprising projects, workshop activities, design and construction.
Therefore, consideration of the nature of the curriculum and the background of the Technology Education students would be given when designing information literacy education. For example, curriculum models that replicate the Technology Education students’ preferred ways of working and learning would include hands on activities, collaborative learning with peers, and a planned, deliberative process of trial and error, such as that which is used in the design process (De Miranda, 2004; McCormick, 2004; Stevenson, 2004). Moreover, in an earlier study, Locke also recommend that information literacy education for this cohort ‘acknowledge the value of the strategies they use in the real world, in the workshop and… de-emphasise the step-by-step process approach to finding information and refer to the circuitous and creative approach they use in designing and constructing artefacts’ (2005 p. 192). In an environment where processes for problem solving form an important part of the students’ professional knowledge base (Ramsden, 2003 p. 50), an emphasis on learning subject content as part of learning the process for solving problems could be made.

**Limitations of the study**

As my study explores the qualitative differences in learning information literacy in 15 education students in two types of programs, it is limited to that particular context and to the experiences of those students participating and to the population that the sample represents (Akerlind, 2005c p. 331; Bowden, 2005 p. 16). This is congruent with the nature of phenomenographic research, as results cannot be generalised across other groups. However, it could be argued that the collective picture of students’ experiences gained from all studies of this nature compensate for the generalisations possible with other paradigms.

While a group size of 15 participants is a recommended minimum of students in a study of this scope, a larger number of participants may have possibly yielded further categories or more clearly illuminated my category six (*community*).
**Significant contributions of this study**

My topic meets Bruce’s recommendations for future information literacy research to include ‘people’s experience of learning information literacy’ (1997, p. 80). Bruce continues that this future research could include learning information literacy in particular contexts, specific phenomena encountered and vehicles used while learning information literacy. Lupton also identifies ‘the ways in which students experience learning information literacy’ (2004 p. 88) as an area for future information literacy research.

This aim of this study has been to provide a better understanding of the experiences of students in learning information literacy. Further, this study offers this understanding from a student’s perspective by examining the variation in the students’ experiences. Key contributions include:

- An empirical study of education students’ experiences of learning information literacy, which includes students’ approaches to learning information literacy;
- Capturing the experiences of both traditional text-based education students and Technology Education students, for whom much of their academic program is applied and practical;
- An understanding of students, rather than information literacy educators’ views of learning information literacy;
- A description of the nature of learning information literacy;
- An affirmation of the experiences of information literacy that have been articulated by other empirical studies;
- An affirmation that learning information literacy is experienced as both a *what* and *how* of learning.
- As the *how* of learning, an elaboration of learning information literacy as an enabler to a range of outcomes, from completing assessment, learning subject content, building professional knowledge, creating new disciplinary knowledge and benefiting the community.
• An affirmation that phenomenography and the relational perspective of learning that underpins it, is a valuable approach to researching experiences of information literacy and learning.

In sum, my description of the character of learning information literacy broadly contributes to the information literacy research and literature, particularly in the higher education sector. Through greater understanding of the students’ range of experiences, one outcome of this research may be the recognition that students can be brought to experience information literacy in increasingly powerful ways, through the design and delivery of information literacy education.

**Suggestions for future research**

This study dovetails with other studies that collectively build a picture of students’ experiences of learning information literacy. To add to this picture, recommendations for further research into the experiences of learning information literacy include:

• Students from other disciplines;
• Students from other sectors; and
• Others such as academics.

Experiences of teaching information literacy would also make a valuable contribution and offer the opportunity to compare views of teaching against views of learning information literacy. Further, with an increasing focus on vocational outcomes for graduates, experiences of professionals engaged in authentic workplaces would provide an equally valuable contribution to the literature. This type of exploration would ensure information literacy education not only meets students’ immediate needs at university but prepares them for their professions and lifelong learning. Explorations of peoples’ experiences of learning information literacy in the community or other cultures might further complete this picture.
**Conclusion**

My study has demonstrated that students experience learning information literacy in a range of different ways. These experiences are hierarchical and inclusive, so the skills and abilities to find information in category one underpin the use of information in the other categories. When viewed this way, students need these skills but they also need to experience information literacy in a more sophisticated way, in order to draw on a broad repertoire of experiences when they perceive the need.

Through being exposed to different ways of viewing information literacy and learning information literacy as well as opportunities to experience it in an increasingly sophisticated way, there may be a qualitative change in students' experiences of information literacy – a change that implies a more complex understanding of the many aspects of information literacy and one which reflects the view of learning information literacy I proposed in chapter two. Accompanying this expanding experience may be an awareness of the potentiality that results from learning information literacy.

While my study was not designed to indicate or measure student learning, I conclude this thesis by considering what a model of curriculum might look like, based on the students’ experiences of learning information literacy in my study and the view of learning information literacy I propose above.

Bruce proposes ‘three critical elements of learning to be information literate:

1. Experiencing information literacy (learning),
2. Reflection on experience (being aware of learning) and

My study affirms these as significant interdependent elements in learning information literacy. Information literacy is experiential and students need to have ongoing opportunities to actively engage with information on many levels and develop the necessary attributes.
Bruce reports ‘when reflection on learning to be information literate is combined with the experience of information literacy, students are helped to recognize the transferability of the processes involved to everyday life, community and workplace contexts (2002 p. 1). Therefore, reflecting on experience enables students to learn from their engagement with information. However, I would argue that while reflection is central to learning information literacy, in itself it is not sufficient to constitute learning. A level of abstraction is needed for the student to extract meaning from reflection.

Reflection on information literacy as both content and as a process for learning is also critical to developing students’ self-awareness and metalearning capabilities. So the goal for educators is therefore, not just to teach information literacy but teach it metacognitively (Biggs & Moore, 1993). Teaching information literacy within the subject context and teaching it reflectively encourages students to self-monitor, build self-knowledge and experience deeper learning. Opportunities to apply knowledge and test understanding completes this cycle of learning.

Underpinning this repertoire of skills, processes and knowledge to find and use information, is the students’ capacity to know when and how to use them. Given the evidence-based link between learning information literacy and learning subject content discussed in this chapter, it is critical to model, teach and assess information literacy in context. As information literacy is situated and contextualised, there is no “one model” or pedagogy of learning information literacy. However, an approach to information literacy education that incorporates all three elements of experiencing, reflecting and applying within the subject context offers students a more expansive and inclusive experience of learning information literacy.
Appendices

Appendix A

Consent Form
Name: Rae-Anne Locke
Centre: Griffith Institute of Higher Education
Contact: Phone 373 57945
Contact: Email R.Locke@griffith.edu.au

By signing below, I confirm that I have read and understood the information package and in particular have noted that:

- This research is being carried out by Rae-Anne Locke, as part of the Masters of Philosophy, hosted by the Griffith Institute of Higher Education.
- This research will investigate students’ experiences and conceptions of learning information literacy.
- This study has received Griffith University Ethics Committee approval.
- I understand that my involvement in this research will involve responding to interview questions;
- I have had any questions answered to my satisfaction;
- I understand that there will be no direct benefit to me from my participation in this research;
- I understand that my participation in this research is voluntary;
- I understand that my confidentiality will be protected by the following provisions: (a) the research focus will be on categories drawn from the aggregated material rather than from any one individual; (b) any report or publication from this study will conceal or remove any identifying features which might tend to connect me with any of the reported responses.
- I understand that if I have any additional questions I can contact the research team;
- I understand that I am free to withdraw at any time, without comment or penalty;
- I understand that I can contact the Manager, Research Ethics, at Griffith University Human Research Ethics Committee on 3875 5585 (or research-ethics@griffith.edu.au) if I have any concerns about the ethical conduct of the project; and
- I agree to participate in the project.

Participant name: .................................................................
Participant signature: .............................................................

Date: .....................................................................................
Appendix B

Information for Participants
This research is being conducted by:
Name: Rae-Anne Locke
Centre: Griffith Institute of Higher Education
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This research is being carried out by Rae-Anne Locke, as part of the Master of Philosophy, hosted by the Griffith Institute of Higher Education, Griffith University. This research will investigate students’ experiences and conceptions of learning information literacy. The results of this study will provide a greater understanding of the experience of this particular student sample in learning information literacy. This understanding will benefit the researcher by enabling the researcher to draw on this experience and improve the design and delivery of information literacy education. Hence, the results will also benefit future student recipients of this information literacy education.

You are being asked to respond to interview questions about your experiences and conceptions of learning information literacy. The interview is likely to take up to sixty minutes. The interview will be audiotaped and subsequently transcribed and the tape erased once transcribed. The risks to participants is nil.

Your confidentiality will be protected by the following provisions: (a) the research focus will be on categories drawn from the aggregated material rather than from any one individual; (b) any report or publication from this study will conceal or remove any identifying features which might tend to connect you with any of the reported responses.

Your participation is voluntary and you may discontinue your participation at any time without penalty or explanation.

You may seek a report or additional information either through Rae-Anne Locke or her primary supervisor, Mandy Lupton (phone 3875 6816 or email M.Lupton@griffith.edu.au).

This study has received Griffith University Ethics Committee approval. Griffith University conducts research in accordance with the National Statement on Ethical Conduct in Research Involving Humans. If potential participants have any concerns or complaints about the ethical conduct of the research project they should contact the Manager, Research Ethics on 3875 5585 or research-ethics@griffith.edu.au

A summary of the results can be posted to you at your home address if you would like to leave the researcher your contact details or you may seek a report of findings through Rae-Anne Locke. Results of the study will form the thesis component of a Masters of Higher Education. It is also envisaged the
results of the study will be disseminated via a journal article and/or conference paper.

The conduct of this research involves the collection, access and/or use of your identified personal information. The information collected is confidential and will not be disclosed to third parties without your consent, except to meet government, legal or other regulatory authority requirements. A de-identified copy of this data may be used for other research purposes. However, your anonymity will at all times be safeguarded. For further information consult the University's Privacy Plan at www.griffith.edu.au/ua/aa/vc/pp or telephone (07) 3875 5585. The completed consent form will be kept with other confidential information in a locked filing cabinet for a period of five years.
References


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