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Graphic Design Education: Fostering the conditions for transfer in a project--based and studio--based learning environment, through a structured and critical approach to reflective practice

Grant Nathan Ellmers
University of Wollongong

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Graphic Design Education: Fostering the conditions for transfer in a project-based and studio-based learning environment, through a structured and critical approach to reflective practice.

Grant Nathan Ellmers

Masters of Arts (Visual), Australian National University

Bachelor of Arts (Visual), Australian National University

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School of Education

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Declaration

I, Grant N. Ellmers, declare that this thesis submitted in partial fulfilment of the requirements for the conferral of the degree Doctor of Philosophy, from the University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. This document has not been submitted for qualifications at any other academic institution.

Grant N. Ellmers

April 7th, 2014

ABSTRACT

Graphic design education has traditionally adopted project- and studio-based learning approaches in which students are introduced to the principles of design through a series of projects. The intention is that students' expertise increases as they progress through their program of study. For this curriculum approach to be effective, students need to transfer their learning between projects. However, despite the widespread application of project- and studio-based learning, there is little empirical research examining their efficacy.

Studies from other design disciplines, such as industrial design and architecture, reveal concerns about the efficacy of project- and studio-based learning.

Researchers have argued these learning approaches emphasise the artefact leaving the student at risk of not learning from the design process itself. Research suggests that learning can become overly bound to the project, resulting in learning outcomes that are unclear, and students who are often unable to articulate what they have learned. This suggests that important learning opportunities are potentially being lost.

Reflection offers a means to support students to connect their learning across projects by introducing a more deliberate engagement with the design process and the learning opportunities this presents. This study investigated a structured and critical approach to reflective practice, and its role in supporting graphic design students to learn from their project in ways that foster the conditions for transfer.

A case study strategy of inquiry was employed, drawing on a mixed-method research approach, and framed by theories of reflective practice and cognitive psychology. An intervention in the form of a structured critical reflective learning framework was designed and introduced to a third year graphic design studio class. The reflective framework aimed to foster the conditions for transfer by prompting students to think about their design process and artefact in a systematic and

specific manner, to identify learning from their project, and then connect that learning with thinking about how they might approach projects in the future.

The results indicate that a structured and critical approach to reflection can foster the conditions for transfer, however not all students may achieve this outcome. In its most successful form, this approach to reflection can support learners to critically analyse their process in ways consistent with the principles of reflection-on-action, and both low- and high-road transfer. However, students may take differing periods of time to achieve these learning outcomes, and some may not achieve these outcomes at all.

The results further reveal an effective way to support students to reflect is through the activity of reflecting, and providing multiple opportunities to reflect is an important way to help students grasp the concepts of reflective practice. However careful consideration must be given to how reflective tasks are scheduled within the curriculum with respect to the scheduling of submission of the design artefact.

It is concluded that reflective practice, applied in a structured and critical manner can play an effective role in guiding students to identify and analyse the learning inherent in their project. This approach fosters transfer by supporting students to connect their thinking from the project with thinking about approaches to projects in the future, and importantly to the broader context of their practice. In this study, not all students achieved these learning outcomes and further research is needed to understand the limitations of this approach, and more importantly, how future students might be supported more effectively. Further research is also needed to examine how the results from this study might inform the broader discipline of design education, and indeed other education settings that employ project- and studio-based learning.

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1 INTRODUCTION

The application of project- and studio-based learning in graphic design education is widespread (Davies & Reid 2000), however there is limited empirical research that examines the efficacy of these learning approaches. Graphic design curricula students are typically introduced to the principles of design through a series of increasingly complex projects, where it is assumed that students transfer their learning between projects as they progress through their program of study. However searches of the design education literature for studies that link project- and studio-based learning and transfer, reveal this is a latent area of research.

Reflective practice has been identified as one metacognition strategy that can provide direct support for transfer (National Research Council 2000). This study examined how a structured and critical approach to reflective practice could support graphic design students in project- and studio based learning environments, to learn from their projects in ways that support transfer to other projects. Informed by the principles of the reflective practitioner (Schön 1983; 1987), structured reflection (Johns 1994; Reymen et al. 2006), and critical reflection (Hatton & Smith 1995; Kember et al. 2007; Mezirow 1990), an intervention was designed and introduced to a graphic design classroom. The intervention aimed to support students to think about their project in ways that stimulated its further development and, importantly, supported them to connect this thinking with thinking about how the project might inform approaches to other projects.

This chapter outlines the purpose and context of this study. The background to the investigation is explained, as is the setting in which the study was situated, the research strategy implemented, the research questions that guided the inquiry, and the significance and limitations of the study. The final section provides an overview of the remaining chapters in this thesis.

1.1 Background to the study

Researchers have argued the benefits of project- and studio-based learning as a means to structure learning environments for design students that help them engage with the ill-structured nature of design problems (Davies & Reid 2000; Dorst 2006; Kvan 2001; Lackey 1999; Lawson 2006; Swann 2002). These approaches have underpinned what many believe is an important aspect of design education, where students are taught in an environment and a manner that parallels an industry context (Dorst 2006). Students learn about design through the process of creating solutions to the introduced design problem(s), rather than through deliberate and separate study of the problem itself (Lawson 2006). Guided by feedback from teachers and peers, these learning approaches typically engage students in authentic learning environments with increasingly complex design projects presented to them as they advance through the course. This learning-by-doing approach reinforces a traditional pedagogical belief that the best way to learn how to design is through the act of designing (Dorst & Reymen 2004; Lawson 2006). This is common practice in graphic design education (Davies & Reid 2000).

For this multiple-project curriculum to be effective, it is important students transfer their learning between projects as they progress through their program of study. Firstly, students must prepare the learning from their project in ways that foster the conditions for transfer (Bransford & Schwartz 1999). One way to support this is to guide learners to think about their project in ways that supports them to abstract general principles from the learning experience (Girk & Holyoak 1983; National Research Council 2000).

While project- and studio-based learning appear to be effective ways to approach the complex and ill-structured nature of design problems, researchers have highlighted limitations to these approaches (Dorst & Reymen 2004; Kvan 2001; Lawson 2006; Swann 2002). These learning models typically have a primary focus on the artefact, and there can be a lack of engagement with the process, leaving the student at risk of learning little from the design process itself (Kvan 2001; Lawson

2006). A further risk exists due to the potential for the learning to become overly bound to the project, where it is not always clear to the student what exactly they have learnt, nor can they express explicitly what it is they did learn (Dorst & Reymen 2004). If a student is not clear about what they have learnt, then it is likely this will impact on their ability to prepare their learning in ways that support transfer.

Reflective practice has been identified as a strategy that can provide direct support for transfer (National Research Council 2000). The benefits reflection offers to learning have been examined in the design literature, for example, Valkenburg and Dorst (1998), Dorst (2003; 1995) Reymen et al. (2006), and Lauche (2001), with Schön's concept of the reflective practitioner (1983; 1987) widely used as a conceptual basis. However, there have been few empirical studies that specifically investigate how reflective practice can support learning from projects in a design education setting.

Studies in other fields of education research have pointed to the learning benefits of introducing reflection in a structured manner (Hoover 1994; Johns 1993; Moon 1999; 2004) and the importance of encouraging critical reflection to increase the opportunities to learn (Boud et al. 1985; Hatton & Smith 1995; Kember et al. 2007; Mezirow 1990; Moon 1999; 2004). However, there has been very little empirical research located in the broader field of design education that investigates the benefits to learning of structured or critical reflection, or that explores the relationships between the two. In graphic design education, reviews of the literature reveal that this is an under-explored area of research.

This study sought to address this gap by investigating how students in a third year undergraduate graphic design subject learnt from their projects when supported by a structured and critical approach to reflective practice, and further, how this might prepare them to transfer their learning across projects.

1.2 Research questions

The study was guided by a broad research question:

How do graphic design students learn from a project when supported by a structured and critical approach to reflective practice?

From this central question, three sub-questions were devised, and further refined over the course of the study, in keeping with the exploratory nature of the research. The sub-questions aimed to reveal how participants in this study responded to the intervention, how their reflections informed further development of their projects, and how they connected their reflections about the project with thinking about other projects and/or their approach to design practice.

Sub-question 1: How do learners reflect when supported by a structured and critical approach to reflection?

This question was concerned primarily with investigating how the participants responded to the introduced reflective practice. In particular, in what ways did the participants reflect on their design process, and to what extent did they reflect in a critical manner? The question also includes how the participants responded to the reflective learning prompts asking them to describe their process, identify and analyse critical incidents, and make judgements.

Sub-question 2: What impact did learners' reflections have on the development of their projects?

Having established how the participants reflected, it was important to determine whether the participants then connected their reflections with how they planned to approach the further development of their project. If they did make these connections, it was important to then also ascertain in what ways these connections occurred. Of particular interest was whether and how participants made these connections in a critical manner. That is, whether they questioned their process in a way that challenged their view of their project.

Sub-question 3: How do learners' reflections influence their thinking about their design practice?

This question explored the extent to which participants connected their reflections about the project with thinking about how they might now approach their design practice and/or other projects.

1.3 Significance of the study

The significance of this research is underpinned by two key factors: (1) the extensive use of project- and studio-based learning approaches in graphic design education, and (2) the lack of empirical evidence to support these approaches. Project- and studio-based learning approaches, applied in a multiple project curriculum, rely on transfer of learning to be effective and yet there is little evidence to suggest that the process of transfer within this setting is either understood, or actively supported with a proven methodology.

This study significantly advances understanding of how graphic design education can be improved by systematically, and robustly investigating how a theoretically sound methodology, in the form of a structured and critical approach to reflective practice, can support students to engage with, and transfer, the learning opportunities present within a project. Further, the framework tested within this study also provides a tool for both students and teachers to identify missed learning opportunities and to work to correct them. By supporting students to identify and prepare their learning for transfer to other projects, and potentially other contexts, this study presents an important new tool for educators.

While the results from this study are bound within a graphic design education setting, the empirical nature of the research has the potential to inform the broader field of design research and other fields of research that specifically examine project- or studio-based learning, reflective practice, and transfer. Being evidence-based, this study contributes to theoretical advances in project- and studio-based

learning, reflective practice, transfer, and the relationships that exist between them. In particular, the study builds on the work of pioneers such as Schön, Dorst, and Reymen to progress theories of reflective practice in design education.

1.4 Research strategy and context

This research problem suited a case study approach, where the researcher investigates a contemporary phenomenon within its real-life context, where the study is located within a bounded system, and is to be studied in-depth (Bogdan & Biklen 1992; Creswell 2007; Stake 2000; Yin 2003). A case study approach is particularly suited to address 'how' or 'why' research questions, and where the investigator has little control over events (Yin 2003). This case study was conducted in a studio class in the final year of a three-year undergraduate Bachelor of Creative Arts degree (Graphic Design Major) at the University of Wollongong, Australia. By situating the study within a graphic design studio classroom, the following boundaries to the case study were established: the participants were limited to those students enrolled in the class; the research focused on the set of learning activities that were designed for the class; and the duration of the study was fixed within the teaching period in which the class was scheduled.

A mixed-method research strategy (Tashakkori & Teddlie 2003) was employed to allow the collection of qualitative and quantitative data to support the development of a deep and broad understanding of the case. The study employed a concurrent nested mixed-method design (Creswell et al. 2003) which supports the ability to: collect qualitative and quantitative data simultaneously during a single data collection phase; employ the strengths of both qualitative and quantitative methods; and gain different perspectives not possible with one approach (Creswell et al. 2003).

Data were collected over 15 weeks from July to November 2007 in the forms of: a questionnaire; written reflective reports; semi-structured interviews; and

observations by the researcher. Multiple forms of data allow for triangulation (Yin 2003), which is important for qualitative research, as this approach enhances data dependability, credibility, and confirmability (Creswell & Miller 2000; Mertens 2005). The questionnaire was administered at the beginning of the data collection phase and sought to collect general information about participants' backgrounds, and their general views on the design process and reflective practices, prior to the introduction of the intervention.

The second form of data involved written reflective reports collected from the participants who received the intervention. The intervention consisted of four written reflective assessment tasks: three minor tasks that guided participants to reflect on sequential stages of their design process during the project; and one final task that prompted participants to consider the whole project. These tasks were scheduled to coincide with presentations participants made during the development of their design project. The intervention was designed to prompt participants to critically reflect on their project in ways that promoted ongoing evaluation and analysis of their project. The design of the intervention was informed by the principles of the reflective practitioner (Schön 1983; 1987), reflective practice (Boud et al. 1985; Hatton & Smith 1995; Moon 1999; Valkenburg & Dorst 1998), structured reflection (Johns 1994; Reymen et al. 2006), and critical reflection (Kember et al. 2007; Mezirow 1990; Moon 2004).

To gain further in-depth data, semi-structured interviews were conducted with eight volunteers at three points during the course of the study. The aim was to gain an understanding of how individual participants responded to the intervention, including their observations of their experiences. Interviewing is a major data collection strategy in qualitative research and is an effective way of "accessing people's perceptions, meanings, definitions of situations and constructions of reality" (Punch 1998, p. 174).

The data was collated, coded, and analysed in keeping with the strategies of mixed-method research (see Chapter Three for detail). The questionnaire data served to provide a portrait of the participant cohort. A taxonomy based on the work of Bennett (2002), and Hatton and Smith (1995) was developed to code the levels of reflective thinking evident in the reflective assessment tasks. The interview transcripts were analysed to identify emergent patterns and themes in the data.

1.5 Definition of key terms

There are a number of key terms used throughout this study. The definitions below are informed by relevant literature (see Chapter Two for further detail).

Reflection

The definition of reflection has been informed by the work of Schön (1983; 1987) Boud et al. (1985), Hatton and Smith (1995), and Valkenburg and Dorst (1998), and for the purposes of this study was defined as: *a process of conscious detachment from the design activity, with the aim to explicitly engage with the thinking and understandings implicit in the activity of designing.*

Structured reflection

The definition of structured reflection in this study draws directly on the work of Reymen, who defines structured reflection as: *“reflection that is performed on a regular basis during the design process and that is performed in a systematic way”* (2003, p.3).

Critical reflection

The definition of critical reflection has been primarily informed by the work of Boud et al. (1985), Hatton and Smith (1995), Mezirow (1990), Moon (1999; 2004), and Kember et al. (2007). For the purposes of this study critical reflection was defined as: *the process where learners challenge their thinking about the project and/or*

their beliefs about design practice, by questioning their approach to the project in an analytical manner.

Reflection-on-action

The definition of reflection-on-action in this study primarily draws on the work of Schön (1983), and Reymen (2001; 2003), and has also been informed by Eraut (1994) and Lawson (2006). Reflection-on-action is: *where learners engage in a deliberate process of pausing to think back over their design process, explore the understandings that they have brought to the handling of their process, and then consider how they might now approach further development of their project or design projects in the future.*

Design practice

In this study design practice draws on the work of Lawson (2006) and is defined as: *the compilation of design strategies and processes a design practitioner typically applies when approaching the activity of designing.*

Design process

For the purpose of this study the definition of the design process primarily references the work of Lawson (2006), Best (2006), and the Design Council (UK) (2005; 2007) and is described at a fundamental level as: *the activity of transforming a design problem or brief, through a sequence of looping and iterative procedures, into a design solution or finished product.*

Transfer

The definition of transfer in this study has been primarily informed by the work of Girk and Holyoak (1983), Perkins & Salomon (1988), Bransford & Schwartz (1999), and the National Research Council (2000). Transfer was recognised as: *the drawing of observations from the project in a manner that is decontextualised from the project context, typically in the form of a general principle, and articulated in a form that can be applied to other projects or the broader context of design practice.*

1.6 Limitations of the study

While this study addresses a significant gap in the graphic design education literature, there are limitations associated with the research method, specifically case-based research, which impact on the ability to draw generalisations from the findings. This case study included a small number of participants and was bound within one subject of study, and one project. While a combination of qualitative and quantitative research strategies can be applied to increase the generalisability of the findings (Johnson & Onwuegbuzie 2004), it is important to acknowledge that transferability of the findings to other settings may be limited. Another limitation of a case-based approach to research is the influence of the researcher's own subjectivities on the outcomes. While the mixed-methods approach employed in this study, the use of multiple data sources, and different analysis methods can provide corroborating evidence to address subjectivity (Creswell 2007), the coding of the data, the findings and the conclusions drawn from this study come from a single perspective, that of the researcher.

A further limitation of this study is that transfer of learning between projects was not specifically measured. While this study sought to explore the benefits that a structured and critical approach to reflective practice may have to support transfer in project- and studio-based learning, measuring transfer was beyond the scope of this study.

This study is also limited by the definitions of key terms. Review of the literature reveals there are multiple definitions of critical reflection for instance, and as such, it was important to define this key term as it was applied in the context of this study. As a consequence this definition of critical reflection may not necessarily relate directly to other studies or research settings. This limitation also applies to the other key terms employed.

1.7 Structure of thesis

This opening chapter has outlined the purpose and rationale for this study and provided an overview of the investigation. The remaining chapters expand on this study in more detail. Chapter Two provides a review of the literature that has informed this study. This includes a background to design education practice and its limitations, an exploration of reflective practice and how it has been employed in design education, and the theory of transfer. Chapter Three describes the research strategy applied in this study, details the case-study approach and mixed-methods employed. This chapter also describes the intervention and the literature that informed its design. The results and subsequent data analysis from the study are presented over three chapters. Chapter Four includes the data and analysis from the questionnaire applied at the beginning of the study, Chapter Five includes the data and analysis from the participant artefacts (reflective assessment tasks), and Chapter Six presents the material from the interviews. Chapter Seven, the final chapter, presents the findings from the study framed by the research questions, further addresses the limitations of the study, and discusses the implementations for and practice and further research. Supporting documents are included in the appendices for reference.

2 LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the literature that has informed this study. The review examines the research associated with graphic design education, however, due to the limited research published in this area studies from other fields of design, such as Industrial Design, Architecture, and Engineering, have also been considered, as has the broader research field of education. To provide some background on the way graphic design has traditionally been taught, the nature of design itself has also been explored briefly. The second part of the chapter focuses on the literature that has informed the intervention, and provides a review of the research associated with reflective practice and transfer.

2.2 Background to graphic design education research

Review of the literature reveals that research in the discipline of graphic design education is an emerging area, and research specifically focusing on the roles of transfer and reflective practice in graphic design education is limited. This is not surprising considering the history of design research in general. While the practice of design has a long history, design research is a more recent development, especially when compared to other fields of research such as the sciences and humanities (Friedman 2000).

Design research can be traced back in a broad sense to the 1960's, where general theories of design began to emerge, and in the 1970's where a shift to a greater focus on individual design disciplines occurred (Cross 2001; Reymen 2001). The body of research associated with graphic design however does not appear to have developed to the same extent as other design disciplines. The works of Bennett through her edited text *Design studies: Theory and research in graphic design, a reader* (2006), and Heller (who has authored, co-authored, and edited more than

100 texts on graphic design ranging from issues of practice to theory) are examples of writers providing a focal point for graphic design research. Empirical research, however, specifically engaging with the field of graphic design is limited, a sentiment echoed by Bennett who states, “traditionally graphic design theory has privileged intuition and creativity over empirical research” (2006, p. 14). In this context it is not surprising to find published research on graphic design education is also limited. The education series of books edited by Heller are notable exceptions, for example, *The education of a graphic designer* Edition 1 (1998) and Edition 2 (2005), *The education of an E-Designer* (2001). These texts however, primarily explore the practice of graphic design education, and empirical research was not within the scope of these publications.

There are however some research publications that specifically address aspects of graphic design education, for example Blair (2006) who explores concerns regarding assessment practices and in particular the design studio critique, and Logan (2005; 2008) whose work examined the presentation of knowledge and expertise in the tradition of practicum pedagogy in graphic design.

Logan’s (unpublished) doctoral thesis titled ‘The presentation of knowledge and expertise in the undergraduate graphic design curriculum’ (2005) and subsequent reporting of the results in the journal publication ‘Metaphor and pedagogy in the design practicum’ (2008), explored how the tradition of the design practicum underpins the approach to teaching and learning in the undergraduate graphic design classroom. This in-depth empirical study drew on situated theories of learning to examine the strengths and limitations of the practice-oriented discourse. Logan concludes that the “tradition of practicum pedagogy provides graphic designers with a sense of their shared specialist knowledge and community affiliations” (2008, p.15), which in turn promotes a metaphorical approach to discourse rather than an abstract and analytical approach, which Logan maintains privileges a view of students “as designers by instinct as well as by education and experience” (2008, p.15). Logan observes the practicum approach to teaching and

learning appears to be dependent upon the industry experience of lecturers, however tensions between the dual demands of practice and education contexts can surface under the pressure of evaluating student achievement, which can in turn disrupt the classroom relationships so critical to the practicum approach to learning. She further concludes that “acknowledging the contribution made to graphic design learning by both the professional and academic contexts may help us find a more effective means of describing its specialist knowledge” (2008, p.15). Logan suggests this has the potential to support student learning, highlight the relationships between the contexts of the profession and education, and to more effectively assess the contributions to knowledge by the disciplines of art and design.

More recent research publications would indicate this field of research continues to grow. For example Tunstall (2009) who describes a three-axis model of six design philosophical orientations, while Blair (2011; 2012) continues to investigate assessment practices in graphic design education, and Laranjo (2013) who explores the notion of the graphic designer as a critical practitioner.

Graphic design educational research is also more recently being supported by professional bodies such as, AIGA (American Institute of Graphic Artists), ICOGRADA (International Council of Communication Design, previously known as the International Council of Graphic Design Associations), and AGDA (Australian Graphic Design Association). These organisations have directly engaged with graphic design education by: hosting conferences, for example, the AIGA Future History conference 2009 and the AIGA New Contexts/New Practices conference 2010; publishing peer reviewed journals, for example Iridescent (ICOGRADA), the AIGA Educators Group that has published a number of case studies; and the publishing of the ICOGRADA Design Education Manifesto in 2000 and a subsequent update in 2011.

With limited empirical research specifically focusing on graphic design education, it is important to also look to more established research practices evident in other design disciplines such as architecture, engineering, and industrial design.

2.1.1 THE NATURE OF DESIGN

Design includes a growing number of disciplines, determined by the different forms and contexts in which a design problem and solution are situated. Some of the more traditional disciplines of design include architecture, landscape architecture, interior design, fashion design, industrial design, and graphic design.

There are numerous definitions of graphic design evident in the literature, for example Arntson (2007), the Australian Graphic Design Association (AGDA) (2006), the International Council of Graphic Design Associations (ICOGRADA)(2007), Jungkind (2006), and Newark (2007). Common themes include the practice of developing visual solutions through the use of typography, illustration, and imagery to create among others, branding solutions, print publications, advertisements, and packaging. AGDA describe graphic design as a problem solving process that requires creativity, innovation and technical expertise, and an understanding of a client's product or service and goals, their competitors, and the target audience, and where visual solutions are created through the manipulation, combination and utilisation of shape, colour, imagery, typography and space (2006). The discipline of graphic design continues to evolve and recent developments include engagement with digital media, including interface design, broadcast, and interactive media (International Council of Graphic Design Associations 2007; Jungkind 2006). The terms communication design and visual communication are increasingly being linked with descriptions of graphic design (Australian Graphic Design Association 2006; International Council of Graphic Design Associations 2007; McCoy 2005).

As with graphic design, numerous definitions of design are also evident, however there appears a general consensus that design can be described in very simple

terms as a process (Dorst 2006; Lawson 2006), and central to this process is the activity of thought and planning that leads towards targeted outcomes (Friedman 2001; Lawson 2006), or in other words, a series of actions that aim to change existing situations into preferred situations (Simon 1981). The process of design typically leads to the development of an artefact, a structure, or a service, however this is an outcome of the design process, it is not the design itself (Friedman 2001).

2.2.1.1 The design process

The design process can, at a very basic level, be described as “the specific series of events, actions or methods by which a procedure or set of procedures are followed, in order to achieve an intended purpose, goal or outcome” (Best 2006, p.208). The Design Council (UK) maintains “the design process consists of a series of activities and methods, which are pulled together in a way that meets the requirements of a problem or project.” (2007, p. 3).

Describing the design process in greater detail can be problematic due to the considerable variation present in the differing design problems and contexts. The general consensus within the design industry is that there is no set best practice regarding the design process (Design Council 2007). This is echoed by Clarkson and Eckert who state “despite the extensive research undertaken since the 1950s, there is no single model which is agreed to provide a satisfactory description of the design process ” (2005, p. 35). There is however, general agreement that there are some commonalities across the differing processes used, and these typically consist of distinct phases that incorporate looping and iterative activity (Design Council 2007). That is, the design process does not follow a linear format, but rather a constant process of cycling and repetition of actions, requiring a flexible infrastructure allowing response to creative change. As Best states:

Design processes are difficult to standardise, in part because of their iterative, non-linear nature, and also because the needs of clients and users are so different. In addition, real life, with its changing market conditions and

customer preferences, is much more dynamic chaotic and fuzzy than any standard model can fully accommodate and often, stages of the design process overlap (2006, p. 114).

While it is acknowledged that describing the design process in a standardised manner is problematic (Clarkson & Eckert 2005), there are some fundamental characteristics that can be identified. This study draws on the characteristics of the Double Diamond Design Process (DDDP) model described by the Design Council (UK) (2005), and as such this model was employed to benchmark the participants' descriptions of the design process. This model describes a four-stage process identified as: Discover; Define; Develop; and Deliver. These stages are summarised as:

- Discover: where the design problem is identified through the exploration of a broad range of ideas, with key activities that include identifying user needs, analysing market research, trends and other information sources;
- Define: where a combination of the ideas or directions identified during the Discover stage are analysed and synthesised into a brief, with key activities including project development, project management, and project sign-off;
- Develop: where design-led solutions are created, iterated and tested, with key activities including multi-disciplinary working, visual management, development methods, and prototype testing;
- Deliver: where the final design concept is taken through final testing, signed-off, produced and launched, followed by product evaluation and feedback loops.

While it is possible to identify and describe characteristics of the design process, Best (2006) proposes this process seldom follows a linear format. The process of design generally involves an iterative activity of recycling and repetition, and it is important to ensure flexibility in approach is maintained to allow responses to creative change (Design Council 2007).

2.2.1.2 The design practitioner

Design can be defined in simple terms as a process (Dorst 2006; Lawson 2006), and as such a designer is someone who implements the process of design. Best describes the designer as someone who “helps unlock the potential of a proposal, and crafts and delivers the solution, to brief, on time and within budget, to satisfy client and customer needs” (2006, p. 17). In other words, the designer works to solve problems, usually for others. Friedman describes the designer as:

A thinker whose job it is to move from thought to action. The designer uses the capacities of mind in an appropriate and empathic way to solve problems for clients. Then, the designer works to meet customer needs, to test the outcomes and to follow through on solutions (2000, p. 49).

Friedman also provides a more multifaceted picture of the modern designer as an analyst, a synthesist, a generalist, a team leader, and a critic:

Today’s designer works on several levels. The designer is an analyst who discovers problems. The designer is a synthesist who helps to solve problems and a generalist who understands the range of talents that must be engaged to realize solutions. The designer is a leader who organizes teams when one range of talents is not enough. Moreover, the designer is a critic whose post-solution analysis ensures that the right problem has been solved (Friedman 2000, p. 49).

According to Lawson (2006), the designer creates solutions, usually in the form of plans that describe the artefact in a manner that will guide those who will subsequently construct the artefact. The designer typically employs drawing and other forms of modelling media as a means of articulating their thinking and problem solving processes.

Designers typically work with problems that have been described as ill-defined, ill-structured, or wicked (Buchanan 1992; Cross 1984; Dorst 2003; Lawson 2006), where both the problem and the solution are unknown at the outset of the

problem-solving exercise. These forms of problems usually have no right or wrong answer, but require reasoning and personal judgement (Moon 2004). According to Cross (1990), the designer typically works in an environment of uncertainty and with incomplete information, which requires them to apply imagination and constructive forethought to solve problems. Design is an exploratory process where “the creative designer interprets the design brief not as a specification for a solution, but as a kind of partial map of unknown territory, and the designer sets off to explore, to discover something new, rather than return with yet another example of the already familiar” (Cross 2007, p. 52).

Schön (1983) argues that all design problems are unique, that is, no two design problems are exactly the same. Lawson however argues that while this might be theoretically true, this is not necessarily the reality designers experience in practice:

While it is theoretically true [that all design problems are unique] it is also misleading since most design problems have features they share in common with others. [Designers] are more able to recognise [these features it seems] through the possible similarity of potential solutions than through some abstract description of the problem (Lawson 2004, p. 118).

According to Dorst (2003), not all of the design process typically involves encountering unknown territory, and in practice, different levels of defined and undefined factors usually exist in any given design problem. Dorst describes three factors that are typically present:

determined factors that include ‘hard’ unalterable needs, requirements and intentions; *under-determined factors* which include aspects that are only revealed during the design process; and *undetermined factors* which are those that afford the designer freedom to create solutions to their own taste, style, and abilities (2003, p. 3)

Designers are more than problem solvers however. The design problem is only one aspect of the design process, and is typically the starting point where the designer

will initially deconstruct the problem and even reframe or redefine the problem as part of their inquiry (Cross 2007). Cross states “designing involves finding appropriate problems, as well as solving them, and includes substantial activity in problem structuring and formulating, rather than merely accepting the problem as given” (2007, p. 99).

2.2.1.3 Design knowledge

An important consideration for design educators is what constitutes design knowledge? A common theme that emerges from the literature is that design knowledge is largely tacit and for most design practitioners this knowledge is often only revealed through the activity of designing (Cross 2007; Dorst 2006; Friedman 2000; Lawson 2004; Schön 1992). Schön for example, describes design knowledge as “knowing in action, revealed in and by actual designing” (1992, p. 3). He maintains that design knowledge is primarily tacit where “designers know more than they can say . . . and they can best (or only) gain access to their knowledge in action by putting themselves into the mode of doing” (1992, p. 3). This is echoed by Lawson (2004) who maintains designers use knowledge in ways they do not fully understand. Cross, linking design knowledge and learning, states “designers find it difficult to externalise their knowledge, and hence design education is forced to rely heavily on an apprenticeship system of learning” (2007, p. 25). This reinforces the employment of project-based and studio-based learning in design education. While there is general agreement that design knowledge often exists in a tacit state, this is not necessarily an ideal situation. Friedman maintains that design knowledge should involve a combination of explicit and tacit forms and states “the challenge of any evolving field is to bring tacit knowledge into articulate focus” (2000, p. 95).

2.1.2 APPROACHES TO DESIGN EDUCATION

Understanding how design practitioners work is important for graphic design educators as design curricula has traditionally aimed to prepare students for the

professional and technical roles of the design industry. As a result, design education programs have in the past typically employed practicing designers to pass on their professional knowledge, skills and values informed by an apprenticeship process (Cross 2001). This approach has underpinned what many believe is an important aspect of the approach to design education; where as much as possible the students are taught in an environment and a manner that mirrors that of industry. In the design classroom, “design students ‘act out’ the role of designer in small projects, and are tutored in the process by more experienced designers” (Cross 2007, p. 19).

Design curricula has traditionally drawn on the principles of (or a blending of) studio-based learning, project-based learning, and public critique (Davies & Reid 2000). In these learning environments, students are typically introduced to the principles of design through a series of projects, with the intention that their level of expertise increases as they progress through their program of study (Dorst & Reymen 2004). Students learn about design through the process of creating solutions to the introduced problem(s), rather than through deliberate and separate study of the problem itself (Lawson 2006). Guided by feedback from teachers and peers, these learning approaches typically engage students in authentic learning environments (Duffy & Cunningham 1996; Jonassen et al. 1999) with increasingly more complex design projects as they advance through the course. This learning-by-doing approach reinforces a traditional pedagogical belief in design education that the best way to learn about design is through the act of designing (Dorst & Reymen 2004; Lawson 2006).

2.1.2.8 Project-based learning

Project-based learning, is a common practice employed in graphic design education (Barlowe 1999; Davies & Reid 2000; Ehmann 2004; Pearson et al. 1999), and has been described as a “comprehensive approach to classroom teaching and learning that is designed to engage students in investigation of authentic problems” (Blumenfeld et al. 1991, p. 369). By placing students in realistic, contextualised

problem-solving environments, project-based learning can serve to establish bridges between knowledge gained in the classroom and real-life experiences (Blumenfeld et al. 1991).

A generalised representation of project-based learning is articulated in figure 2.1, and draws on the work of Blumenfeld et al. (1991), and Barron et al. (1998). The first step usually involves the articulation of a driving question, often in the form of design brief, from which the students then enter into the activity of designing. This activity is usually collaborative in nature. As the project develops, the student(s) pauses from the activity of designing while the work is revised by staff and the student(s), and then the student(s) return to the design activity. This process is cyclic in nature and can occur numerous times during the development of the design project. In the final stage the student(s) presents the final outcomes of the project.

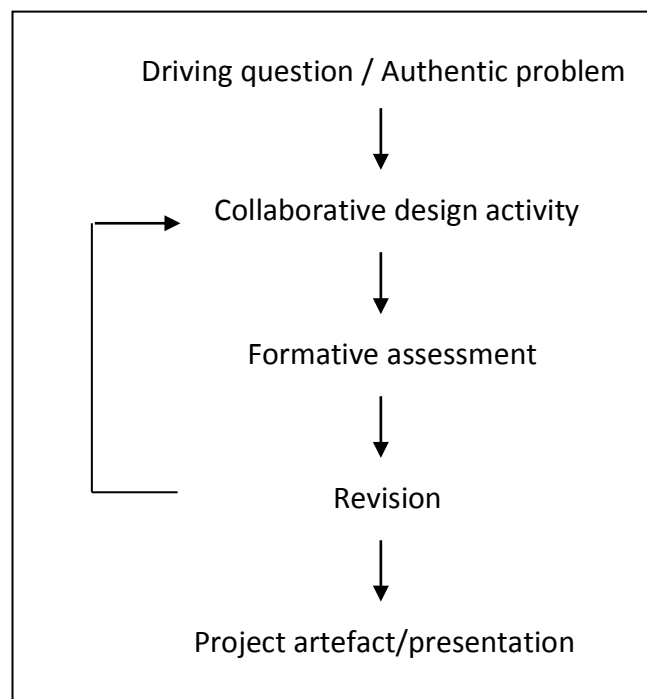


Figure 2-1: Project-based learning (generalised model)

2.1.2.9 Studio-based learning

The second learning model commonly employed in graphic design curricula is studio-based learning (Davies & Reid 2000). This learning model is traditionally situated in a design studio environment under tutelage of a master designer (Lackey 1999). It encourages 'learning by doing' in a professional environment similar to that which might be experienced in industry (Carbone et al. 2001). In the studio, the teacher engages the student in the activity of designing with the relationship between teacher and student framed by the master-apprentice approach (Kvan 2001; Schön 1987).

Studio-based learning has its origins in architectural design education (Lackey 1999). Lackey outlines the traditional features of studio-based teaching in the architecture studio: setting the design problem; periodic lectures; critique of student work, of which there are four distinct types - desk critique, pin up, interim/midterm critique, and final critique; and assessment by design jury. Kvan (2001) describes four fundamental steps in the traditional studio-based learning process: the formulation of the problem, the exploration of solutions through 'action-based activity', problem re-examination, and examination by jury (Fig. 2). The exploration of solutions and problem re-examination steps are cyclic in nature with the student preceding to final examination once they are satisfied (or the deadline is reached) with their design solution.

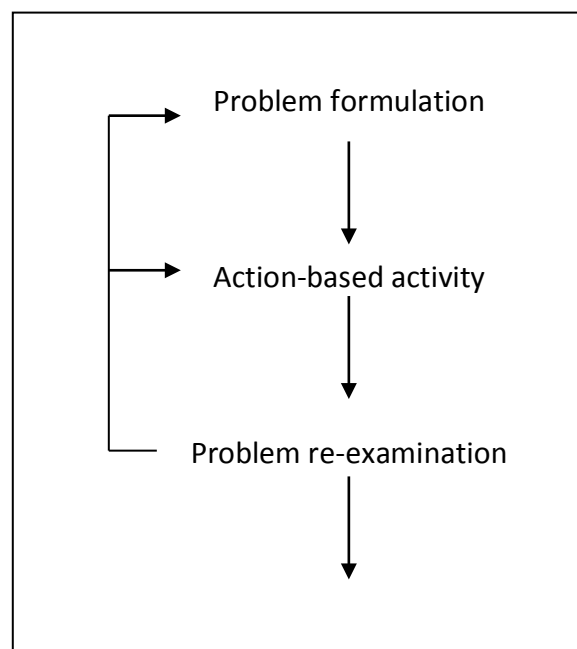


Figure 2-2: Studio teaching cycle (Kvan 2001)

Concerns with traditional approaches to design education

Researchers agree that studio-based and project-based learning models can be an effective way to approach the complex and ill-structured nature of design problems (Davies & Reid 2000; Dorst & Reymen 2004; Kvan 2001; Lawson 2006), however, on close examination this may not be the most effective way to teach or learn (Dorst & Reymen 2004; Kvan 2001; Lawson 2006). Kvan (2001) and Lawson (2006) observe that these learning models typically focus primarily on the artefact, and there is usually a lack of engagement with the process that led to the development of the artefact. They argue that this has the effect of emphasising the artefact outcomes leaving the student at risk of not learning from the design process itself. This sentiment is echoed by Dorst & Reymen (2004) who also express concerns about the learning becoming bound within the project:

Because of the complexity of design issues and the ill-structured nature of the student design problems, it is not even always clear what exactly is learnt by the student. Moreover, students cannot always express explicitly (in words) what it is they did learn (2004, p. 1).

This is a legitimate concern when employing a multiple project approach to curricula that relies on the ability of the learners to transfer their learning between projects. To promote transfer, it is important that students learn from their projects in ways that support and encourage them to prepare their learning in forms from which they can draw when approaching other design projects. “Learning design doesn’t just involve skill acquisition, it also involves the learning of declarative knowledge, and the building up of a set of experiences that can be directly used in new projects” (Dorst & Reymen 2004, p. 4).

Schön (1987) notes that the studio-based learning framework is not infallible and identifies two key issues to consider: stance and behaviour. Stance is the situation where the design teacher or ‘master’ withholds their knowledge due to fear the

“student may misunderstand, misuse, or misappropriate [that knowledge and expertise]” (1987, p. 119). Behaviour represents the interaction between the student and design teacher or master, where a successful learning experience is reliant on the development of an effective relationship.

Studio-based learning has attracted other criticisms. Anthony (1991) documents considerable concerns regarding the studio-based learning model, particularly the jury process. Her study, which examined teaching and learning practices in architecture education, indicated that the vast majority of students felt the design studio and jury approach needed improvement. Anthony found little or no formal attention given in the studio to design production issues, there appeared to be little formalised support for research technique development, and faculty often failed to provide constructive criticism during the jury assessment process. She concluded that studio-based learning would benefit from a major overhaul and that faculty could look to the pedagogical approaches of medicine and law. Henderson (2004) highlights the increasing difficulty for education institutions to sustain a vibrant studio culture in the traditional sense and that traditional studio-based learning appears to be in decline. Contributing factors include, pressures on staff time, diminishing resources, increasing student to staff ratios, changing student work and study patterns, health and safety issues, and increasing reliance on computer aided design. Henderson recommends establishing a greater positive learning experience by including collaborative learning in a more formalised manner, and redefining the design critique and jury assessment process.

2.1.2.10 Problem-based learning

Problem-based learning has been attracting attention in design education (Ellmers & Foley 2007; Kvan 2001; Roberts 2004; Russell 1999) due to parallels with traditional forms of learning in design (studio-based and project-based learning). Problem-based learning has been described as an instructional educational methodology in which students engage with contextualised problems and look to

discover meaningful solutions (Rhem 1998). An essential aspect of problem-based learning is the use of 'real-world' problems to frame the approach to learning (White 1996). It is through this discovery that the students identify what they know and importantly what they don't know, establishing a framework in which to approach the problem (Duch 1997; Major & Palmer 2001). Five fundamental steps in problem-based learning have been identified (see figure 2.3):

1. problem formulation;
2. development of a solution through a self-directed learning approach;
3. a re-examination of the problem to test the proposed solution;
4. abstraction where the solution is contextualised with other known cases;
5. a final reflection stage where the students reflect and critique their learning process seeking to identify areas for future improvement (Koschmann et al. 1994).

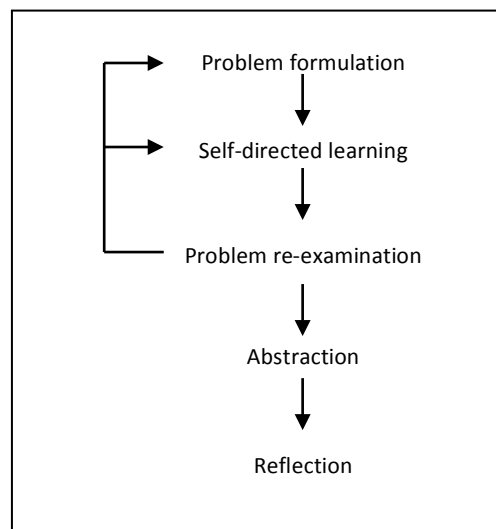


Figure 2-3: Five steps in problem-based learning (Koschmann et al. 1994)

There are parallels between problem-based and project-based learning, and it is not unusual to witness the two frameworks being discussed together (Esch 1998; Thomas 2000). The defining features of project-based learning; “centrality, driving question, constructive investigation, autonomy and realism” (Thomas 2000, p. 6) are also present in problem-based learning, however the separation between the

two lies in the end focus. It is the final artefact/project that traditionally drives the planning, production, and evaluation process in project-based learning, whereas, the primary focus of problem-based learning typically revolves around the inquiry and research of the problem (Esch 1998).

Comparing problem-based learning and studio-based learning, Kvan (2001) observes that problem-based learning appears to emerge from the principals of studio-based learning and makes the important point, that in light of problem-based learning practices “opportunities for learning are omitted in the studio setting” (2001, p. 95). Kvan attributes this to the deliberate focus on process in problem-based learning compared to a design artefact emphasis in studio-based learning.

The significance of problem-based learning to this study is the focus on the process (including the inquiry and research of the problem) that underpins the artefact. While it could be argued that studio-based learning and project-based learning both include engagement with the process, problem-based learning brings engagement with the process to the surface in a deliberate manner (Kvan 2001). One way problem-based learning achieves this is through a deliberate engagement with reflection (Koschmann et al. 1994).

2.3 Key literature informing the intervention

As previously discussed, graphic design curricula traditionally employs a multiple project approach to learning. The series of projects usually grow in complexity as the student progresses through the program of study, and for this approach to be effective, it is important that students transfer their learning between projects (Dorst & Reymen 2004). Dorst & Reymen (2004) argue that one problem in traditional approaches to design curricula, is that the students themselves are often left to connect the learning from their projects. To further compound the problem, studio-based learning and project-based learning traditionally focus on the artefact

as the primary measure of learning (Kvan 2001; Lawson 2006). This creates a situation where the learning is typically bound within the artefact and the context in which the artefact was developed, and as a consequence for the student, it can frequently be unclear what they have actually learnt, further hindering the likelihood they will transfer their learning to other projects (Dorst & Reymen 2004). To understand this problem it is important to investigate the notion of transfer and explore ways in which the learner can be supported to learn from their projects in ways that foster the conditions for transfer.

2.3.1 TRANSFER

The phenomenon of transfer of learning has been of interest in educational psychology for many years, for example, Bransford and Schwartz (1999), Broudy (1977), Girk and Holyoak (1983), Greeno (1997), Perkins and Salomon (1988), and Salomon and Perkins (1989). The ability to transfer has been broadly defined as “the ability to extend what has been learned in one context to new contexts” (Byrnes 1996, p. 74). Bransford and Schwartz refer to a traditional view of transfer as “the ability to directly apply previous learning to a new setting or problem” (1999, p. 68). Transfer is often underpinned by the belief that it is more effective to broadly educate people than simply train them to perform particular tasks (Broudy 1977).

Transfer is affected by the way the information is learned (Bransford & Schwartz 1999) and requires a sufficient level of original learning to be effective (National Research Council 2000). “The first factor that influences successful transfer is the degree of mastery of the original subject. Without an adequate level of initial learning, transfer can not be expected” (National Research Council 2000, p. 53). The ability to transfer is influenced by the degree to which people learn with understanding, as apposed to memorising sets of facts or following fixed sets of procedures (National Research Council 2000). Guiding students to realise potential transfer implications within their learning can improve the possibility of transfer (Anderson et al. 1996). Transfer can be encouraged through an emphasis on

metacognition strategies such as encouraging students to monitor, reflect, and improve their strategies for learning and problem-solving (National Research Council 2000).

While there is a broad discussion in the literature engaging with the theory of transfer, in the design literature this discussion is limited, and studies engaging specifically with the discipline of graphic design education appear to be absent, suggesting that this is an unexplored area of research. While there is discussion in the broader design literature about the importance of connecting learning between projects, for example Quayle and Paterson (1989), Davis (1998), Valkenburg and Dorst (1998), Davies & Reid (2000), Lawson (2004) and Cross (2007), these studies do not directly link their research with concepts of transfer of learning. The work of Busby (1988; 1999) and Lauche (2001) located in the engineering literature are the few exceptions. Busby's work is discussed below, however as Lauche links transfer and reflection, her work is discussed later in this chapter (see section 3.3.2).

In engineering design practice, transfer has been shown to provide a means of engaging with the complexity of design problems, to draw on past experiences with the aim to inform development of design solutions, and to develop expertise (Busby 1988). Busby states

One could never progress from elementary to complex designs without the ability to reapply existing solutions or part-solutions to new problems . . . the idea of transferring a solution for one design problem to another that is similar in some way is a basic notion, and a basic part of accumulating experience and expertise. Designers are inclined, for instance, to learn about problems by attempting transfer - by trying out possible solutions (1988, p. 178).

Busby's study, located in an industry environment, identifies causes for failure of transfer in engineering design (1988). These include a reluctance by designers to refer to past experiences when there were perceived inefficiencies with the past design solution, or differences in environments or characteristics of engineering

objects and activities. Busby observed that in many situations a designer's failure to transfer was influenced by variations in personal beliefs or preferences of individual designers. Busby found transfer was a difficult process to judge in a design environment because transfer can occur (or not) at different stages in the design process and have different levels of application to the design in development. Busby concludes that practices can be developed to teach designers to transfer, especially to people in the early stages of their careers, however he cautions against inflexibility. "It is better to equip individual designers with the ability to practice transfer when it is appropriate, than to impose inflexible and unresponsive policies" (Busby 1988, p. 186).

Due to the limited research in the design education literature specifically engaging with transfer, it has been necessary to look to research in the broader field of education such as Girk and Holyoak (1983), Perkins and Salomon (1988), Salomon and Perkins (1989), Greeno (1997), and Bransford and Schwartz (1999). Girk and Holyoak (1983) maintain employing multiple contexts in the learning process can increase the possibility of transfer through encouraging learners to abstract general principles from their learning experience. They argue conveying the knowledge in multiple contexts helps students develop a flexible representation of knowledge, which can increase the likelihood of transfer. This representation can in turn support abstraction of general principles, subsequently increasing the possibility of transfer and supporting a more flexible transfer process (Girk & Holyoak 1983).

While transfer can guide learners to draw generalisations from the learning situation, Cree and Macaulay (2000) caution against over-generalisation. They maintain learners need to discriminate between situations to guard against this. The benefits to the transfer process of abstracting general principles from the learning experience in a way that is decontextualised from the learning context has been recognised (National Research Council 2000; Salomon & Perkins 1989). "Research studies generally provide strong support for the benefits of helping students represent their experiences at levels of abstraction that transcend the

specificity of particular contexts and examples” (National Research Council 2000, p. 65). Abstraction is recognised to have occurred when the learner draws observations that are decontextualised from the learning experience, typically as a general principle, and articulated in a form that can be applied to a broader range of other experiences.

Abstraction thus involves both decontextualisation and re-representation of the decontextualized information in a new, more general form, subsuming other cases. Abstractions, therefore, have the form of a rule, principle, label, schematic pattern, prototype, or category. This makes clear how abstraction leads to transfer: It yields a re-representation that subsumes a greater range of cases (Salomon & Perkins 1989, p. 125)

Two forms of transfer have been described that are particularly beneficial to this study, low-road and high-road transfer (Perkins & Salomon 1988; Salomon & Perkins 1989). Low-road transfer occurs when skills and knowledge learned in one context can be readily applied to another similar context. Perkins and Salomon maintain this process occurs with relative ease because the similarities between the learning context and the new context allow the learner to recognise which skills and knowledge are useful and how they should be applied. Low-road transfer is generally evident in near-automatic performance across similar conditions, and usually relies on extensive practice to be effective. High-road transfer, by contrast, occurs when knowledge is used in a new context that is different to the learning context. Perkins and Salomon argue this type of transfer relies on mindful, deliberate abstraction of principles, either in advance of its new application or by recalling past experiences in light of a new situation and abstracting relevant principles retrospectively.

Identifying evidence of transfer can be problematic. Broudy (1977) highlights the difficulty of consistently finding evidence of transfer, and Detterman and Sternberg (1993) maintain transfer is rare, with the similarity between the two situations determining the likelihood of successful transfer. In response to these concerns,

Bransford and Schwartz (1999) argue for a broader definition of transfer that includes evidence of what they identify as 'preparation for future learning', that is, the ability to draw observations from the learning experience in a manner that fosters the conditions to transfer the learning to future experiences. This 'preparation for future learning' approach builds on the traditional definition of transfer as the "ability to directly apply one's previous learning to a new setting or problem" (Bransford & Schwartz 1999, p. 68), which Bransford and Schwartz term Direct Application Transfer theory. They state "the better prepared learners are for future learning, the greater the transfer. In other words, preparation to learn from new experiences" (Bransford & Schwartz 1999, p. 68). They contend that the ability to learn from new experiences in this manner can place learners on a trajectory towards improving their levels of expertise (1999).

To prompt learners to think about their experiences and organise them into coherent view requires direct support (Bransford & Schwartz 1999). Assessment is one important way to provide this support. When considering assessment to promote transfer, Bransford and Schwartz argue the assessment tasks should "directly explore people's abilities to learn new information and relate their learning to previous experiences" (1999, p. 69). This includes a shift of focus from the ability to generate a finished product, to the ability for preparation to learn to solve new problems. "When people have the opportunity to 'bump up against the world' and receive feedback, their learning can improve quite dramatically, and the value of their previous experiences can be revealed" (Bransford & Schwartz 1999, p. 93).

2.3.2 REFLECTIVE PRACTICE

To foster the conditions for transfer it is important to guide learners to think about their project in deliberate ways and encourage them to abstract general principles from their learning experience (National Research Council 2000). Reflective practice is one metacognition strategy that can provide direct support for transfer (National

Research Council 2000). Reflection has been successfully applied in numerous disciplines as a tool to enhance learning, and is explored extensively in the literature in disciplines including, medicine, management, education, and to a lesser extent the broad discipline of design. However searches of the literature seeking empirical studies specifically engaging with reflective practice in graphic design education reveals that this is an unexplored area of research.

Reviewing the literature on reflection it is evident that it is a contentious concept with multiple approaches and definitions that are open to interpretation and are often quite context specific. Kember states:

What is perhaps surprising, in spite of the wide interest in reflection and the volumes written about it, is that the concept is ill defined. Formal definitions are not easy to find . . . [and] many write about reflection with the apparent assumption that everyone knows what it is (2007, p. 1).

There is however general agreement that reflection has an influential role to play in the pedagogical practice of higher education, specifically as an important tool to aid learning from experience (Boud et al. 1985; Kolb 1984; Moon 1999; Schön 1987).

Reflection as a learning aid has a long history in education research. The educationalist and philosopher John Dewey is recognized as one of the early pioneers in the field of research in reflection and describes reflection as “assessing the grounds (justification) of one’s beliefs” (1933, p. 9). Dewey maintains that reflection is framed by scientific thinking and learned by doing. Mezirow (1990), drawing on the work of Dewey, describes reflection as “the process of rationally examining the assumptions by which we have been justifying our convictions” (1990, p. 5). Mezirow argues reflection is a synonym for higher-order mental processes that are a way of making meaning from our experiences, and that involve the “assessment of the assumption implicit in beliefs, including beliefs about how to solve problems” (1990, p. 12). Boud, Keogh, and Walker define reflection as “a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and

appreciation” (1985, p. 3). Hatton and Smith (1995) describe reflection as a process of conscious detachment from an activity, followed by a distinct period of contemplation. Moon states reflection is a “tool to facilitate transfer of surface approach to learning to a deep approach . . . [and is] a process to link to previous knowledge” (Moon 1999, p. 155). To maximise the effectiveness of reflection Moon (1999) maintains learners require time, space, and facilitation to engage in the reflective process.

Daudelin (1996) reports on the impact and benefit of introducing reflection into a management environment. She found that providing managers with a 1-hour period of reflection, employing sets of structured questions and guidelines, significantly increases the learning from their experience. Daudelin concludes from her study that reflection provides important opportunities for managers to learn from current work situations in a way that can be applied to new situations, and to support them to take responsibility for their own learning. Applying reflection in a structured manner allows this process to occur in a short period of time, which is important in a work environment where “managers often place a higher value on action than reflection” (Daudelin 1996, p. 37).

Reviewing the literature specifically focused on reflective practice and design, there are variations in how reflection is described and employed across the different disciplines. Reymen (2003), reviewing the literature on reflection in a design context, found there are broad applications of reflection across design research, education, and practice, which differ in “definition, goal, theoretical basis, and possible use” (2003, p. 1). There is however consensus about the importance of reflection as an integral aspect of the design process (Adams et al. 2003; Badke-Schaub et al. 1999; Cross et al. 1996; James 2007; Lawson 2006; Reymen et al. 2006; Schön 1983; Valkenburg & Dorst 1998). Reymen, bridging across different design disciplines (in her study this included architecture, mechanical engineering, and software engineering), defines reflection in a design context as “an introspective contemplation on the designer’s perception of the design situation and on the

remembered design activities” (2003, p. 3) and states that the reflective process “consists of three main activities that are called preparation, image forming, and conclusion drawing” (Reymen et al. 2006, p. 20). Valkenburg and Dorst (1998) maintain reflection is an important part of the design process, both when working individually and in teams, and involves a conscious and rational action that can lead to reframing the design problem, guide subsequent design activity, or the identification of further design considerations.

Reflection plays an important role in the design process as a means to explicitly engage with the thinking and understandings implicit in the activity of designing (Dorst & Reymen 2004; Schön 1983). This has advantages when addressing the learning opportunities inherent in the design experience. Friedman argues “reflective practice is not a form of silent meditation on work . . . reflection takes the form of bringing unconscious patterns and tacit understandings to conscious understanding through articulation” (2001, p. 42). Lauche maintains that reflection is a central element of design and “can occur as an individual state of mind during designing or can be applied systematically as a critical review of the chosen methodological approach for learning and improving strategies” (2001, p. 271).

Reflective practice has been identified as a key element in experiential learning, which can in simple terms be described as learning from experience (Moon 2004). A common understanding of experiential learning is based on the work of Kolb (Moon 2004), who describes a cycle of experiential learning that includes four linked stages (Kolb 1984). Kolb states that learners might cycle through the stages a number of times and may start their learning at any stage of the cycle. These stages are:

1. concrete experience;
2. reflective observation drawn from the experience;
3. abstract conceptualisation which involves the development of general rules describing the experience, or the application of known theories to it;
4. active experimentation involving the formation of approaches to modify the next occurrence of the experience.

A further David Boud who has written extensively on the topic of experiential learning developed five propositions about experiential learning in collaboration with Cohen and Walker. These are:

- Experience is the foundation of, and the stimulus for all learning
 - Learners actively construct their own experience
 - Learning is a holistic process
 - Learning is socially and culturally constructed
 - Learning is influenced by the socio-emotional context in which it occurs
- (2000, p8-14 [taken from Moon 2004, p 111])

An important aspect of learning from experience is that an intervention in some form or another is required to facilitate the generation of knowledge from that experience. Criticos makes the observation “if experience in itself was so valuable, then humans who are enmeshed in experience ought to be more knowledgeable than they are. Sadly the only conclusion that can be reached is that we do not learn from experience” (1993, p. 161). Criticos (1993) suggests that to generate knowledge from experience, some form of processing of that experience should take place.

2.3.2.1 The reflective practitioner

A central reference for this study is the work of Donald Schön, who developed the concept of the reflective practitioner (1983; 1987). Schön has been described as a founding father of reflective practice for the broad discipline of design (Reymen 2003), and his work provides a framework for understanding and plotting the activity of the design process. He describes the design process as a reflective conversation with the design situation and highlights reflection as a critical element of professional design activity. Schön’s framework is based on a constructivist view of human perception and thought processes; the designer constructs their view of the world based on their experiences. Schön maintains that reflection is intimately bound up with action. He rejects the theory of technical rationality that distinguishes professionals by the extent of their ‘book knowledge’. He argues that design practice is action-oriented and relies on an implicit knowledge that resists

definition within the prevalent methodological paradigm of technical rationality. Comparing Dewey and Schön's concepts of reflective practice, Waks (1999) observes that while both approaches can be defined as learning-by-doing, the key difference is that Dewey looks to remove the reflection process from the practical problem and engage in scientific thinking, where as Schön maintains reflection occurs within activity of doing, not removed from it.

Schön articulates three forms of reflection: reflection-in-action; reflection-on-action; and reflection-on-practice. Reflection-in-action occurs when the design professional is 'surprised' by, or experiences a unique situation during the development of the design solution (1983). Schön (1987) describes reflection-in-action as 'thinking on our feet' and reflecting in the midst of an action without interrupting it. Schön states "what distinguishes reflection-in-action from other forms of reflection is its immediate significance for action" (1987, p. 29). Reymen (2003), drawing on the work of Schön, describes reflection-in-action where the designer thinks about what they are doing while doing it, in such a way as to influence further doing. She maintains a key aspect of reflection-in-action is that it occurs during the design activity, not removed from it, and relates directly to activity taking place at that time.

Schön introduces the concept of reflection-on-action when exploring the conceptual boundaries of reflection-in-action, and indirectly describes reflection-on-action as a process of reviewing actions from the recent past (1983). Other researchers have also contributed to the dialogue around reflection-on-action. Eraut describes reflection-on-action as the "process of making sense of an action after it has occurred and possibly learning something from the experience which extends one's knowledge base" (1994, p. 146). Lawson states reflection-on-action involves "a higher level of activity [than reflection-in-action] in which the process is monitored . . . [it] involves a mental 'standing back' and asking if the process is going well or might be steered differently" (2006, p. 299). Reymen (2003) maintains reflection-on-action can take place after the fact or designers can pause in the midst

of the action to stop and think. What is common across these descriptions is that this reflective process usually has no direct connection to the present action, which is what differentiates this process from reflection-in-action. Reymen (2003) argues that when designers engage in a process of reflection-on-action they engage in a deliberate process of: pausing to think back over what they have done; exploring the understandings that they have brought to the handling of the design process; and considering how they might approach a similar problem in the future.

Reflection-on-action can be defined as thinking about doing after doing, in such a way as to influence further doing. The goal of reflection-on-action may be evaluating past and current design situations in order to adjust next situations. This can be done by answering questions about the past like 'What were critical situations?' and 'What were factors influencing critical situations?' (2003, p. 5).

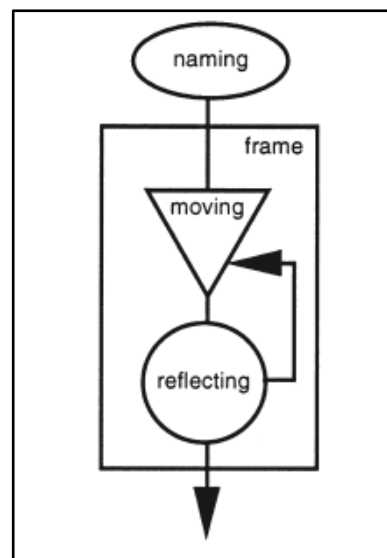
Reflection-on-practice was a concept identified in Schön's later work (Schön & Bennett 1996) and involves a process of identifying and critically engaging with tacit understandings that have emerged through repetitive experiences of practice. A key point of difference compared to reflection-on-action is that consideration is given to reviewing numerous design experiences to identify patterns of behavior with the intention to influence subsequent approaches to the broader context of practice, rather than a single design project. Examples are becoming aware of having fallen into an unfortunate pattern of design behaviour, such as 'falling in love with an initial design idea'. Reymen drawing on Schön's work describes reflection-on-practice as "thinking about doing after repetitive doing, in such a way as to influence further doing" (2003, p. 6). Reymen maintains reflection-on-practice includes the process of thinking over several design experiences with the aim to identify patterns of successful and unsuccessful practices in order to influence practice in the future (2003).

While Schön's work has played an influential role helping researchers and practitioners understand the design process, his work however has not escaped

criticism. There has been some questioning of Schön's theory, particularly the distinctions between reflection-in-action and reflection-on-action (Broadbent et al. 1997; Eraut 1994; Hatton & Smith 1995; Moon 1999; Munby & Russell 1989). Eraut (1994) feels these distinctions are not sustained through the examples Schön provides and suggests the definition of reflection-in-action is problematic, where as the use of the term reflection-on-action is more resolved. This is also reiterated in the work of Munby and Russell (1989) who maintain that confusion arises when trying to apply Schön's modes of reflection-in-action. They conclude that Schön's work is "not sufficiently analytical and articulated to enable [them] to follow the connection that must be made between elements of the experience and elements of cognition so that [they] may see how reflection-in-action might be understood to occur" (1989, p. 74). Broadbent et al. (1997) also express concern about the limited sample on which Schön drew when developing his theory of the reflective practitioner and state "whilst [Schön] analyses quite well the events that take place during studio education - the process of design - he has very little to say about its content" (1997, p. 1). Eraut suggests that part of the confusion may lie with the use of the term 'reflection', and he advocates that "reflection is essentially a metacognitive process" (1994, p. 146), and suggests replacing the term reflection with metacognition would help provide a clearer distinction.

Although concerns have been raised about the distinctions between reflection-in-action and on-action, the work of Reymen (2003) and Reymen et al. (2006) provides some of the clearer discussion in the design literature regarding Schön's different forms of reflection. Reymen states that the reflective forms differ in the sense that they focus on three different levels of designing: "micro-level design process dynamics [reflection-in-action]; macro-level design process dynamics [reflection-on-action]; and design-project level dynamics [reflection-on-practice]" (2003, p. 7). Reymen further suggests reflection-in-action and on-action are typically associated with the reflective process that occurs during the design activity, where as reflection-on-practice usually occurs at a design management level (2003).

The application of Schön's reflective practice in the context of design practice has been explored. Valkenburg and Dorst (1998) apply Schön's framework to outline the process of practice in an industrial design studio. They articulate the mechanism of reflective practice based on Schön's reflective practicum (see figure 2.4) in four stages: 'naming', in which the problem is articulated; 'framing', the context of the problem; 'moving', the design activity; and 'reflecting', in which the designer assesses the design development within the frame (problem context). They describe the reflective stage as a conscious and rational action that aims to guide the student towards re-framing the problem, further design activity, or addressing new issues that emerge through the reflective process (Valkenburg & Dorst 1998). The researchers conclude that the descriptive method provides a framework that allows the breakdown of the design process for observation and discussion. They suggest this approach could be beneficial in the education environment as it provides a



framework in which to articulate the activity of design.

Figure 2-4: The mechanism of reflective practice (Valkenburg & Dorst 1998)

Based on Schön's reflection strategies, Quayle and Paterson (1989) outlined techniques to encourage reflection in studio-based design education. They defined these techniques as 'informed reflection' and incorporated strategies for design learning that seek to bridge one student project to another, include reflection during and after the design process, and require "conscious reconsideration of a

thought, idea or experience with expressed objectives" (Quayle & Paterson 1989, p. 30).

Adams et al. (2003) employed Schön's reflective practitioner framework to analyse the design activity of engineering design students. From their empirical data the researchers mapped the design activity of the students and concluded "problem setting and engaging in a reflective conversation across problem setting and problem solving activities are important features of effective design practice" (2003, p. 292).

2.3.2.2 Structured reflection

Researchers suggest that designers and learners benefit from a structured approach to reflection (Johns 1993; Moon 1999; Reymen et al. 2006). There are a number of definitions of structured reflection present in the literature, however empirical research specifically published in a design context is limited. Reymen et al. define structured reflection in a design context as "the combination of reflection in a systematic way and reflection regularly during a design process" (2006, p 16). They maintain that a systematic approach to reflection decreases the chance the practitioner may overlook important aspects of their process and when performed in a regular way increases the likelihood the reflection will occur.

In the broader literature, the concept of structured reflection has similarities with 'guided reflection' and these two terms appear to be used interchangeably. Johns (1993; 1994) has published extensively in the field of clinical nursing on the role of, and approaches to, reflection, including the articulation of a structured reflection model. He argues that structured reflection supports reflective practitioners to "access, make sense of, and to subsequently learn through their experiences to become more effective in their practices . . . [and] enables the would-be reflective practitioner a comprehensive and valid means of 'knowing' the breadth and depth of reflection" (1994, p. 1). His model of structured reflection (which he also

describes as guided reflection) describes five distinct stages, each with a series of learning prompts to guide the learners thinking. These stages include: describing the experience; reflecting on the experience; exploring influencing factors in the decision making process; exploring alternative strategies; and exploring learning from the experience.

Concerns about structured reflection are evident in the literature. Johns' structured reflective model has been criticised for focusing on lower levels of reflective activity and "does not extend to consideration of the conditions that shape the reflective activity itself" (Moon 1999, p. 70). Moon (1999) suggests the addition of further learning prompts to probe higher-level reflective thinking would complement Johns' model. Moon describes four strategies to encourage guided reflection: "the structure of the task provides the best guide for reflection; different types of reflective exercise will generate different types of reflection; reflection may be guided in an organized sequence; and more support in the beginning can give way to less structure later" (1999, p. 171). Hoover (1994), working with pre-service teachers, found that employing reflective learning prompts without a pre-determined specific focus lead to an outpouring of complaints and survival concerns from students. She observed that with a greater structured approach and clearer focus, the students engaged in reflection in a more progressive manner. Hoover also found that written reflective assessment tasks supported learners to "make their cognitive processes explicit which enhanced the potential for higher-level thinking" (1994, p. 83).

Empirical research engaging with structured reflection specifically in a design context is an emerging area. Primary references for this study are the PhD research of Reymen (2001) and her later work (Reymen et al. 2006), which explored the role structured reflection can play to support the development of domain-independent knowledge across different design disciplines. Her study included architecture, mechanical engineering, and software engineering. Reymen defines structured reflection as "reflection that is performed on a regular basis during the design

process and that is performed in a systematic way” (2003, p. 3). Her study was situated in an industry context and her structured reflective approach included a series of checklists and forms that were designed to guide the designers to think about their design situation and design activities in particular ways. The model aimed to support designers to engage with the design process in a domain-independent manner and to support them to improve the effectiveness and efficiency of their design processes. The designers were asked to complete the forms before and after the many individual design sessions that make up the overall design process, with the idea that this would promote regular reflection during the process. This approach was primarily informed by Schön’s notion of reflection-on-action, where the designer thinks about the design activity after it has occurred, in such a manner as to influence approaches to further activity. To test the model, a series of case studies were developed by Reymen that included 2 different expertise levels of designers: junior designers who had just completed their first large scale design project in a practice setting; and expert designers selected for their level of expertise in specific design disciplines.

Reymen (2001) reports that participants felt the introduced structured reflection helped them get an overview of the design situation and design activities through supporting an increased awareness about the design situation; prompting thinking about the design process; helping them identify problems, work in a more focused manner and with a greater sense of order to the process; supporting learning and highlighting opportunities to define and improve their processes; and improving documentation and description of the design process.

Concerns were raised by the participants in Reymen’s study (2001) regarding the introduced structured reflective practice, with notable differences between the expert designers and the junior designers. The expert designers observed the structured reflection required considerable time to complete, and they felt if employed too often, the process risked becoming a ritual, and opportunities for learning could be lost. They felt the reflective method should be employed as a

guideline and applied in a flexible way, and the need for, and the level of reflection, differs during the different phases of the design process. The junior designers on the other hand generally felt the goals of the introduced reflection were clear, and they felt the concepts of the method were relevant and useful. However they were not necessarily convinced about the form of the method, and felt it was not yet developed sufficiently to be useful in practice. They also had problems with the generic presentation of the method, and felt that the terminology used was not discipline specific enough. They also felt the method was too prescriptive not allowing them enough flexibility, and required too much administration and documentation.

Reymen (2001) concludes that structured reflective practice supports design professionals to describe their design process in a domain-independent manner, and can stimulate communication between designers in multidisciplinary projects, and communication between designers and stakeholders. Reymen further concludes that structured reflective practice provides a vocabulary for dialogue and thinking about design situations and design activities, can offer further insight into the design processes of designers, and may result in a more efficient and effective design process. She acknowledges however her reflective practice model would benefit from further refinement and extension.

To guide designers to reflect on their design processes in a structured way, studies have explored the benefits of prompting designers to identify critical situations from their process (Badke-Schaub et al. 1999; Reymen et al. 2006; Wallmeier et al. 1999). Critical situations are defined as “situations that have an important influence on the further direction of the design process or the product being designed” (Reymen et al. 2006, p 169). Critical situations have parallels with what Tripp (1993) and Ghaye and Lillyman (1997) describe as critical incidents. It has been recognised that the process of identifying critical incidents requires an interpretation of the significance of an event (Tripp 1993). Subsequent analysis of the event’s significance

has been shown to help the practitioner develop their practice further and increase their level of expertise (Ghaye & Lillyman 1997).

Badke-Schaub et al (1999) examined the roles critical incident analysis and structured reflective practice can play, as a means to increase the efficiency of design practices. They introduced critical incident analysis “as a training means to educate the designers in a way that they learn to reflect [on] their design processes” (1999, p. 206). The results from their quantitative study reveal structured reflection can support designers to focus their attention on the design process in specific ways, and designers, through this approach, identified and subsequently analysed critical situations from their design process. This outcome was evident in both individual and group design activities. The results also indicate that the systematic manner of structured reflection motivated designers to reflect on their processes. The researchers found however that asking designers to document all critical situations was too time consuming for the rigors of industry practice, and they conclude that asking designers to identify one or two of the most important critical situations from their design process is sufficient to prompt analysis leading to increased efficiency of work practices. This outcome has parallels with Reymens findings (2001). Badke-Schaub et al (1999) conclude that critical incident analysis highlights the designers processes of thinking and activity, and supports engagement with the complex, dynamic, and social processes of design practice.

Reflective practice has an integrated role in the education curriculum in the industrial design program at the Eindhoven University of Technology in Holland. Gielen (2007) reports on the implementation of a competency centered and project-based curriculum for both the bachelor’s and master’s degrees in this industrial design program. The program has an experience-based learning approach where students develop their competencies by working on authentic tasks, and where the experience is the starting point for students to construct their own understandings of design practice. Reflection plays a primary role in this curriculum

in the form of self-evaluation reports where the students reflect on their project developments and/or outcomes. This report is a primary aspect of the project assessment process and can inform plans for following assignments and projects to address students' competency levels. As the curriculum implementation was in the early stages, reporting of results was limited, however this curriculum provides an informative understanding on how reflective practice can be integrated in a structured manner into design curricula.

2.3.2.3 Critical reflection

One of the primary aims of this study was to encourage learners to reflect on their design project in a critical manner. As with reflection, there are multiple definitions of critical reflection in the literature that were also open to interpretation and were often context specific. Similarly, the literature engaging with critical reflection in a design research context is limited. Consequently this study has also looked to the broader field of education and has drawn primarily on the work of Boud, Keogh and Walker (1985), Mezirow (1990), Hatton and Smith (1995), Moon (1999; 2004), and Kember et al. (2007).

When compared with reflection, critical reflection has been described as a higher and more analytical level of reflective thinking. Mezirow (1990) distinguishes between reflection and critical reflection, where reflection in a general sense is a synonym for higher-order mental processes that allow the making of meaning from our experiences, where as critical reflection is a critique of the presuppositions on which beliefs have been built and that leads to a transformation of perspective. Kember et al., drawing on Mezirow (1990), state critical reflection occurs when there is "evidence of a change in perspective over a fundamental belief" (2007, p. 6). These concepts of critical reflection have parallels with what Moon (2004) refers to as deep reflection. Moon, also acknowledging the work of Mezirow (1990), maintains deep reflection is generally characterised by a transformation of perspective or what she refers to as transformative learning. Boud, Keogh and

Walker (1985) describe critical reflection as the role of conscious thought in the reflective process as a means of formalising an intentional learning from experience.

There are a number of reflective frameworks described in the literature, however the work of Hatton and Smith (1995), and Kember et al. (2007) have been particularly informative to this study. Hatton and Smith (1995) have developed what Moon (2004) maintains is one of the better known frameworks that describe levels of reflection. Hatton and Smith (1995) identify and describe four levels of reflective thinking, descriptive writing, descriptive reflection, dialogic reflection, and critical reflection. *Descriptive writing* can be summarised as thinking that is not reflective and includes descriptions of events or reports of literature with no attempt to provide reasons or justification. *Descriptive reflection* also includes descriptions of events, however alternative viewpoints are considered, although typically only from one perspective. *Dialogic reflection* demonstrates evidence of the learner stepping back from events/actions leading to a level of analytical thinking about their experience, including making judgements, and with the recognition that possible alternatives may exist. *Critical reflection* demonstrates an awareness that actions and events are not only located in, and explicable by, reference to multiple perspectives but are located in, and influenced by, multiple historical, and socio-political contexts.

Applying their reflective framework to the work of pre-service teachers in a higher education context, Hatton and Smith (1995) found the students more readily moved from descriptive writing to descriptive reflection as they developed the ability to provide a range of reasons for their actions. Dialogic reflective thinking was apparent as learners became “increasingly aware of the problematic nature of professional action [and] they begin a rather exploratory and tentative examination of why things occur the way they do” (1995, p. 46). When observing instances of critical reflection, they found “the use of critical perspectives depends on development of metacognitive skills alongside a grasp and acceptance of particular

ideological frameworks, and in most studies of pre-service students, is not a very common occurrence” (1995, p. 46). Hatton and Smith conclude that reflective thinking at the descriptive levels was “more easily mastered and utilised than either the exploratory dialogic or demanding critical forms, both of which require knowledge and experiential bases that take some time to develop” (1995, p. 46).

A framework of reflective levels to assess the quality of student reflective writing has been developed by Kember (1999). Drawing on the work of Mezirow, he described seven categories of reflective thinking, however in later work (Kember et al. 2007) these levels are distilled down to four categories: habitual action/non-reflection; understanding; reflection; and critical reflection. The categories of reflection commence at the ‘*non-reflective*’ level where the learners thinking is largely reproductive with little or no interpretation; ‘*understanding*’ where learners show evidence of understanding, however this is confined to theory and is not related to practice; ‘*reflection*’ where theory is applied to practical situations and situations encountered in practice will be considered and successfully discussed in relationship to what has been taught; and *critical reflection* where there is evidence of a change in perspective over a fundamental belief of the understanding of a key concept or phenomenon. Kember et al define critical reflection as reflection that “necessitates a change to deep-seated, and often unconscious, beliefs and leads to new belief structures” (2007, p. 2) and in a similar finding to Hatton and Smith (1995), note that it is unlikely to occur frequently. They maintain that critical reflection requires a period of time to occur. “Critical reflection, involving perspective transformation, is likely to take some time so there will be significant periods between initial observations and final conclusions” (Kember et al. 2007, p. 174). The results of the 2007 study show these levels of reflective thinking supported teachers when assessing levels of reflection in written work and provided a reliable indication of the levels of reflective thinking expressed by learners. The researchers suggest the reflective categories could be used to guide grading of the assessment with those learners achieving critical reflection achieving a high grade and so on.

There are parallels between the Hatton and Smith reflective model (1995) and the Kember et al. (2007) model. Both identify four levels with the process of describing as a base level of reflection and critical reflection as higher-level reflective thinking. The levels in between described by each model have some variation, however it could be argued these differences are minimal and largely semantic. Both models and the conclusions drawn by the researchers have been very informative to this study through the design of the intervention and informing subsequent analysis of the participant artefacts.

Reflective practice has drawn criticism with researchers highlighting that much of the reflective thinking by the learner can often be non-critical and non-reflective in nature (Hatton & Smith 1995; Johns 2006; Kember et al. 2007; Moon 2004). Johns (2006), writing in a clinical nursing context, notes reflective practice has been criticised for its lack of definition, modes of implementation, and unproven benefits. Hatton and Smith (1995) and Kember et al. (2007) maintain evidence based research demonstrating that reflection is being achieved is limited. Hatton and Smith state that while reflective strategies have the potential to encourage reflection,

there is little research evidence to show that this is actually being achieved. It is necessary to move beyond self-reports to the identification of ways in which reflective processes can be evidenced. It is not sufficient to assert that reflection is encouraged by a procedure or technique, rather means must be specified to demonstrate that particular kinds of reflecting are taking place (1995, p. 4).

Moon (2004) argues that to achieve transformative learning through reflective practice, learners benefit from approaches that overtly encourage and support them to reflect in a critical manner, however, the level to which learners reflectively engage may have more to do with how the reflective practice is designed and applied in the curriculum than the learner's ability, or lack of, to reflect in a

meaningful and critical manner. Referring to the Personal Development Planning (PDP) activities that were introduced across higher education courses in the United Kingdom following the Dearing Report (1997), where students are prompted to engage in a critical thinking process about their personal experiences, progress, and the decisions they made during their higher education studies, Moon cautions against reflective tasks as box filling exercises where little attention is given to the depth of reflective thinking (2005). These concerns are echoed by James (2007), who questions the value in the long term of enforced reflective practice and/or consistently reflecting, if staff and students do not understand or are not convinced of the merits of reflective practice.

2.3.2.4 Reflection as a learning support to foster transfer

There is limited empirical research specifically exploring the relationships between reflective practice and transfer in a design context. One exception is the work of Lauche (2001) who explored how heedful action, reflection, and transfer could provide a tool to support interaction among designers and their management of the design process. This study was undertaken with mechanical engineers from a range of different companies in the Swiss machine industry. Heedful action was defined as the action where the designer acts in a purposeful, attentive, and critical manner, which can be represented through a “sequence of goal setting, orientation, planning of how one would go about the task, carrying out the plan and evaluation of the results according to the goal” (2001, p. 267). Reflection played a central role in Lauche’s design process model and was primarily informed by Schön’s concept of reflection-in-action (1983) as a means to structure and understand the reflective conversation between the designer and the artefact as well as his social surroundings. Lauche (2001) defined transfer as the process of sharing and exchanging experiences between the participants in the study in a manner that facilitated communication across different areas and levels of expertise.

Lauche (2001) concludes that reflection can support the improvement of design strategies and help practitioners to articulate assumptions and the intuitive knowledge inherent in their design process. Reflection can also support an abstract perspective of design practice and should be part of the principle training of designers. She observes design education would benefit from including reflection as a pedagogic means of mutual instruction and engineering education could profit from a deliberate instruction in reflective practice. Lauche suggests industry would benefit from the establishment of forums for internal knowledge transfer where design strategies are clarified and collective reflection is supported.

2.4 Chapter Summary

This chapter has provided a summary of the literature relating to the way graphic design has traditionally been taught. Studies specifically engaging with graphic design education however were limited, and it was necessary to look to the broader field of design education. There was a general consensus in the literature that recognised design education practices traditionally have close links with an industry context, where students learn about design through the act of designing. Design educators typically draw on studio-based learning and project-based learning to inform approaches to curriculum, where students are introduced to the principles of design practice via a series of projects, with the expectation that students transfer their learning across the different projects as the progress through their program of study.

Despite the widespread application of studio-based and project-based learning in graphic design education, there is little research examining the effectiveness of these learning approaches, and searches for studies specifically examining how students connect their learning between projects, reveal this is an unexplored area of research. There are concerns evident in the broader design education literature with these pedagogical practices. Researchers argue studio-based learning and project-based learning emphasise the design artefact leaving the student at risk of

not learning from the design process itself. It has also been suggested that the learning can become bound within the project, and it is not always clear what the student actually learnt, nor is the student always able to articulate explicitly (in words) what it is they did learn. If a student has difficulty articulating their learning, how are they going to transfer their learning to other projects?

Reviews of the literature suggest one possible solution to these concerns may include a structured approach to reflective practice as means to critically engage with the learning from the project, in ways that encourage transfer of the learning to other projects. Reflective practice and its role in design practice and design education, has an established track record in the broader design literature, however there is a lack of published studies specifically engaging with the field of graphic design education. Design researchers have demonstrated that reflective practice can provide a framework for understanding and plotting the activity of the design process, and that reflective practice is one way to support students to learn from their projects in an explicit manner. Few studies in the design literature however link reflective practice and transfer.

This chapter has provided a review of the research literature that has informed this study. What surfaced through this review was that graphic design education lacks the same depth of research evident in other design disciplines and that empirical studies in particular in graphic design education were limited. Searches for studies specifically engaging with the primary themes of this study (reflective practice, transfer, and graphic design education) reveal more research is needed to support educators address the limitations of studio-based and project-based learning, and transfer of learning between design projects.

3 METHODOLOGY

3.1 Introduction

This chapter outlines the research method of inquiry employed in this study and the related theoretical background of the methodology. This includes highlighting literature that informed the research design, identifying and describing the data collection procedures, and outlining the analytical framework used to analyse the data collected.

3.1 Research design

A case study research strategy has been employed to guide this study, which utilises a mixed methods approach and is informed by an interpretative paradigm. These approaches are described below, including a review of relevant literature, and the rationale outlining why these approaches are appropriate to this study.

3.1.1 AN INTERPRETATIVE PARADIGM

This study has been framed by an interpretative paradigm. The study paradigm is important to acknowledge when identifying and describing a research methodology, as this identifies the philosophical ideas and views of the researcher, which in turn influence the practice of the research (Creswell 2007). A paradigm can be described as “a basic set of beliefs that guide action” (Guba 1990, p 17), that inform the researcher’s view of the world, and thus the research (Creswell 2007; Lincoln & Guba 2000). These beliefs can help explain why particular research methods have been employed, for instance why the researcher selected quantitative, qualitative, or mixed-method approaches.

An interpretative paradigm recognises that reality is socially constructed (Mertens 2005), and researchers working within this paradigm seek understandings of the

world in which they live and work (Creswell 2005). An interpretative paradigm also recognises that individuals have their own unique view of the world, and it is the researcher's role to make sense of the participant's world or reality (Radnor 2002). That is, the researcher's goal is to understand the multiple social constructions of meaning and knowledge (Mertens 2005).

Tilden (1957) suggests the interpretative paradigm involves revelation based upon information. An interpretative paradigm, whether it relates to the prescribed intervention or the perceived result of the intervention, allows the researcher to make meaning of the practice. An interpretative paradigm supports the researcher to describe an educational intervention while providing the ability to judge its effectiveness. This judgement relies solely on the perspective and vested interests of the researcher and it is important that the phenomenological nature of the interpretativist approach is open and explicit.

3.1.2 CASE STUDY AS A RESEARCH STRATEGY

This research suits a case study approach. A case study has been defined as an inquiry that investigates a contemporary phenomenon within its real-life context, which is located within a bounded system, and is studied in a detailed manner (Bogdan & Biklen 1992; Creswell 2007; Stake 2000; Yin 2003). Bogdan and Biklen (1992) maintain that the important features of a case study include a detailed examination, that is limited in scope to a single setting, subject, depository or event. Creswell (2007) maintains that a case study research approach departs from other traditions of research in that it focuses on a bounded system (the case) that is studied in depth. Yin describes a case study as an inquiry that "investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly defined" (2003, p. 13). Stake, while acknowledging that any definition of a case study is problematic, states that a case study is "both a process of inquiry about the case and the product of that inquiry" (2000, p. 436).

Yin (2003) suggests that a case study approach is particularly suited when 'how' or 'why' research questions are posed and when the investigator has little control over events. Yin maintains there are three conditions that locate the research within a case study strategy: the type of research question posed; the extent of control an investigator has over actual behavioural events; and the degree of focus on contemporary as opposed to historical events (2003).

The case study designed for this research aims to provide an insight in to how the implementation of a structured critical reflective learning framework impacts on student learning in a graphic design tertiary education setting. In this instance the researcher is exploring 'how' the intervention impacted on the students learning in a design studio class where the focus is on events associated with contemporary design practice.

Case studies similar to this one, in which the researcher develops and implements an intervention based upon instructional theory, offer powerful means for investigating and furthering theories of instruction (Reigeluth & Frick 1999), as they can investigate the effects of an instructional intervention that operationalises particular theoretical principles in a natural setting. This has the advantage of allowing a realistic assessment of the new instructional approach in combination with a comparison of the actual outcomes and experiences with those predicted by the theory (in this instance the theory of reflective practice). Thus the implementation of the intervention bounds the case and allows for in-depth investigation of the phenomenon.

3.1.3 MIXED-METHODS RESEARCH STRATEGY

Social phenomena are complex and a range of research methods are needed to better understand these complexities (Creswell et al. 2003). Employing a mixed-method research strategy gives the ability to respond to the complexities of social

phenomena through the inclusion of qualitative and quantitative data collection to allow the creation of a more in-depth picture and a broader understanding of the case.

Whilst employment of mixed-methods research strategies in social science research has been widespread (Maxwell & Looms 2003), Tashakkori and Teddlie (2003) maintain, as a research method, it is still in its adolescence. In fact many different terms are used to identify this form of research strategy including, *integrating*, *synthesis*, *qualitative and quantitative methods*, *multi-method*, *mixed methodology* (Creswell 2009, p. 205), and *mixed research* (Onwuegbuzie & Johnson 2006). Creswell refers to *mixed methods* as the term used in “recent writings” (Creswell 2009, p. 205), and this is the term adopted for this study.

While there may be variations in terms used to identify mixed methods, there is greater consistency when defining mixed-method research. Tashakkori & Teddlie define mixed-method research as studies that “incorporate qualitative and quantitative data collection and analysis techniques in either parallel or sequential phases” (2003, p. 11). Creswell et al. develop this definition further by defining mixed-method research as “the collection and analysis of both qualitative and quantitative data in a single study, in which the data are collected concurrently or sequentially, are given priority, and involve the integration of the data at one or more stages in the process of research” (2003, p. 212). Onwuegbuzie & Johnson, drawing on the mixed-method literature, observe that mixed research can be articulated as “combining qualitative and quantitative research in a concurrent, sequential, conversion, parallel, or fully mixed manner” (Onwuegbuzie & Johnson 2006, p. 52).

Mixed methods strategies have been described as falling into two primary categories, concurrent or sequential (Creswell et al. 2003). This two-category approach reflects the parallel and sequential phases described by Tashakkori and Teddlie (2003). Within the concurrent or sequential mixed methods strategies

Creswell et al. (2003) describe three variations within each category. The variations for a concurrent design include: concurrent triangulation; concurrent nested; and concurrent transformative. The variations for a sequential design include: sequential explanatory; sequential exploratory; and sequential transformative.

Of these six types of mixed-method research strategies, a *concurrent nested design* is the strategy that best suits the aims and conditions of this study. Creswell et al. (2003) identify the defining features of a concurrent nested design as including:

- a single data collection phase during which both qualitative and quantitative data are collected simultaneously;
- a primary method is identified that guides the research with a secondary database that provides a supporting role, where the secondary approach is given less priority and is embedded or nested within the predominate method;
- the two methods are mixed during the data analysis stage;
- the mixing of the two methods facilitates an integration of the information and comparison of data sources, that is typically accomplished in the discussion section or resides side by side as two different pictures providing an overall composite assessment of the problem;
- is used to gain broader perspectives through using different methods as apposed to relying on one predominant method alone.

Advantages of a concurrent nested design include: the ability to collect two forms of data simultaneously during a single data collection phase; employing the strengths of both qualitative and quantitative methods; and the facility to gain different perspectives not possible with one approach (Creswell et al. 2003). Creswell et al. (2003) also outline limitations that the researcher must take into consideration, and include: finding a way to transform data to allow integration during the analysis phase; that comparing the two data sources may reveal discrepancies that then need to be resolved; and methods unequal in priority may also provide unequal evidence, which may be a problematic when interpreting results.

The concurrent nested design research strategy implemented in this study is represented in figure 3.1. Qualitative data was identified as the primary method of the research strategy, with quantitative data embedded as the secondary method, while the two methods were integrated for the analysis phase.

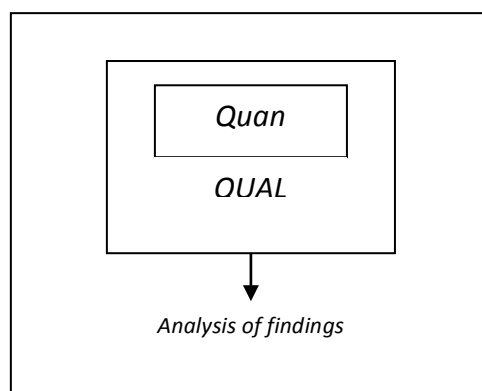


Figure 3-1: Concurrent nested mixed-method strategy representing qualitative data as primary method and quantitative data embedded as secondary method (Creswell et al. 2003, p 226)

When drawing on a mixed-method approach within a single project it is important to identify the principal research method, the supplementary data should inform the analysis that is undertaken in the principle strategy and be verified within the principal focus of the project (Creswell et al. 2003). This view is supported by Morse who states that mixed-method research suits a situation where “using supplemental research strategies to collect data that would not otherwise be obtainable by using the main method and incorporating these data into the base method” (2003 p. 191). The principle research method within the mixed-methods approach for this study is qualitative.

3.1.3.8 Qualitative methods

Mertens (2005) suggests qualitative methods are appropriate for research that is designed to provide an in-depth description of a specific program, practice, or setting and involves a set of interpretative material practices to reveal the world in which the research and observer are located. Qualitative researchers “study things in their natural settings, attempting to make sense of, or to interpret phenomena in

terms of the meanings people bring to them” (Mertens 2005, p. 229). Lincoln and Guba (1985) maintain a basic assumption that qualitative research is the social construction of reality which can be conducted only through interaction between and amongst investigator and respondents. Lincoln and Guba (1985) also maintain that qualitative research is the preferred method for researchers working in a constructivist paradigm. This is supported by Mertens who states “qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them” (2005, p. 229).

Creswell (2007) outlines six characteristics of a qualitative study:

- describing an holistic account of the problem, which involves the reporting of multiple perspectives, identifying the many factors involved, and illustrating the larger picture that emerges;
- learning the meaning the participants hold about the problem or issue under investigation;
- including multiple sources of data collection to enable a complex picture of the problem to be developed;
- the researcher is a key instrument in the study;
- the study is located in a natural setting with the data collected at the site where the participants experience the issue or problem;
- interpretative inquiry where the researcher makes interpretations of what they see, hear and understand which cannot be separated from their own backgrounds, history, context, and prior understandings.

3.1.4 SUMMARY

Employing a mixed-method approach is appropriate for case study research. By using more than one research method it is possible to obtain a more complex picture of human behaviour and experience, and increase the scope and comprehensiveness of the study (Creswell et al. 2003; Mertens 2005; Morse 2003).

Including supplementary data has the potential to provide a richer explanation of the problem (Morse 2003). This study has implemented a concurrent nested mixed-method strategy where qualitative methods have been identified as the primary method, including supplementary quantitative data to provide a more comprehensive picture of the case.

3.2 Research method

This section describes the research context, the data collection approaches, the data analysis methods, and addresses issues of quality in relation to the study.

3.2.1 RESEARCH CONTEXT

3.2.1.8 The setting for the study

This study was conducted with students enrolled in a graphic design studio subject in the final session/semester of the three-year Bachelor of Creative Arts (Graphic Design) at the University of Wollongong. The primary reason for this choice is that this subject runs in parallel to another design studio subject where the students develop a major design work intended to serve as a graduating signature work in their design portfolio. This work provided the point of focus for the introduced reflective practice (the study intervention). By situating the study within this subject, the following boundaries to the case study were established: participants are limited to those students enrolled in the subject; the researcher was also the lecturer for the subject; the set of learning activities were designed for the subject; and the duration of the subject was fixed.

3.2.1.9 Research participants

Thirty-four students were enrolled in the subject. The student cohort consisted of an equal gender split, with approximately 75% of the cohort aged 18-22, 20% aged

23-30, and 3% 30 years and above. Approximately 70% of the cohort entered the program directly from school having completed the New South Wales Higher School Certificate, 17% with no Higher School Certificate, and the remaining 13% with a range of qualifications from vocational institutions.

3.2.1.10 Role of the researcher

The relationship between the researcher and participants had to be recognised, as the researcher was also the teacher for the subject in which the study was located. Steps were taken to avoid any conflict of interest. This included employing an alternative person to conduct and record the interview data, which was not released to the researcher until the assessment for the subject was complete. This was to allow the participants to engage with the interview material without feeling their responses might impact on their assessment for the subject.

3.2.1.11 Ethics

Before any data was collected Human Research Ethics applications were submitted for approval by the University of Wollongong's Human Research Ethics Committee. An application for the pilot study was approved in September 2006 and the application for the main data collection phase was approved in July 2007 (see Appendix for ethics material).

The following safe guards were built into the study:

- students would be fully informed of the research through an information sheet and briefings from the researcher prior to commencement of the study;
- opportunities were provided for questions about the study at the briefings and in subsequent classes;
- participation in the study was voluntary with the opportunity for the students to leave at any time without affecting their course of study;

- all information collected was treated in a confidential manner. Only statistical findings and confidential quotes will be used in publications arising from this study;
- written consent was obtained for all forms of data collection (See appendix C);
- the intervention was incorporated into the subject curriculum in a manner that allowed all the students, whether they elect to participate in the study or not, to benefit.

The information sheets and consent forms that were provided to the participants at the beginning of the study are provided in Appendix C.

3.2.1.12 Pilot study

A pilot study was undertaken in with the aim to trial survey and interview questions, and to note how learners respond to the reflective learning framework, which was represented in the form of a diagram.

Forty-five participants were enrolled in the subject of study where the pilot study was situated, with twenty-eight electing to participate in the pilot study. Once the purpose of the study had been discussed, the participants were asked to break into groups of three and were given thirty minutes to respond to nine questions predominately of a qualitative nature, engaging with issues of design process and the role of reflection in that process, which included responding to the proposed reflective learning framework. In the second stage the participants were asked to report back their responses to the whole class for a general discussion.

There were some significant outcomes from the pilot study. Overall, the participants appeared to have a limited grasp of the features of the design process, which was surprising considering there were in their third year of study. This outcome demonstrated that the knowledge the researcher expected the students to have at the third year level of study (based on the course curriculum) and the knowledge they demonstrated or applied may be very different. Another was that the reflective learning framework diagram proved difficult for the participants to

understand, however once it was explained, they indicated that the framework made more sense. The group generally agreed that the framework helped them think about their design process in a more explicit manner. These outcomes indicated that the researcher could not make assumptions about the knowledge the participants in the study may or may not apply during the intervention, and it would be important that the intervention contained background information to support participant engagement. Based on these observations from the pilot study further background material was provided during the main study to assist the participants to engage with the framework in a more effective manner.

3.2.2 DATA COLLECTION

The data sources collected for this study included qualitative and quantitative approaches reflecting the mixed-method approach adopted. The majority of data collection methods reflect a qualitative approach in keeping with the stated primary methodology emphasis. The study was situated in a design studio subject in the Graphic Design program at the University of Wollongong that had thirty-four students enrolled. Data was collected over fifteen weeks in the forms of: a questionnaire; participant artefacts; semi-structured interviews; and observations by the researcher.

When developing a data collection plan it is important researchers select techniques that will assist them to answer their research questions (Gillham 2000). Employing a multiple data set approach is important for qualitative research as this provides a data triangulation strategy (Yin 2003), which enhances data dependability, credibility, and confirmability (Creswell 2009; Mertens 2005). “Any finding or conclusion in a case study is likely to be much more convincing and accurate if it is based on several different sources of information, following a corroboratory mode” (Yin 2003, p. 98).

Participant involvement with the three data forms varied. All participants in the study engaged with the intervention in the form of a structured critical reflective practice (described in the following Section 3.3.2.2 XX), which was embedded in the subject curriculum. As a result participant artefacts were collected from all participants. Participants were asked to complete the questionnaire at the start of the data collection period with most participants electing to be involved. Eight students volunteered to participate in semi-structured interviews scheduled at three significant points during the data collection phase. The aim was to collect further in-depth data to establish a more complex picture of the case study. An overview of the data collection strategy is presented in table 3.1.

| Table 3-1: Overview of data collection strategy | |
|--|-------------------------------|
| Case setting: Graphic design studio subject | |
| Participants (optional engagement) | Remaining participants |
| Questionnaire | |
| Intervention applied | |
| Participant artefacts (reflective assessment tasks x 4/participant) | |
| Observations (researcher as participant-observer) | |
| Semi-structured interviews (8 volunteers x 3 interviews) | |

This study draws on a mixed-method research approach as previously discussed, specifically a *concurrent nested design* (Creswell et al. 2003). This included collecting the data simultaneously with qualitative data as the primary focus and quantitative data as the secondary focus, to represent a broader perspective of the case. This meant careful consideration had to be given when planning the data collection phase to ensure issues regarding both qualitative and quantitative methods were taken into account.

3.2.2.8 Data collection methods employed in this study

It is important when developing a data collection strategy for qualitative research that the researcher includes a diverse range of data allowing the creation of an in-depth picture of the case (Creswell 2007). Mertens (2005) describes three primary qualitative data collection methods; observation, interview, and review of documents and records. Yin (2003) particularly focusing on case study research, elaborates further by outlining six sources of evidence that maybe collected: documentation; archival records; interviews; direct observation; participant observation; and physical artefacts.

In this study, physical artefacts were collected from the participants in the form of written reflective assessment tasks. These were submitted as part of the subject curriculum where the case was situated. The artefacts in the form of reflective assessment tasks were completed by the participants in written form that included illustrations, and were submitted in a combination of digital and paper formats. This is discussed in more detail in section 3.3.2.2.

Semi-structured interviews were conducted with eight volunteers at three points during the course of the study to provide in-depth data from individual participants. Interviewing is a major data collection instrument in qualitative research and is an excellent way of “accessing people’s perceptions, meanings, definitions of situations and constructions of reality” (Punch 1998, p. 174). There are a number of approaches to the interview in qualitative research, structured, unstructured, and group (Mertens 2005; Punch 1998). Mertens (2005) makes the important point that a semi-structured interview can include a combination of structured and unstructured approaches.

The aim of the interviews was to gain an in-depth understanding of how individual participants were responding to the intervention and to document their experience. The interview is an excellent method to access and understand participant’s “perceptions, meanings, definitions of situations and constructions of reality”

(Punch 1998, p. 174). The data that emerges from the interview process supports an assessment of the new instructional approach and allows a comparison of the actual outcomes and experiences with those predicted by the theory.

An interview protocol (see Appendix E) was developed as a means to guide the interview discussion, ensuring similar questions were asked of each participant, while allowing flexibility for the interviewer to explore related issues that might emerge during the interviews. The aim of the interviews was to capture a snapshot of the participant's design experience during the intervention, including their thoughts and observations of their experience with the reflective framework.

The questions aimed to:

- establish participants prior industry experience;
- establish participants understanding of the design process;
- document their views about reflection and how they were reflecting during the development of their design project;
- identify any impact the introduced intervention had on the development of their design project;
- identify any impact the introduced intervention could have on the broader context of their design practice.

The interview schedule, and the period of design activity each interview covered, is outlined in figure 3.2. The first series of interviews was scheduled once the participants had completed their first student presentation in the first reflective report. The interview focused on the period of time from the commencement of the design project to the design proposal presentation. The second series of interviews was scheduled on completion of the second student presentation and subsequent second reflective report, focusing primarily on the period of time from the first and second presentations in the studio class. The third series of interviews took place on completion of the participants design artefact, and third and fourth reflective

report. This interview provided the opportunity to inquire about the participant's experience in the final concluding stages of their design project, and their experience across the whole design project.

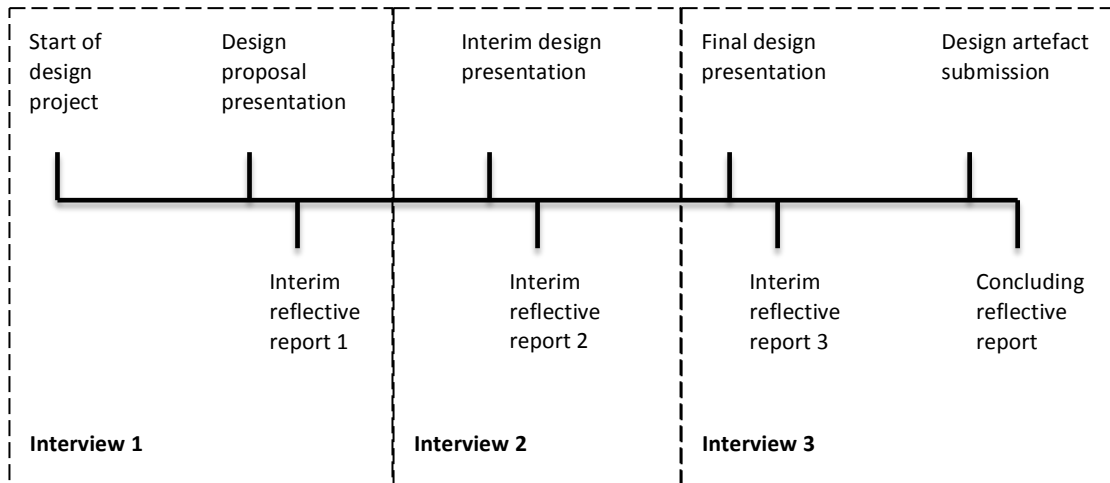


Figure 3-2: Interview schedule and coverage of participant design activity

Quantitative data was also collected using a survey instrument in the form of a questionnaire and was administrated at the beginning of the data collection phase. The questionnaire sought to collect general information about participant backgrounds, and their general views on the design process and reflection prior to the introduction of the intervention. The questionnaire consisted of twelve questions, eight closed questions (quantitative in nature) employing a five-step likert scale (strongly agree, agree, undecided, disagree, strongly disagree), and four open response questions (qualitative in nature). The questionnaire instrument is included in Appendix C.

Surveys are commonly deployed in quantitative research and allow an effective collection of data from a sample population (Creswell 2007; Mertens 2005). Through the process of generalising from a sample of the population, inferences can be made about characteristics, attitudes, or behaviours of this population (Creswell 2007). Yin (2003) describes the use of surveys in case study research as a form of interview that enables the production of quantitative data to contribute to the case

study evidence. There are limitations however with a survey approach as the researcher must “rely on individuals’ self-reports of their knowledge, attitudes, or behaviours . . . thus the validity of the information is contingent on the honesty of the respondent” (Mertens 2005, p. 167). While a survey might traditionally be employed to study a sample of the population, in this study the aim was to gain an understanding of the participants as a cohort to inform the case study by seeking to enrich the descriptions of the case participants.

3.2.2.9 The intervention

An intervention was designed with the aim to support learners to reflect on their project in a structured and critical way. The intervention, which has been identified as *structured critical reflective practice* (SCRP), was situated in the final session/semester of the three-year bachelor degree program in a subject of study where the participants were directed to create a signature design work for their graduating portfolio. The intervention was developed in three stages. In the first stage a reflective learning framework was designed for the learning setting of this study to represent the core features of a structured and critical approach to reflective practice. This framework was designed to guide how the intervention was to be applied in the studio class. The second stage involved the design of a four-step reflective process (informed by the framework), which was developed to guide the design of stage three, the reflective assessment tasks that were introduced to the participants. The design and the literature that informed the intervention are described in further detail below.

3.2.2.9.1 The reflective learning framework

The reflective learning framework developed by the researcher builds on a foundation of the traditional design pedagogy approaches of project- and studio-based learning, and is also informed by the principles of reflective practice, problem-based learning, and experiential learning (see further discussion in Chapter

2). The framework commences with the establishment of an authentic design problem or design brief where the design context is established. The learners then engage in a cyclic process of design activity and reflection that leads to the creation of a design artefact. Once the artefact is complete, the students submit the artefact for assessment, and then enter a final reflective stage where they think back over their project with the aim to identify learning they could apply to projects in the future. This framework is illustrated in figure 3.3 and is described in more detail below.

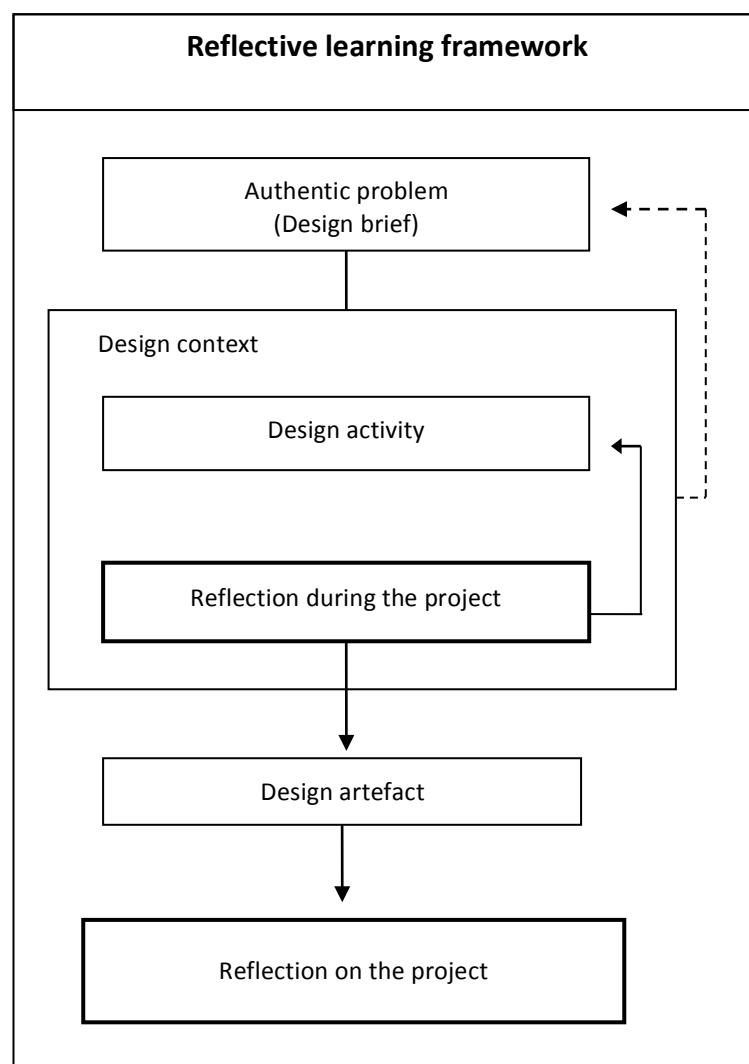


Figure 3-3: Structured Critical Reflective Learning Framework

The participants start by developing a design or project brief. This approach has parallels with the principles of project-based learning where an authentic problem

is initially articulated (Blumenfeld et al. 1991), and studio-based learning where a design problem is firstly established (Lackey 1999). Both these learning approaches employ the design brief or authentic problem to drive the subsequent learning.

While developing their design brief, the learners were also directed to establish the design context in which their project will be located. This approach links with Schön's notion of framing (1984), which has been employed within Valkenburg and Dorst's mechanism of reflective practice (1998). While the design problem and its context are often developed together at the start of the project, as these aspects are inter-related, as the project develops both the design context or frame and the design problem can be re-examined as part of the reflective process.

Once the problem and context are established the student enters the stages of design activity and reflection during the project development, which occur in a cyclic manner within the design context (as shown in figure 3.3). The design activity stage represents the process of designing. This has been referred to as a 'learning-by-doing' approach (Dorst 2006) and is fundamental to the authentic learning environments of project-based and studio-based learning. Reflection during the project stage draws on the principles of reflection-on-action (Reymen et al. 2006) where the designer pauses during the process of designing, to make sense of their experience in order to extend their knowledge base. During this reflective process the design context and/or the original problem maybe re-examined and re-defined.

Once the design solution is satisfactorily developed or the deadline is reached, the student enters the *design artefact* stage where they present their solution in the form of a physical artefact. Presenting the design solution in the form of a physical artefact is fundamental to authentic learning environments. In a traditional graphic design learning environment this is where the project usually finishes and the students then commence another project.

The final stage of the framework is identified as *reflection on the project*, and involves a reflective stage once the design artefact is submitted. The inclusion of this additional learning stage is where the framework significantly departs from traditional graphic design pedagogical approaches. The students are prompted to reflect back over their whole project. The framework aims to support this by prompting the learners to: stand back and distance themselves emotionally from their project with the aim to observe and analyse their project; identify and analyse critical incidents in their design process; and to connect thinking about their project with thinking about how they might approach similar projects in the future. This final reflective stage has parallels with the principles of problem-based learning, specifically, the final reflective stage described by Koschmann et al. (1994) where the students reflect back over their project and critique their learning process seeking to identify areas for future improvement (see section 2.2.2.1 for further detail). This reflective stage also has similarities with principles of reflection-on-practice (Reymen 2003; Schön & Bennett 1996) where learners are encouraged to identify and critically analyse understandings implicit in their design practice that have developed through observing repetitive design experiences.

3.2.2.9.2 The 4-step reflective process

This section describes the 4-step reflective process that was designed by the researcher to guide the development of the learning activities for the study (which are described in the following section). The 4-step reflective process designed for this study was informed by the principles of reflection-on-action, critical reflection, structured reflection, and transfer (see Chapter 1 for definitions of these terms).

Step 1 of the 4-step reflective process aimed to initiate the process of reflective thinking by prompting the participants to pause and stand back from the design activity, through the activity of summarising their design process. This is important as the activity of designing often results in the designer being so immersed in the activity, they are not always in a position to stand back and consider their process critically and rationally (Dorst 1997).

Step 2 builds on step 1 and aims to promote critical reflection by prompting learners to review their design process (by referring to the material from step 1), identify critical incidents in their process, and then explain their rationale. This approach has been informed by the principles of critical incident analysis (Ghaye & Lillyman 1997; Tripp 1993). Identifying critical incidents from the design process requires an interpretation of the significance of an event (Tripp 1993), and subsequent analysis of the event can help the practitioner develop their practice further and increase their level of expertise (Ghaye & Lillyman 1997). Identifying and analysing critical situations from the design process can have an important influence on further development of the design project (Reymen et al. 2006).

Both steps 3 and 4 were designed to establish the conditions for transfer, where the learner draws observations from their current project in a manner that can be applied to projects in the future or addresses the broader context of their design practice. This form of transfer has been referred to as 'preparation for future learning' (Bransford & Schwartz 1999). Step 3 builds on steps 1 and 2, and was designed to prompt the learner to connect thinking about their project with thinking about subsequent development of their project. Step 4 prompts participants to extend their thinking further and in light of their observations from steps 1-3, consider how they might now approach other design projects, or their design practice, in the future. The 4-step reflective process is summarised in 3.2.

| Table 3-2: 4 -step reflective process | |
|---------------------------------------|---|
| Step 1 | Initiate a reflective thinking process by pausing and standing back from the design activity and review their design process |
| Step 2 | Critically reflect on their project by identifying and evaluating critical incidents from their process |
| Step 3 | Connect thinking about the project with thinking about further development of their project |
| Step 4 | Connect thinking about the project with thinking about possible approaches to other projects in the future and/or their design practice |

3.2.2.9.3 Reflective assessment tasks

The researcher designed a series of learning activities in the form of written reflective assessment tasks and these were introduced to the learners at different stages during and after the development of their design project. The tasks consisted of a sequence of inter-related learning prompts whose design was informed by the aims of the reflective framework and the 4-step reflective process.

An important role of the reflective tasks was to guide the participants to engage with the introduced reflective practice in a structured and critical manner, and foster the conditions for transfer. The tasks required learners to reflect on their project in a written format. The process of writing serves as an important learning aid, with the benefits of writing as a form of learning, having been well documented in the literature (Britton 1980; Klein 1999; Moon 2004; 2006). The process of writing also serves an important role to shape learners thinking and learning from their project at what Britton defines as the 'point of utterance' (1980). When considering assessment tasks as a means to support transfer, it is important that learners are prompted to relate the new learning with past learning, that is, the tasks should "directly explore people's abilities to learn new information and relate their learning to previous experiences" (Bransford & Schwartz 1999, p. 69). Making the reflective tasks assessable further links with the benefit assessment plays as an integral aspect of learning (Drew & Shreeve 2005; Ehmann 2005; Gibbs & Simpson 2004) and that serves to motivate and direct student learning (Boud 1990; Briggs 2003).

Learning prompts for this study are defined as questions or hints that aim to encourage learners to think about aspects of their project in specific ways. Learning prompts can assist learners to engage at a metacognition level where they move beyond the application of knowledge, to gain an understanding of the knowledge. That is, a situation where learners understand how a task was performed, not just applying the skills necessary to perform the task (Schraw 1998).

Two forms of the reflective tasks were developed, a minor task and a concluding task. The minor task guided the learners' reflective thinking during the development of the project at three key developmental points, while the concluding task directed the learners to reflect back over the whole project including reviewing their responses to the three minor tasks. These reflective tasks are described in detail below.

3.2.2.9.3.1 Minor reflective assessment task

The participants were asked to complete the minor reflective assessment task at three key points during the design project, at: the design proposal presentation; the design prototyping presentation; and the presentation of the final design artefact. The aim was to guide the learner to link thinking about their project with thinking about subsequent development of their project, and thinking about how they might approach other projects in the future in light of their experience. The task also served to guide participants to document their process and thinking during the project for reference when completing the final concluding reflective assessment task.

The minor task included six learning prompts (LPs). These prompts aimed to guide learners to think about their project in a structured and critical manner by encouraging engagement with the 4-step critical reflective process designed for this study. These LPs are described in further detail below, including a summary of the literature that informed their design, the aim of each LP, and how they align with the 4-step reflective process. This material is subsequently summarised in table 3.3.

Learning prompt 1 (LP1): Describing the design process

LP1 asks participants to outline their design concept, describe their design process, and summarise the feedback they received during their project presentations and critiques.

The design concept statement outlines the key principles of the design project. To assist the participants they were provided with a template that asked them to outline the design principle(s) the project engaged with, the design context and final form of the design artefact. For example, the participant's project might have explored typography (design principle) in User Interface design (design context), through the design of a website interface (project form). The participants were then asked to provide background information underpinning their concept, and finally, to describe the design artefact in further detail.

LP1 was designed to initiate reflective thinking process by prompting participants to distance themselves from their project (Dorst & Reymen 2004). LP1 was informed by step one of the 4-step reflective process where learners are prompted to pause and stand back from their design activity and describe their design process in an explicit manner. This aim was to help prepare the participant for subsequent analysis and interpretation. LP1 aimed to provide foundational material for the participant to draw on when responding to subsequent learning prompts.

This approach has parallels with the initial stage of reflection-on-action where the designer pauses during or after the process of designing (Reymen 2003). LP1 also aligns with the first stage of the reflective process from the experiential learning cycle described by Boud (1994) called 'returning to the experience'. Boud maintains that returning to the experience, by pausing from the design process and thinking back over what has transpired, encourages a distancing from the project allowing the learner to form a variety of perspectives.

Learning prompt 2 (LP2): Linking personal feelings to the project

LP2 included two questions, firstly, participants were asked to reflect on how they felt about the feedback they received from their project presentation and critique, and secondly, they were asked to reflect on their feelings concerning the progress of their design project to date.

LP2 asked learners to describe how they felt about the feedback from their work-in-progress class presentation and the progress of their project in general. By asking the participants about their feelings, this prompt sought to engage the student in the feedback process and the emotional aspect of their project. LP2 links with step 1 of the 4-Step reflective process, where learners are prompted to pause and stand back from their design activity and describe their project.

LP2 specifically aimed to prompt learners to link their personal feelings with their project, with the objective to establish a positive affective state (Boud & Walker 1991) for re-evaluation of their project, distancing themselves from any negative emotive positioning that may have occurred through the design presentation or critique process. Boud and Walker maintain that negative feelings can detract from the learning process whereas positive feelings lead to “self-affirmation, increased confidence, greater clarity in understanding the experience, and increased creativity in working with it” (Boud & Walker 1991, p 34). This approach has parallels with the second stage of the experiential learning cycle described by Boud (1994) called ‘Attend to feelings’.

Learning prompt 3 (LP3): Identifying and analysing critical incidents in the design process

The participants were asked to review their design process, identify and describe three critical incidents from their process, and then explain why they thought these incidents were critical or important.

LP3 was designed to direct participants to review the descriptions of their design process, and then identify and evaluate critical incidents from their process. The aim was to encourage critical reflection, by prompting the participants to identify what aspects of their design process they felt were significant and then discuss their rationale. LP3 links with step 2 of the 4-stage reflective process, where the learners are prompted to reflect on their project by identifying and evaluating critical

incidents from their process. LP3 aims to shift the learner's thinking from the descriptive state of step 1 to a state where the learner begins to interpret their project.

The design of LP3 is informed by the principles of 'critical incident analysis' described by Tripp (1993) and Ghaye and Lillyman (1997). Tripp notes "incidents happen, but critical incidents are produced by the way we look at a situation, it is an interpretation of the significance of the event" (1993, p. 8). Reflecting on and analysing these critical incidents "assist the practitioner in moving their practice forward and obtaining expert status" (Ghaye & Lillyman 1997, p. 80). While there may have been numerous incidents during the design process, asking participants to identify what *they* believe are critical incidents engages their own interpretation process of the project.

Learning prompt 4 (LP4): Applying thinking from the design project to inform subsequent project development

LP4 asked participants to look back over their responses to the previous learning prompts (LP1-3) and identify elements from their reflective observations that could inform further development of their project. They were then asked to explain their rationale. This engaged participants with step 3 of the 4-step reflective process by prompting them to link thinking about their project with thinking about subsequent development of their project.

The approach to LP4 is consistent with the principles of reflection-on-action where the practitioner thinks about a specific design activity, after the activity has occurred, in such a way as to influence further activity (Reymen 2003). Reymen states "a goal of reflection-on-action may be evaluating past and current design situations in order to adjust next situations" (2003, p.5). Through the process of prompting learners to link their thinking, the aim was to also foster the conditions for transfer, broadly defined as 'preparation for future learning' (Bransford &

Schwartz 1999). Bransford and Schwartz suggest that the better-prepared learners are for future learning, the greater potential exists for transfer (1999).

Learning prompt 5 (LP5): Linking thinking from the current project with previous projects

The participants were prompted to link their current design project with previous projects by asking if the issues and observations made through the preceding LPs reminded them of any previous projects. The participants were then asked to explain how they felt these projects linked together.

LP5 was designed to encourage the participants to link thinking about their current project with thinking about previous projects. The aim was to prompt participants to think beyond their immediate design project and consider it in the context of past projects. LP5 was designed to prepare the participants for the next LP (LP6) where they are prompted to engage with step 4 of the 4-step reflective process by connecting thinking about their project with thinking about possible approaches to other projects in the future.

The design of LP5 was informed by the principles of reflection-on-action, specifically “evaluating past and current design situations in order to adjust next situations” (Reymen 2003, p. 5). The design of LP5 was also informed by the ‘Re-evaluation of the experience’ stage of the Experiential Learning Cycle described by Boud (1994), specifically the sub-stages: Association, where learners relate new information to that which is already known; and Integration, where learners seek relationships between new and old information.

Learning prompt 6 (LP6): Linking thinking from the current project to thinking about approaches to projects in the future

The participants were asked to review their responses from the preceding LPs (LP1-5) and in light of this review, consider how they might now approach design projects in the future.

LP6 aimed to promote critical reflection by prompting the participants to connect thinking from their design project with thinking about how, in light of the current design project, they might now approach projects in the future. That is, to shift their cognitive focus from the immediate project to thinking how it could inform approaches to the broader context of their design practice. The prompt was designed to promote engagement with step four of the 4-step reflective process, where learners are prompted to link thinking about their project with thinking about how they might now approach projects in the future.

The design of LP6 was informed by the principles of reflection-on-action described by Reymen (2003), and the principles of transfer described by Perkins and Salomon (1989). Reymen describes a reflective process where the practitioner specifically reflects in a manner where they “evaluate past and current design situations in order to adjust next situations” (Reymen 2003, p 5). Perkins and Salomon (1989) describe two forms of transfer, low-road and high-road. They maintain that low-road transfer occurs when skills and knowledge learned in one context can be readily applied to another similar context, while high-road transfer occurs when knowledge is used in a new context that is different from the learning context. Conclusions drawn by the participants made within a similar context to the current project have parallels with the principles of low-road transfer and those that move beyond the immediate project and have parallels with high-road transfer (Perkins & Salomon 1989). These concepts are explored in greater detail in Chapter 2, section 2.3.1.

Summary of learning prompts for minor reflective assessment tasks

Table 3.3 contains a summary of the minor task, including each learning prompt, the aim of the LP, and how each LP aligns with the 4-step reflective process.

Table 3-3: Summary of the minor reflective assessment task

| | Learning prompt (LP) | Aim of prompt | 4-Step reflective process |
|-----|--|---|---------------------------|
| LP1 | Briefly outline your design concept. Summarise your design process. Summarise the feedback you received from your design presentation. | To describe the design process | Step 1 |
| LP2 | How do you feel about the feedback you received from your presentation? How do you feel about the progress of your design project to this point? | To link personal feelings with the project | Step 1 |
| LP3 | Identify three significant aspects (critical incidents) of your design process to date. Describe these critical incidents and explain why you think these aspects are significant. | To identify and analyse critical incidents from the design process | Step 2 |
| LP4 | How might the issues identified through the reflective process (from Parts 1 and 2) help you further develop and refine your design project? Why do you think this? | To link thinking about the project with thinking about subsequent project development | Step 3 |
| LP5 | Do these issues remind you of any previous experience? If so how? | To link thinking about the current project with previous projects | Step 3 or 4 |
| LP6 | In light of these issues, are there aspects of your design technique/process you would approach differently in the future? If so how? | To link thinking about the project with thinking about projects in the future | Step 4 |

3.2.2.9.3.2 Concluding reflective assessment task

The concluding reflective assessment task was designed to prompt the participant to reflect in a structured manner over their whole project, and to promote

connections between thinking about outcomes from their design project with thinking about possible approaches to design projects in the future and/or the broader context of their design practice. This assessment task employed some similar learning prompts (LPs) to the minor tasks, but also included a further series of LPs specifically designed to encourage the participants to consider their whole project. The participants were asked to complete the concluding task after submission of the design artefact and completion of the minor tasks. The LPs, their aims, and how they align with the 4-step reflective process, are summarised in Table 3.4.

Learning prompt 1 (LP1): Describing the design process

LP1 was designed to guide learners to return to their whole project through the activity of outlining their design concept, their research, and describing their design process for the complete project. The aim of LP1 has parallels with LP1 from the minor task, the only difference being that the concluding task asks the participant to summarise the whole project, as posed to focusing on specific stages of the design process during the development of the design project. For this reason LP1 has been not described in further detail here.

Learning prompt 2 (LP2): Identifying and analysing critical incidents in the project

LP2 directed the participants to identify three outcomes from their design project, and was designed to engage the participant in the process of critical incident analysis. The aim was to foster the conditions for critical reflection by prompting the participants to identify what aspects of their project they felt was significant, and then discuss their rationale. Step 2 of the 4-stage reflective process informed the design of LP2 where the learners are prompted to reflect on their project through a process of identifying and evaluating critical incidents from their design process. LP2 has parallels with the aims and literature underpinning LP3 from the minor task and for this reason is not described in further detail here.

Learning prompt 3 (LP3): Looking back over the project to identify shifts in project focus

The participants were asked to compare their concept statement from the first minor task with their final statement, and consider how their concept might have changed. The participants were advised to also refer to how they expressed their concept statements in the second and third minor tasks as a means to track any changes in their project focus.

LP3 was designed to guide the participant to identify changes in their design concept statement that may have occurred during the development of their design project. By prompting the participant to compare their design concept statements, the aim was to provide a point of reference from which the participants could identify and analyse changes that may have occurred to the focus of their project. By asking participants to compare previous concept statements with the final statement the aim was to guide the participant to consider their whole project. LP3 was designed to link with step 2 of the 4-stage reflective process where the learners are prompted to reflect on their project through a process of identifying and evaluating critical incidents from their design process.

The design of LP3 was informed by the principles of reflection-on-action, where the participant is guided to pause and think back over what they have done, and explore the understanding they have brought to the handling of the situation (Reymen 2003). LP3 was also informed by the principles of critical incident analysis described by Tripp (1993) and Ghaye and Lillyman (1997), which is described in LP3 of the minor task, and for this reason is not described in further detail here.

Learning prompt 4 (LP4): Linking personal feelings with the project

The participants were asked to consider if they felt their final design concept statement was an improvement on their first concept statement, and then discuss why they felt this was the case. LP4 has overlaps with LP3, however where LP3 asks the participants *how* their concept statement has developed (or not), LP4 asks the

participant about their *feelings* regarding the development of their concept statement.

LP4 aimed to engage the participants with their personal feelings (Boud & Walker 1991) about their design project by asking them to make observations about how they believed their work had developed. LP4 was designed to prompt participants to critically reflect on their design project through a process of identifying and evaluating critical incidents from their design process, specifically by prompting participants to link their personal feelings with their project. The literature underpinning the design of LP4 is the same as LP2 from the minor task, and for this reason is not described in further detail here.

Learning prompt 5 (LP5): Identifying patterns in the project

The participants were asked to look back over their three minor tasks and identify any patterns or re-occurring issues they had identified. To help the participants engage with LP5 it was suggested they could note any changes of perception they might have had about their project progress, or consider their responses to previous critical incident analysis.

LP5 was designed to prompt participants to look back over their three completed minor tasks and identify any patterns or themes that might be present, for example re-occurring critical incidents or observations. The aim was to encourage the participants to stand back and consider their whole project, and identify and critically evaluate understandings embedded in their project. LP5 was designed to link with step 2 of the 4-step reflective process where participants reflect on their project through a process of evaluating critical incidents in their design process.

The approach to LP5 was informed by the principles of reflection-on-action, where the designer pauses to make sense of an action or experience that has no direct connection to the design activity and engages in a process of identifying and critically evaluating understandings embedded in the design experience (Reymen 2003).

Learning prompt 6 (LP6): Identifying learning from the project

The participants were asked to identify and describe three things they had learnt from their project.

LP6 was designed to prompt the participants to identify instances of learning from their project. The aim was to guide the participant to identify learning in an explicit manner that would help the participants engage in a process of identifying and critically evaluating understandings embedded in their project. This approach links with step 2 of the 4-step reflective process, and the principles of reflection-on-action, and has been described in LP5. LP6 was designed to also provide material for the following learning prompt, LP7.

Learning prompt 7 (LP7): Considering how this learning could apply to projects in the future

The participants were asked to review the new learning they had identified and described in LP6, and consider how they might apply this new learning to future design projects.

LP7 was designed to prompt the participants to consider in what way the learning identified in LP6 could inform how they might now approach projects in the future. The aim was to promote engagement with step 4 of the 4-step reflective process where the participant connects thinking about the project with thinking about how they might approach design projects in the future.

The design of LP7 was informed by the principles of reflection-on-action where the designer thinks about the design activity after the activity, in such a way as to influence future design activity (Reymen 2003). LP7 was also informed by the principles of transfer described by Bransford and Schwartz (1999) where the better-prepared learners are for future learning, the greater potential exists for transfer.

Learning prompt 8 (LP8): Considering alternative project outcomes

The participants were asked to reflect back over their completed design project and to identify alternative outcomes and explain their rationale.

LP8 was designed to guide the participants to consider alternative outcomes to their project. The aim was to encourage the participants to think beyond their final project artefact by considering, in light of their project experience, if there might have been other design solutions they could have explored. LP8 was informed by step 4 of the 4-step reflective process, where the participant connects thinking about the project with thinking about how they might approach design projects in the future. LP8 was also designed to provide material and cognitively prepare the participants for the following learning prompt (LP9).

The design of LP8 was informed by the principles of reflection-on-action, specifically the process of evaluating the current design situation with the intention to consider how to subsequently approach design situations in the future (Reymen 2003).

Learning prompt 9 (LP9): Considering how the project could inform approaches to a similar project context in the future

The participants were asked to consider, in light of their project experience, would they now approach a similar design situation in the future differently? The participants were asked to explain their responses to this question.

LP9 was designed to encourage the participant to consider how their project could inform their approach to a project in a similar context in the future. The aim was to encourage the participants to connect thinking about the their project with thinking about how they might now approach a similar design project in the future. That is, what observations and conclusions can they draw from this project that could help them when faced with a similar design project in the future? This links with step 4 of the 4-Step reflective process. LP9 was designed to build on the observations made by the participants in the previous learning prompt (LP8).

The design of LP9 was informed by the principles of reflection-on-action, specifically where the designer considers the current design situation in such a way as to change how they could approach future design situations. LP9 also links with notions of transfer, specifically the concepts of ‘preparation for future learning’ (Bransford & Schwartz 1999).

Learning prompt 10 (LP10): Considering how the project could inform approaches to the broader context of design practice

The participants were asked to consider how the final outcomes from their design project could prepare them for industry or post-graduate study, and how their observations from the reflective reports could prepare them for industry or post-graduate study.

LP10 was designed to prompt the participants to consider how the project could inform approaches to their design practice. The aim was to guide the participants to connect thinking from the project with thinking beyond the project context, by considering how they might now approach the broader context of their practice in light of the observations drawn from their project. LP10 was designed to prompt the participants to engage with step 4 of the 4-step reflective process, where the participant connects thinking about the project with thinking about how they might approach design projects in the future.

The design of LP10 was informed by the principles of reflection-on-action, and with the principles of transfer, specifically the concepts of ‘preparation for future learning’ (Bransford & Schwartz 1999), and high and low-road transfer (Perkins & Salomon 1989).

Summary of learning prompts for concluding reflective assessment task

Table 3.4 contains a summary of the concluding reflective assessment task, including each learning prompt, the aim of the LP, and how each LP aligns with the 4-step reflective process.

Table 3-4: Summary of the concluding reflective assessment task

| | Learning prompt (LP) | Aim of prompt | 4-Step Reflective Process |
|-------------|--|--|---------------------------|
| LP1 | Briefly outline your design concept Outline three primary references including their relevance. Describe your design process that lead to the completion of your major design project. | Describing the design process Describing actions from the recent past | Step 1 |
| LP2 | Identify and describe 3 outcomes of your design project. Discuss why you believe these outcomes are particularly significant. | Identifying and analysing critical incidents from the project | Step 2 |
| LP3 | Compare your concept statement from the first reflective task with your final statement. How has your concept changed? | Looking back over the project to identify shifts in project focus | Step 2 |
| LP4 | Do you feel your final concept statement is an improvement on the first? Why? | Linking personal feelings with the design project | Steps 1/2 |
| LP5 | Look back over your responses to the three reflective tasks. What patterns do you see emerging? | Identifying patterns in the reflective and project | Step 2 |
| LP6 | Identify and describe three things you have learnt during this project. | Identifying learning embedded in the project | Step 2 |
| LP7 | How might you apply this learning to future design situations? | Applying new learning to future practice | Step 4 |
| LP8 | Now you have completed your project, do you see any alternative outcomes? Why? | Considering alternative outcomes in the same context as the current project | Step 4 |
| LP9 | Is there anything you would do differently in the future when approaching a similar design situation? Why? | Projecting new knowledge to a similar design context in the future | Step 4 |
| LP10 | How might the final outcomes from your design project (DESN312) prepare you for industry or post-graduate study? How might your reflections/observations from the reflective tasks (DESN302) prepare you for industry or post-graduate study? | Projecting new knowledge to the wider context of design practice | Step 4 |

3.2.3 DATA ANALYSIS

The approach to the data analysis in this study takes into account issues relating to a mixed-method methodology. Below, the approach is outlined and explained in relation to the literature.

3.2.3.8 Approaches to data analysis

There is no single right way to perform qualitative data analysis (Punch 1998), rather the approach to qualitative data analysis is a process that is custom built, revised, and choreographed for each individual study (Miles & Huberman 1994). What is important is that the analysis process designed is applied in a methodical and consistent manner and can be clearly articulated. As Punch writes, “methods for the analysis of data need to be systematic, disciplined . . . [and are] able to be seen and described” (1998, p. 200). While the data analysis process is tailored for the individual study, there are approaches that are typically present in qualitative research analysis. These include: data preparation and organisation; data reduction into themes through coding and condensing the codes; and the final stage of data representation in figures, tables, or discussion (Creswell 2007). This approach has parallels with what Merriam (1998) refers to as the process of making sense of the data through consolidation, reduction, and interpretation.

Drawing on general analysis strategies for qualitative inquiry described in the literature, Creswell (2007) has developed a spiral model articulating a general approach to data analysis. The spiral begins with data collection, and moves through the stages of data management, reading and memoing, describing classification and interpretation, and finally representation and visualisation. Creswell maintains that the qualitative researcher “engages in the process of moving in analytic circles rather than using a fixed linear approach” (2007, p. 150). The data analysis techniques used in this study are summarised in table 3.5 and draw on Creswell’s (2007) data analysis and representation stages for case study research.

Table 3-5: Data analysis techniques and how they were applied in this study

| Technique | For a case study | How technique applied in this study |
|------------------------------|--|--|
| Data managing | Create and organise files for data | File management structure developed to store digital data Digital files backed up to an alternative hard-drive Participant artefacts converted to digital form as required Interview audio recordings transcribed |
| Reading and memoing | Read through text, make margin notes, form initial codes | Each data file was examined multiple times Text files were printed and marginal notes added at time of reading Notes were made in the researchers journal during the analysis process Initial coding ideas recorded |
| Describing | Describe the case and its context | Case described and context established in the thesis introduction and methodology chapters |
| Classifying | Use <i>categorical aggregation</i> (drawing meaning across multiple instances of data) to establish themes or patterns | Interview transcripts were read multiple times and across the 8 participants responses to establish reoccurring themes and patterns embedded in the transcripts Coding of the individual participant artefacts were cross-referenced against other participant artefacts to maintain a coding consistency |
| Interpreting | Develop naturalistic generalisations | Observations from the data made in a generalised manner that would allow people to learn from the research and/or apply the outcomes to other situations |
| Representing and visualising | Present in-depth picture of the case using narrative, tables, and figures | Observations from the analysis described in detail and in a consistent manner Tables and figures used to explain the observations from the analysis |

This study draws on a mixed-method research approach, in particular a *concurrent nested strategy* (Creswell et al. 2003). Three data analysis procedures that are

particularly appropriate to a mixed-methods concurrent nested approach were undertaken in this study as advised by Creswell (2003): data transformation; multiple level examination; and matrix creation. These procedures are described in table 3.6 including how they have been applied in this study.

| Table 3-6: Data analysis procedures for mixed-method nested studies | | |
|---|---|---|
| Procedure | Definition | How applied in this study |
| Data transformation | Quantifying qualitative data enabling comparison of quantitative results with qualitative data OR creating factors/themes from quantitative data to compare with qualitative themes | Presenting the data from the questionnaire in a format that enables comparison across the different data forms Creating qualitative codes for the participant artefacts and presenting the findings in a format that enables comparison across the different data forms Identifying re-occurring themes from the interview data in a format that enables comparison across the different data forms |
| Multiple level examination | Data collected at different levels | Survey whole case Artefacts collected from whole case In-depth interviews with individuals |
| Matrix creation | The matrix allows a combining of QUAL and QUANT data to allow an analysis across both forms | Qualitative data from participant artefacts coded and presented in a matrix that has parallels with Quantitative format |

3.2.3.9 Approaches to data coding

Data coding has been defined as the process by which data is observed and dissected, conceptualised, and then re-assembled in new ways (Strauss & Corbin 1998). Coding can be described as the process researchers employ to analyse data to support the identification and development of ideas from which they may construct theories.

3.2.3.9.1 Coding the participant artefacts

To code the participant artefacts, a cognition taxonomy was developed to identify the levels of reflective thinking evident in the reflective assessment tasks. This taxonomy was developed based on the work of Bennett (2002), which was informed by the work of Hatton and Smith (1995). Hatton and Smith developed what Moon (2004) describes as one of the better known frameworks describing levels of reflection. Adapting the work of Hatton and Smith, Bennett (2002) developed a cognition taxonomy to identify levels of reflective thinking evident in reflective writing of students in a Masters of Education program. Bennett identifies and describes five levels of cognition: reproductive description; summarising description; interpretation; judgement; and generalisation. In collaboration with Bennett, these cognition levels and their descriptors have been modified to allow application to this study. These levels of cognition along with their descriptors, are outlined in table 3.7. A sixth level of cognition has been added, identified as abstraction, with the aim to differentiate thinking that moves beyond the context of the design project to address wider or future design practice.

The data generated in qualitative research is generally voluminous in nature and researchers often rely on computing systems to help store, retrieve and aid analysis of the data (Mertens 2005). Employing a computer program “encourages a researcher to look closely at the data, even line by line, and think about the meaning of each sentence and idea” (Creswell 2007, p. 165). For this study the computer software program QSR NVivo was employed throughout the coding process of the participant artefacts, and subsequent matrix searches of the coded data, to help analyse, manage, and shape the data. The participant artefacts (the reflective assessment tasks) were coded at a sentence level, representing ‘units of meaning’ (Herrington & Oliver 1999, p. 11) and in NVivo each sentence was aligned to one of the six cognition levels. When considering what cognition level the sentence should be coded, the sentence context was taken into account, and if there was any coding doubt, the sentence was aligned to the lower cognition level.

Table 3-7: Cognition taxonomy

| Cognition levels | Cognitive Descriptors |
|--------------------------|--|
| Abstraction | Presents a general principle or procedure that moves beyond the design project to address wider or future practice. |
| Generalisation | Presents a general observation or draws a generalising conclusion within the context of the project |
| Judgement | Goes beyond re-presenting or interpreting information to offer a value judgement or claim |
| Interpretation | Seeks to explain or make sense of an event or statement by interpreting information from the project. |
| Summarising description | Descriptive response that summarises or synthesises or recounts information presented in the project. This includes re-wording and re-structuring of a number of events into one statement. This type of response does not present new information from beyond the project |
| Reproductive description | Descriptive response that reproduces information directly from the case with no elaboration |

3.2.3.9.2 Coding the interview data

The semi-structured interviews were audio recorded in a digital format and then transcribed once the data collection period had finished. To analysis the data, the interview transcripts were printed and read numerous times, and using margin notes, patterns and themes were identified. Evidence of how the participants engaged with the intervention was also documented, with the aim to: establish the participants perspective on reflective practice; how they engaged with the intervention during the development of their design project; how the participant felt the intervention impacted on their design project; and how the participant felt the intervention influenced thinking about how to approach design projects in the future

3.2.4 ASSESSING THE QUALITY OF THE STUDY

In mixed-method research it is important that the quality of the research is established. This includes addressing issues of trustworthiness for the qualitative data (Creswell et al. 2003; Lincoln & Guba 1985) and issues of validity for the quantitative phases of the study (Creswell et al. 2003).

3.2.4.8 Issues of data trustworthiness

Data trustworthiness is an important consideration in qualitative research as collecting data in social settings is subject to interpretation and meaning that is also reliant on different factors (Creswell 2007). Creswell (2007) maintains that establishing data trustworthiness is important means to assess the accuracy of the research findings. Trustworthiness is a process of validation, and it is essential to employ accepted validation strategies to document the accuracy of the studies. Creswell (2007) describes eight verification procedures as a means to provide trustworthiness in qualitative research, of which he maintains at least two procedures should be employed. These are: prolonged engagement and persistent observation; triangulation; peer review/debriefing; negative case analysis; clarification of researcher bias; member checking; rich, thick descriptions; and external audits. Mertens (2005) describes a very similar set of strategies as a means to enhance trustworthiness in qualitative research. The strategies, based on Creswell (2007), employed in this study to establish trustworthiness, are outlined in Table 3.8, and include how these strategies were applied in this study.

Table 3-8: Verification strategies used in this study

| Strategies | Definition | How applied in this study |
|---|---|---|
| Prolonged engagement and persistent observation | <p>Building trust with participants, learning the culture, and checking for misinformation that stems from distortions introduced by the researcher or informants.</p> <p>Investment of sufficient time</p> | <p>Data collected across 13 week teaching period</p> <p>Intervention applied across 13 week teaching/collection period</p> <p>Physical artefacts collected from each participant across the collection period</p> <p>The interviewed participants were interviewed 3 times through the data collection period by the same interviewer with the aim to build participant trust and maintain a cohesion across the interviews</p> <p>Researcher's journal kept throughout design/development of the study</p> |
| Triangulation using multiple data sources | Making use of multiple and different sources, methods, investigators, and theories to provide corroborating evidence. | <p>Multiple data sources including:</p> <ul style="list-style-type: none"> - Questionnaire - Participant artefacts - Semi-structured interviews <p>Researcher's journal maintained</p> |
| Peer review / debriefing | External check of the research process | <p>PhD supervisors (Education)</p> <p>Dr Marius Foley (Design academic RMIT University)</p> <p>Presented various stages of study at peer-reviewed conferences, and a journal publication</p> |
| Clarification of researcher bias | Researcher comments on past experiences, biases, prejudices, and orientations that likely shaped the interpretation and approach to the study | <p>Researcher bias was outlined in study proposal and approved by Faculty post-graduate research panel</p> <p>Researcher bias acknowledged in thesis</p> |
| Rich, thick descriptions | Describing in detail the participants or setting under study enabling readers to transfer information to other settings and whether the findings can be transferred | <p>Researcher has provided a detailed description of the analysis process, making it available for the reader to assess</p> <p>Raw data provided</p> <p>Data collected in a detailed manner</p> |

3.2.4.9 Issues of validity

Potential threats to validity for quantitative studies include internal and external threats. Internal validity threats include experimental procedures, treatments, or experiences of the participants that threaten the researcher's ability to draw correct inferences from the data about the population in the experiment" (Creswell 2009, p. 162). External threats "arise when experimenters draw incorrect inferences from the sample data to other persons, other settings, and past or future situations" (Creswell 2009, p. 162).

The quantitative aspect of the study included the collection of quantitative data in a survey format. An important issue to consider regarding the survey approach is that the process relies on "individuals' self-reports of their knowledge, attitudes, or behaviours. Thus the validity of the information is contingent on the honesty of the respondent" (Mertens 2005, p. 167). The researcher is relying on not only on the honesty of the participant response, but also must consider the way the response is framed by the participants' perception of the subject matter. This threat to validity is counted by acknowledging the validity threat in the first instance, but more importantly, collecting multiple sources of data, that is, implementing a triangulation data collection approach to provide multiple perspectives of the case.

3.3 Chapter summary

This study was positioned as case study research that employed a mixed-methods approach. The research is situated within an interpretative paradigm, which framed the primary theoretical assumptions, the literature reviewed, and the researcher's orientation regarding the practice of the research.

The purpose of this study was to investigate how a structured and critical approach to reflective practice can support student learning in a graphic design classroom. This chapter described the context for the research, the approach to the data

collection including the intervention and the rational behind the design, and the approach to the data analysis.

4 RESULTS: QUESTIONNAIRE

4.1 Introduction

This chapter presents the findings from the questionnaire, outlining the aims and the relevance to the study, the results, and a discussion of these results.

The questionnaire was administered at the beginning of the data collection stage and aimed to obtain a profile of the participants as a cohort, prior to the commencement of the intervention. The questionnaire asked participants for demographic information, further background information, and sought participant views and understandings relating to the process of design and reflection.

4.2 Presentation of findings

The findings have been presented in two sections: the first provides participant profile information; and the second presents the participants' views and understandings of the design process and reflective practice.

4.2.1 PARTICIPANT PROFILE INFORMATION

Thirty-four participants were enrolled in the subject of study (DESN302 Reflective Design Practice) in which the intervention was applied, all of whom consented to participate in the research study. Twenty-two participants completed the questionnaire, which was 100% of those participants who attended class at the time the questionnaire was administered. The participant profile information has been supplemented with Course enrolment information obtained by the researcher.

4.1.1.8 Participant profile information collected from course enrolment details

The participants were enrolled in the University of Wollongong Bachelor of Creative Arts degree program, with thirty enrolled in a graphic design major, and four participants enrolled in a graphic design and visual arts double major degree. Five participants were also enrolled in double degrees that included a Bachelor of Arts, a Bachelor of Communication and Media, or a Bachelor of Computer Science. This information is summarised in Table 4.1.

| Table 4-1: Participant profile enrolment information | | |
|--|---|-----------|
| Degree | | Frequency |
| Bachelor of Creative Arts | Graphic Design Major | 25 |
| Bachelor of Creative Arts | Graphic Design and Visual Arts Double Major | 4 |
| Bachelor of Creative Arts / Arts | Graphic Design Major | 1 |
| Bachelor of Creative Arts / Communication and Media | Graphic Design Major | 3 |
| Bachelor of Creative Arts / Computer Science | Graphic Design Major | 1 |
| Total students enrolled in subject | | 34 |

There was an equal gender split across the student cohort comprising seventeen females and seventeen males. Of the thirty-four participants enrolled in the subject of study, twenty-six participants were aged eighteen to twenty two, seven participants were aged twenty-three to thirty, and one participant was aged over thirty. The majority (76%) of the student profiles were in the eighteen to twenty-two year age bracket. This represents a profile where the majority of the participants entered their university studies directly from secondary school. This information is summarised in table 4.2.

Table 4-2: Participant gender and age profile

| | | Frequency (n=34) |
|--|-------------------------|-------------------------|
| Gender | Female participants | 17 |
| | Male participants | 17 |
| Age (at the time of data collection) | Aged 18-22 years | 26 |
| | Aged 23-30 years | 7 |
| | Aged 30 years and above | 1 |

4.1.1.9 Participant profile information collected from the questionnaire

Further demographic information was collected from the questionnaire administered as part of the data collection strategy. This included establishing the participants' academic qualifications prior to the commencement of their degree program, and their industry experience to date. As previously stated, twenty-two participants completed the questionnaire, which was 100% of those participants who attended class at the time the questionnaire was administered.

Entry to the Bachelor of Creative Arts degree was by interview and portfolio, and informed by the Australian Tertiary Admission Rank (ATAR) results. Twenty-one participants indicated they had completed the New South Wales Higher School Certificate, including three participants who also had a vocational certificate qualification (such as the New South Wales Technical and Further Education Institute). One student had not completed a higher school certificate but had completed a vocational qualification. This information is summarised in table 4.3.

| Table 4-3: Participant Academic qualifications | |
|--|------------------|
| Previous academic qualifications | Frequency (n=22) |
| Higher School Certificate | 18 |
| Higher School Certificate + Vocational Certificate | 3 |
| Vocational Certificate | 1 |

The participants were asked to indicate their industry experience. Twelve participants indicated they had no industry experience, five indicated one year or less, two indicated two to three years, and one student indicated more than 3 years' industry experience. This industry experience profile is to typical considering that the majority of the participants entered the Graphic Design program directly from secondary school and as a consequence had limited opportunities to engage directly with industry. This information is summarised in table 4.4.

| Table 4-4: Participant industry experience | |
|--|------------------|
| Industry Experience | Frequency (n=22) |
| None | 12 |
| 1 year or less | 5 |
| 2-3 years | 2 |
| More than 3 years | 3 |

4.2.2 QUESTIONNAIRE: PARTICIPANT'S VIEWS AND UNDERSTANDINGS ABOUT THE DESIGN PROCESS AND REFLECTIVE PRACTICE

To obtain an insight into the participant's views and understandings about the design process and reflective practice before they commenced the intervention,

they were asked eleven questions, three questions about the design process and eight questions about reflective practice.

4.2.2.1 Establishing participants' understanding of the design process.

To establish participant understanding of the design process, the participants were asked three questions. They were asked to describe their interpretation of the design process. They were then asked if this was the process they followed in practice, and finally if they felt there were any links between understanding the design process and the final design outcome. The first question employed an open-ended approach, and the following two questions required responses through a five-step Likert scale. For the purpose of this study the design process at a fundamental level is defined as the activity of transforming a design problem or brief, through a sequence of looping and iterative procedures, into a design solution or finished product. To bench-mark the participant's responses they are compared to the Double Diamond Design Process model (Design Council 2005) (see Literature Review, section 2.2.1.1 for more detail).

Question 1: Describe what you think of as the design process.

This question sought to ascertain the participants' understanding of the design process by asking them to describe their interpretation of the design process. This was an open-ended question (n=22).

Reviewing the participant's responses to this question, there were statements that provided a brief overview of the design process and can be summarised as implementing concepts into a finished product or design solution. Four notable aspects of the design process were also evident: concept creation; engagement with clients or design briefs; design development methods; and product or project evaluation.

Specific reference to concept development and implementation through to a final design solution was a notable aspect of the design process descriptions of twelve

participants. It could be argued the four stages of the DDDP are implicit in these simple descriptions, however this link is difficult to prove due to the lack of detail provided by the participants. Typical example excerpts from the participants' descriptions of the process include:

- "In my opinion I feel the design process is everything from conceptualising the work then developing and enhancing it until completion (or a deadline is reached)."
- "The process from beginning to end in which you conceptualise the project, initiate and produce the project in its finished form."
- "The process by which a concept is formed and is followed through to completion including experimentation and final outcomes."
- "The design process is the act of conceptualising and developing a work."

In contrast, two participants described the design process in greater detail clearly resonating with all four-stages of the DDDP model. One participant's description is included below with the stages of the DDDP model identified in italics:

- "The process of recognising, exploring and responding to the need outlined in the given brief, and designing a solution for that need which not only achieves specific outcomes. This process involves research [*Discover*]; setting of objectives [*Define*]; experimentation and design (ideas generation) [*Develop*]; reassessment of objectives (needs, goals and project direction) [*Define*]; client approval [*Discover/Define/Develop/Deliver*]; project finalisation [*Deliver*]; production [*Deliver*]; project assessment and reflection [*Deliver*]."

When describing the design process, nineteen participants referred to the development of concepts or the creation of ideas. This parallels with the Discover stage described in the DDDP model where a broad range of ideas and concepts are created and developed. Typical examples of this are evidenced in the following excerpts from participants' responses:

- "Problem solving – conceptualising"
- "Ideas generation"
- "Development of ideas and concepts."

- “Form initial ideas and brainstormers that evolve into concepts.”

Working with client or design briefs was a stage of the design process identified by eleven participants, which is consistent with the Define stage of the DDDP model. For this study a client was defined as a person or company who commissions the designer to perform a design task, usually guided by a design brief. For this study a design brief was defined as a document or memorandum of understanding developed between the designer and client outlining the objectives and projected outcomes of the design task. The determining of the design brief through discussions with the client is represented in the Define stage of the DDDP model. Typical examples of this are evidenced in the following participant comments:

- “The process of recognising, exploring and responding to the need outlined in the given brief . . .”
- “The design process is the steps you take to establish a response to a given brief.”
- “Getting a brief or job, communicating with a client to establish what they need, and then coming up with a solution that will work for all involved.”
- “The design process uses a variety of steps. These include design brief - a statement of design goals . . .”

Thirteen participants, in their descriptions of the design process, referred to design activity that can be identified as “design development methods”. Design development methods include creative techniques and methods such as brainstorming, visualisation, prototyping (experimentation), testing, and scenarios. This design activity is represented in the Develop stage of the DDDP model. Typical excerpts from the participants’ comments include:

- “A series of workings, experiments, attempts, trials and errors etc, that lead to an evolution of ideas, concepts and visual responses . . .”
- “. . . it involves initial brainstorming, design roughs . . .”
- “. . . creating a few sketches on paper . . .”
- “This process involves research; setting of objectives; experimentation and design”

The process of evaluating, seeking feedback, and/or reflecting on the completed design artefact and design process, was referred to by eight participants. This has parallels with the Deliver stage of the DDDP model, where evaluation and feedback loops are applied once the product has been launched. This also aligns with Schön's (1983) notion of reflection-on-action, which has been described by Eraut as the "process of making sense of an action after it has occurred and possibly learning something from the experience which extends one's knowledge base" (1994, p. 146). Typical examples of this stage are evidenced in the following participant comments:

- "Evaluation and conclusion: summary of process and results, including constructive criticism and suggestions for future improvements."
- "Evaluation: How has the work changed, has it attained earlier goals or worked with concepts. Have you pushed boundaries, was the work achieved with the attention of financial or passion for design, time restrictions and if any of these factors have impacted the end result. Positives and negatives of work. Without the evaluation you will never improve as a designer and learn from mistakes and gain from your achievements."
- "I believe that it is the process undertaken from the initial idea to the reflection of the finished product."
- "On completion, there is time to reflect on the project. What worked, what didn't? Why? A lot of learning takes place in this final stage of the process."

In summary most of the participants provided brief summary descriptions of the design process that were consistent with the brief summary provided by Best (2006), while two participants provided a greater descriptive summary. Further analysis of the participants descriptions of the design process revealed four aspects of the design process that have parallels with the DDDP model: concept creation; engagement with clients or design briefs; design development methods; and product or project evaluation. This information and their frequency are summarised in table 4.5.

Table 4-5: Question 1 Identified stages of the design process

| Identified stages | Double Diamond Design Process model | Frequency (n=22) | Percentage of participants |
|--|---|------------------|----------------------------|
| Implementing concepts into a finished product or design solution (brief descriptive summary) | Discover / Define / Develop / Deliver (Implied) | 12 | 55% |
| Implementing concepts into a finished product or design solution (greater descriptive summary) | Discover / Define / Develop / Deliver | 2 | 9% |
| Concept creation | Discover | 19 | 86% |
| Engagement with clients or design briefs | Define | 11 | 50% |
| Design development methods | Develop | 13 | 59% |
| Product or project evaluation | Deliver | 8 | 36% |

Question 2: Do you always follow the process you have just outlined?

This question sought to ascertain whether the participants believed they actually followed in practice the process they had described in Question One. It was important to find out if the participants were describing the design process they apply in practice or describing the concept of the design process. This question used a five-step Likert scale to record participant responses (n=22).

Table 4-6: Question 2: Do you always follow the process you have just outlined?

| Question | Likert scale | Frequency (n=22) | Percentage of participants |
|--|-------------------|------------------|----------------------------|
| Do you always follow the process you have just outlined? | Strongly agree | 5 | 23% |
| | Agree | 16 | 73% |
| | Undecided | 0 | 0% |
| | Disagree | 1 | 4% |
| | Strongly disagree | 0 | 0% |

Almost all participants (96%) agreed or strongly agreed they followed the design process they had outlined in Question 1. That is, the participants felt their descriptions of the design process resembled the process they applied in practice.

Question 3: Do you think understanding the design process leads to a better design outcome?

This question sought to establish whether the participants believed there was a link between an understanding of the design process and the quality of the final design outcome. This question used a five-step Likert scale to record participant responses (n=22).

| Table 4-7: Question 3: Do you think understanding the design process leads to a better design outcome? | | | |
|--|-------------------|------------------|----------------------------|
| Question | Likert scale | Frequency (n=22) | Percentage of participants |
| Do you think understanding the design process leads to a better design outcome? | Strongly agree | 11 | 50% |
| | Agree | 9 | 41% |
| | Undecided | 2 | 9% |
| | Disagree | 0 | 0% |
| | Strongly disagree | 0 | 0% |

Almost all participants (91%) indicated they agreed or strongly agreed that an understanding of the design process leads to a better design outcome. While 9% (two participants) indicated they were undecided, no participants disagreed with this statement.

4.2.2.2 Establishing participant understanding of reflection

To establish participant understanding of the role of reflection in their graphic design process, the participants were asked eight questions that focused specifically

on the principles of reflective practice. In the first instance the participants' general understanding of reflective practice was sought, followed by questions focused on reflection that takes place during the act of designing, and finally, questions regarding reflection that occurs on completion of the design artefact.

Schön's notion of the reflective practitioner (1983; 1987) has been used in this study to frame the analysis of the participants' responses. Schön refers to three types of reflection: reflection-in-action, reflection-on-action, and reflection-on-practice (see section 2.3.2 for more detail).

Reflection-in-action has been described by Schön as 'thinking on your feet', and involves constructing new understandings to inform the actions in the situation that is unfolding (1983). In other words reflection-in-action can be defined as thinking about the activity of designing during the activity, in such a way as to influence subsequent design activity (Reymen 2003).

Reflection-on-action, has been described as an activity where the designer pauses, during or after the process of designing, to make sense of an action or experience in order to extend the designer's knowledge base, and where the reflection has no direct connection to the present action (Reymen 2003). Drawing on the work of Reymen (2003) three stages are typically present in the process of reflection-on-action:

1. pausing or standing back from the design activity;
2. identifying and critically evaluating understandings embedded in the design experience; and
3. drawing conclusions in a manner that could inform further design activity.

Reflection-on-practice in a design context can be described as identifying and critically analysing understandings implicit in design practice that have grown up around observing repetitive design experiences (Reymen 2003). This involves

critically reflecting across several design experiences. Reflection-on-practice has similarities with reflection-on-action, however the important difference is that reflection-on-practice involves looking back over multiple design experiences, whereas reflection-on-action typically focuses on a single design experience in the present or recent past.

Question 4: Some designers say reflection is an important part of the design process. How would you define reflection?

Question 4 was an open-ended question. The participants' responses were reviewed and four stages were identified: the action of standing back or reviewing the design activity; analysing and evaluating the design activity; reflection as a means to improve design practice for future design situations; and reflection as a means to maintain focus on the design aims or client brief.

Eleven participants described a process of standing back or looking back over their design activity. This was also described as a process of distancing oneself from the design activity. This theme has parallels with the first stage of reflection-on-action, pausing or standing back from the design activity. Typical examples from the participants' descriptions of reflection include:

- "Reflection is standing back from the project and getting an overview of it as a whole."
- "I would define reflection as standing back from the work in progress and taking time to think about the work, including the process that is being followed. Distancing yourself from it allows you to be more critical and then improve the work to a greater extent."
- "Reflection involves looking back at your work at several stages in the design process. Reflection may also be looking back from another perspective."
- "I believe that reflection is the point where you look back on the process and critique the outcomes, the good and the bad."

Critically analysing or evaluating their design activity was a stage described by eighteen participants. This description has parallels with the second stage of reflection-on-action, identifying and critically analysing understandings embedded in the project. Typical examples of these descriptions include:

- “Reflection is looking back on the work that you have completed and evaluating it critically . . .”
- “I would define reflection as analysis. Analysis involves asking ‘why’ something did or didn’t work, taking that on-board and hopefully using that knowledge to improve future outcomes.”
- “Reflection is an important part of the design process as it allows us to analyse where we have succeeded, and where we may have encountered problems and or made mistakes.”
- “[Reflection] as the process of analysing the work that has been done. [That is], the continuous analysis of work-flow from design process through to concept development and final production. I would also include a subjective and objective analysis of the relationship between any people working on that project, and specific areas of the project (ie. Concept, cost, production means, validity, consumer/market audience, teamwork, enthusiasm etc).”

Seven participants described a process of reflecting on their design project as a means to learn from their project in a way that could influence future practice. This was often described as an outcome of the analysis and evaluation process of reflection, and links with the third stage of reflection-on-action. Typical examples of this are evidenced in the following participant comments:

- “It allows future projects to be better approached. Learn from your mistakes”.
- “Analysing our strengths and weaknesses allows us to work more efficiently in the future, and hopefully avoid problems we have encountered previously.”
- “Reflection should analyse all steps of the design process and will hopefully aid in better design and design practice in the future.”
- “Evaluating the design process. How well you achieved the outcome, what you would change in order to improve efficiency regarding future projects.”

Reflection as means to maintain focus on design requirements and/or the client brief, was a theme evident in seven participant descriptions of reflection. Typical examples of this can be seen in the following participant excerpts:

- “Reflection occurs throughout the process. At every stage I take the time to stop and evaluate the work against the requirements of the job.”
- “Reflection is a constant process, which maintains the project focus in line with the design concept.”
- “A set of aims that can be used as a guideline to evaluating your work is also useful to keep you on track to what you are aiming to achieve.”
- “Reflection is about assessing the required outcomes of the work (as noted at the initial stages of the process), and examining whether the design is satisfying the full requirements of the brief.”

In summary, four stages emerge from the definitions of reflection articulated by the participants in response to Question 4 and are summarised in table 4.8.

| Table 4-8: Question 4: Some designers say reflection is an important part of the design process. How would you define reflection? | | |
|---|------------------|----------------------------|
| Identified stages | Frequency (n=22) | Percentage of participants |
| The action of standing back or reviewing the design activity | 11 | 50% |
| Analysing and evaluating the design activity | 18 | 82% |
| Reflection as a means to improve design practice for future design situations | 7 | 32% |
| Reflection as a means to maintain focus on the design aims and client brief | 7 | 32% |

Three of these stages have close associations with the three stages of reflection-on-action: pausing and looking back over the project; identifying and critically analysing understandings inherent in the project; and drawing conclusions to influence future practice. References to analysing or evaluating the design process/activity were often coupled with the notion of standing or looking back on the design process.

Seen together these two themes provide a picture of two of the three fundamental stages of the reflection-on-action process, that is, the pausing from the design activity (standing or looking back) and thinking back over what they have done (analysing or evaluating).

The fourth stage, identifying reflection as a means to maintain focus on the design aims and client brief is an outcome of the reflection-on-action process. Put another way, it is through the application of the reflection-on-action process that the designer pauses from the design activity, facilitating assessment of the design development against the aims of client brief.

4.2.2.3 Participants' approaches to reflection during the act of designing

Two questions were asked (Q5 and Q6) in order to gain an insight into the participants' approach to reflective practice during the act of designing. Reflection during the activity of designing could include principles of reflection-in-action and reflection-on-action (see section 2.3.2.1 for more detail).

Question 5: I reflect on my work during the development of a design project.

This question sought to establish whether the participants felt they reflected during their design process and the level of that reflection leading to the completion of the design project. This question used a five-step Likert scale to record participant responses (n=22).

A significant majority (86%) of the participants indicated they reflected during the design process, either at all times (27%) or often (59%). Two participants indicated they reflected occasionally and one participant was undecided. None of the participants indicated they did not reflect, that is, all participants, except for one undecided participant, felt they reflected in some form or another.

Table 4-9: Question 5: I reflect on my work during the development of a design project.

| Question | Likert scale | Frequency (n=22) | Percentage of participants |
|---|--------------|------------------|----------------------------|
| I reflect on my work during the development of a design project | At all times | 6 | 27% |
| | Often | 13 | 59% |
| | Occasionally | 2 | 9% |
| | Undecided | 1 | 5% |
| | Not at all | 0 | 0% |

Question 6: Reflecting on my work as I develop the design project can help me achieve a better final outcome.

This question sought to establish whether the participants believed reflecting during the process of designing could assist them develop a better final design solution. This question used a five-step Likert scale to record participant responses.

Table 4-10: Question 6: Reflecting on my work as I develop the design project can help me achieve a better final outcome.

| Question | Likert scale | Frequency (n=22) | Percentage of participants |
|---|-------------------|------------------|----------------------------|
| Reflecting on my work as I develop the design project can help me achieve a better final outcome. | Strongly agree | 13 | 59% |
| | Agree | 7 | 31% |
| | Undecided | 1 | 5% |
| | Disagree | 1 | 5% |
| | Strongly disagree | 0 | 0% |

With 90% of the participants either strongly agreeing (59%) or agreeing (31%) it is clear most participants believed reflection during the process of designing can assist them to develop a better design outcome.

4.2.2.4 Reflecting on the completed design artefact

The focus of the next five questions was to establish the participants' views regarding the relationship between reflective practice and the final design artefact. These questions focus particularly on reflection on the design experience post-completion of the design project. The researcher developed these questions to parallel with the principles of reflection-on-action where the designer pauses to consider their experience with the aim to extend their knowledge base (Reymen 2003). Reflecting on the completed design artefact is consistent with the Deliver stage of the DDDP model.

Question 7: Some designers believe this final reflection on the completed project helps them to learn from the project outcomes and experiences. Do you agree with this statement?

This question sought to establish if the participants' believed the process of reflecting back over the completed design project can assist in learning from the design experience. This has close associations with the principles of reflection-on-action. This question used a five-step Likert scale to record participant responses (n=22).

Table 4-11: Question 7: Some designers believe this final reflection on the completed project helps them to learn from the project outcomes and experiences. Do you agree with this statement?

| Question | Likert scale | Frequency (n=22) | Percentage of participants |
|--|-------------------|------------------|----------------------------|
| Some designers believe this final reflection on the completed project helps them to learn from the project outcomes and experiences. Do you agree with this statement? | Strongly agree | 12 | 54% |
| | Agree | 7 | 32% |
| | Undecided | 2 | 9% |
| | Disagree | 1 | 5% |
| | Strongly disagree | 0 | 0% |

Approximately 86% of the participants either strongly agreed (54%) or agreed (32%), therefore, it is evident that generally the participants felt that reflection assisted learning from the project outcomes and experiences.

Question 8: Why do you think that?

Question 8 allowed the participants to expand on the thinking that informed their response to Question 7. Two themes emerged: linking the process of reflecting back over their completed design artefacts to future design practice; and learning from the design experience. There was also some linking of the design experience to previous experience, and some questioning of the value of reflecting on the completed artefact. Twenty-one participants responded to this question (n=21).

The link between the process of reflecting back over the project, to future design practice, was made by ten participants. This has parallels with the Schön's notion of reflection-on-action where the practitioner thinks about the design activity after the activity has been completed, and in a manner that influences further design activity (1983). Typical examples from the participants' descriptions of reflection include:

- "We always face new challenges with each design project and it is good to take the time to reflect on these obstacles and to conjure up a solution for future situations that represent these difficulties to ensure smoother operations."
- "I think that the above statement is true because I have found in my own work, on the occasions where I have adopted a similar strategy, I am better prepared for future work in the same area. In working on a design one might notice that they were able to produce a specific result and by reflecting on their process they can determine how they achieved this result and be able to recreate or further this outcome."
- "It allows us to see our strengths and weaknesses, and hopefully in turn, better our design process for the future. We must be able to analyse and criticise our own design work if we intend on developing further as a designer."
- "This post-completion stage of reflection is essentially in helping a designer to refine their operations or designs, in order to be more economical in future projects (i.e. economical with their time, money and more so, design style or personal process)."

Learning from the project was a theme apparent in thirteen of the participant's responses. The identification of learning as an outcome of the reflective process links specifically to two of the three stages of reflection-on-action; identifying and critically evaluating understandings embedded in the design experience; and drawing conclusions to inform future practice. Typical examples from the participants' descriptions of reflection include:

- "I learn from experience as well as thinking about experience. Often we overlook our experiences and don't learn from them, however by thinking about the experience with more depth and asking yourself questions, eg "How can you approach this differently or better?" you are forcing yourself to think in advance and therefore proposing a learnt experience for the future."
- "It helps you to learn from the mistakes you've made, as well as the things you got right, and prepares you for future work. The more proactive you are in reflecting and critiquing your own work, the more successful future jobs will be."
- "Because it is one of the best ways to learn. If you are not completely satisfied with the outcome it's a good way to work out what you could have done better and if you are satisfied with the outcomes it's a good way to realise what you have done to make the outcome successful. It is a perfect way to improve or understand what it is that you are doing successfully."
- "After completing the project, having a short break and then coming back to reflect on it, you see things that were not clear during the process. Throughout the project you are so focused on trying to make it work that you tend not to dwell on the things that haven't worked. Reflection on completion of the project frees your mind from the pressure of making the project work and allows you to analyse the negatives, and the positives, to learn for the future."

Not all participants could see the value of reflection. One participant indicated they felt reflecting on their design work had the potential to impede the activity of designing and interfere with the creative aspect of the design process.

- “I do not think reflection is important although it is individual to the designer and the production. One should not dwell on a finished work as it will hinder future productions and may corrupt the designer’s creative nature.”

Another participant while agreeing reflection can aid the process of designing, felt there are limitations with the reflective process. This participant indicated they did not feel the observations achieved through the reflective process could transfer across different design contexts or situations.

- “Sure some reflection helps but every project is different... in terms of fruit, if you were to eat an apple and reflect on that and remind yourself that that’s how you should eat an apple for the rest of your life but only go on to eat oranges or bananas and never eat an apple again, then you’ve really wasted a whole lot of time reflecting on the outcomes of eating an apple when you could have been looking into the strategies of eating bananas or oranges.”

In summary, ten participants linked the process of reflecting on the completed design artefact with improving future design practice. Thirteen participants described reflecting as a way to learn from the project. These observations have parallels with the practice of reflection-on-action. Eight participants referred both to linking the current project with future practice, and learning from the project. Two participants questioned the value of reflection once the design artefact has been completed.

| Table 4-12: Question 8 summary: Why do you think that? | | |
|--|------------------|----------------------------|
| Identified stages | Frequency (n=21) | Percentage of participants |
| Linking reflection on current project to future design practice | 10 | 53% |
| Learning from the project | 13 | 62% |
| Referring to both linking reflection on current project to future design practice, and learning from the project | 8 | 38% |
| Linking the project to previous projects | 2 | 10% |
| Questioning of the value of reflecting on the completed artefact | 2 | 10% |

Question 9: Do you think describing the design process in a written format helps you to clarify the process you followed?

Question 9 sought to establish whether or not the participants felt the written format assisted them to clarify their design process. This clarification was necessary as the intervention employs a written format as the means for the participants to respond to the reflective learning prompts (as opposed to other formats like audio). This question used a five-step Likert scale to record participant responses (n=22).

| Table 4-13: Question 9: Do you think describing the design process in a written format helps you to clarify the process you followed? | | | |
|---|-------------------|------------------|----------------------------|
| Question | Likert scale | Frequency (n=22) | Percentage of participants |
| Do you think describing the design process in a written format helps you to clarify the process you followed? | Strongly agree | 9 | 41% |
| | Agree | 8 | 36% |
| | Undecided | 4 | 18% |
| | Disagree | 0 | 0% |
| | Strongly disagree | 1 | 5% |

Approximately 77% of the participants indicated they either strongly agreed or agreed that describing their design process in a written format assisted in clarifying their design process. While three participants remained undecided, one participant strongly disagreed. This participant also disagreed that reflection helped in learning from the project outcomes and experiences (Q7).

Question 10: Taking time after the design project has been completed to observe and analyse the final project outcomes can help me identify what I have learnt.

The aim of Q10 was to establish whether the participants thought reflecting back over their project was a useful learning tool. This has parallels with the principles of reflection-on-action. This question used a five-step Likert scale to record participant responses (n=22).

| Table 4-14: Question 10: Taking time after the design project has been completed to observe and analyse the final project outcomes can help me identify what I have learnt. | | | |
|---|-------------------|------------------|----------------------------|
| Question | Likert scale | Frequency (n=22) | Percentage of participants |
| Taking time after the design project has been completed to observe and analyse the final project outcomes can help me identify what I have learnt. | Strongly agree | 11 | 50% |
| | Agree | 7 | 32% |
| | Undecided | 3 | 13% |
| | Disagree | 1 | 5% |
| | Strongly disagree | 0 | 0.0% |

With approximately 82% of the participants either strongly agreeing or agreeing it is clear that on the whole the participants felt reflecting back over their design project was a valuable learning tool.

Question 11: Reflecting back over my design project and identifying what I have learnt could help me solve future design problems.

The aim of Q11 was to establish if the participants felt identifying learning from the project could inform their approach to their design practice in the future. This concept has parallels with the third stage of reflection-on-action described by the researcher; drawing conclusions to inform future practice. This question used a five-step Likert scale to record participant responses (n=22).

| Table 4-15: Question 11: Reflecting back over my design project and identifying what I have learnt could help me solve future design problems. | | | |
|--|-------------------|------------------|----------------------------|
| Question | Likert scale | Frequency (n=22) | Percentage of participants |
| Reflecting back over my design project and identifying what I have learnt could help me solve future design problems. | Strongly agree | 9 | 41% |
| | Agree | 10 | 45% |
| | Undecided | 3 | 14% |
| | Disagree | 0 | 0% |
| | Strongly disagree | 0 | 0% |

86% of the participants indicated they strongly agreed or agreed with this statement. This suggests that the participants felt reflecting back over the design project may inform their future design practice. No participants indicated they disagreed with this statement, although three participants remained undecided.

4.3 Summary of the findings from the Questionnaire

The information collected through the questionnaire provides a profile of the participants as a cohort prior to the commencement of the learning intervention. It includes: demographic information about the participants; an insight into participant understanding of the design process and reflective practice; how the participants integrate reflection into their design process; and the role they feel reflection plays on completion of the design artefact.

The data collected from the questionnaire indicates the participant cohort were predominantly in the 18-22 year old age bracket, with an equal gender split. The majority of the participants had limited or no industry experience. The participants on the whole did not demonstrate a comprehensive understanding of the design process, however the majority of the participants where described partial stages of the design process.

Reviewing the participant's responses to the questions about reflection, they appeared to have some understanding of reflection and how this can aid the development of their design projects. When asked to define reflection, the participants' responses were consistent with the principles of reflection-on-action. By contrast, few participants' descriptions of reflection aligned with the principles of reflection-in-action and reflection-on-practice.

Almost all the participants felt they reflected during the activity of designing, and believed reflection can help them achieve better design outcomes. The majority of the participants felt the process of reflecting back over their design project once completed, can help them learn from their project, and help them with their approach to projects in the future. What was not clear from the participant's responses was how they might have reflected to help them learn from their design project.

In summary, the results from the questionnaire suggest the participants on the whole were familiar with stages of the design process, but not necessarily in a detailed way. The participants appeared familiar with some aspects of the reflective process, primarily in a manner consistent with the principles of reflection-on-action, and agreed that reflection could assist their learning from the design project. This suggests the participants had some knowledge of the design process and reflective practice prior to commencing the intervention.

The next chapter presents the results of the introduced structured and critical reflective practice.

5 RESULTS: REFLECTIVE ASSESSMENT TASKS

5.1 Introduction

This chapter presents the results, and a summary of findings, from the introduced structured critical reflective practice (the intervention) that was introduced into the subject curriculum.

5.1.1 THE INTERVENTION: A STRUCTURED AND CRITICAL APPROACH TO REFLECTIVE PRACTICE

The intervention was deployed in the form of a structured and critical approach to reflective practice, which has been described in detail in the Methodology chapter. In summary the participants were guided to reflect on their project through a series of four written assessment tasks in the form of three minor tasks and one concluding task. The minor reflective tasks aimed to prompt the participant to reflect on their project by guiding them to document their design process and connect thinking about their project with thinking about how they might approach further development of their project. The participants were required to complete the tasks at three key points during the design project, and as a consequence, the tasks incorporated identical learning prompts. These key points occurred at: the design proposal presentation; the design prototyping presentation; and the presentation of the final design artefact.

The concluding reflective task was designed to prompt the participants to reflect on their whole design project once the project had been completed. The task aimed to promote connections between thinking about the design project and thinking about how they might now approach design projects in the future. With this aim in mind the concluding task employed an additional set of learning prompts that included prompting the participants to review the previously completed minor tasks.

The literature and rationale underpinning the design of the learning prompts for both the minor and the concluding reflective assessment tasks has been discussed in detail in the Methodology chapter (see section 3.3.2.2).

5.2 Presentation of results

The data has been presented in two sections: the results from the minor reflective assessment tasks; and the concluding reflective assessment task. The first minor task was deployed in a training role, with the aim to familiarise the participants with the new reflective method. This approach addressed the possibility that some participants might perform poorly due to a lack of understanding of the report requirements. For this reason the data from first task has not been reported. The data from the second and third minor tasks have been combined as the reports had identical aims, and identical learning prompts (LPs). The data from the concluding reflective task has been reported separately due to the unique aims and the inclusion of additional learning prompts.

The reflective reports were all coded at the sentence level, as this represented the ‘units of meaning’ evident in the data (see section 3.3.3.2 for further detail). Each sentence from the participant reflective reports was aligned to a cognition level, described in the cognition taxonomy developed by Hatton and Smith (1995) and modified by Bennett (2002). This taxonomy is described in further detail in section 3.3.3.2.

The results from each of the LPs across all reports has been reported following the pattern below:

1. The aim of the LP including the targeted cognition level;
2. A table of results;
3. Examples of participant’s responses that align with the targeted cognition levels;
4. Observations elicited from the data

5.2.1 MINOR REFLECTIVE TASKS TWO AND THREE

This section outlines the results of the data collected from the second and third reflective tasks as the first minor task was not included in the analysis. The participants completed the second task after the design prototype presentations and the third task after the final presentations of their design artefact, but before the final submission of the design project.

The minor tasks each consisted of the following six learning prompts (LPs):

- LP1. Describing the project process
- LP2. Linking personal feelings to the project
- LP3. Identifying and analysing critical incidents in the project
- LP4. Applying thinking from the design project to inform subsequent development of the project
- LP5. Linking thinking from the current project to previous projects
- LP6. Linking thinking from the current project to thinking about approaches to projects in the future

5.2.1.1 Learning prompt 1 (LP1): Describing the project process

Aim of LP1

LP1 aimed to initiate reflective thinking by the participants by prompting them to pause and stand back from their design process. To achieve this, LP1 was designed to guide participants to return to their project, by asking them to summarise or recount their design process and provide foundational material for the participant to draw on when responding to subsequent learning prompts. The aims of LP1 align primarily with the Summarising Description cognition level. This may also include some engagement at the Reproductive Description cognition level, where the participant reproduces information directly from the case with no elaboration.

Results

Table 5.1 presents a summary of the analysed data collected from LP1. The first row of data indicates the number of participants who responded to this learning prompt (the 'n' value) and the number of participants who responded at each cognition level. The second row of data presents the total percentage of participant responses coded at each cognition level. The shaded column represents the cognition level specifically targeted for this learning prompt. For example, the first row indicates 34 participants responded to this learning prompt (n=34), and in this instance all 34 participants made responses that aligned with the targeted cognition level 'Summarising Description'. The second row indicates 87.9% of the total written responses from the participants to this learning prompt were coded at the cognition level 'Summarising Description'. Note: this approach has been maintained when reporting the results for subsequent learning prompts.

| Table 5-1: Minor Reflective Report 2+3 LP1 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=34) | 25 | 34 | 16 | 2 | 0 | 0 |
| Total percentage of responses coded at this cognition level | 8.7% | 87.6% | 3.3% | 0.4% | 0.0% | 0.0% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Summarising Description

The following participant responses typify the targeted cognition level Summarising Description:

- "I took some of these sketches, created some basic 3D models, and animated these using a cell shading technique as a test."
- "Begun to look at typefaces, which would accompany the created typeface or letter, which would not distract the viewer from the created typeface and not present a certain theme or numerous ideas itself."

- “The main criticisms I received based on my actual visuals were based on the choice of typeface within the logo, although there were mixed opinions on this between different people within the class.”

Observations elicited from the data

In this prompt, all participants were identified as responding at the targeted cognition level Summarising Description. That is, all participants made descriptive responses to the learning prompt that summarised, synthesised, or recounted information from their design project. Of the total participant responses, 87.6% were coded at the Summarising Description cognition level.

This result suggests that learners can pause and stand back from the design activity by describing their design process. This is consistent with the first step of the 4-step reflective process developed by the researcher where the conditions for reflection-on-action are fostered by prompting the participants to pause and stand back from their design process (Reymen 2003). These results also align with the first stage of the experiential learning cycle described by Boud (1994) called ‘returning to the experience’.

5.2.1.2 Learning prompt 2 (LP2): Linking personal feelings to the project

Aim of LP2

LP2 aimed to initiate reflective thinking about the design project by prompting the participants to pause and stand back from their design process. To achieve this, LP2 was designed to guide participants to return to their project, by asking them to summarise or recount their feelings about their design process. By asking the participants about their feelings, LP2 sought to engage the student in the feedback process and the emotional aspect of their project.

LP2 was designed to encourage the participants to primarily engage at the Interpretation and Judgement cognition levels. That is, the participants were encouraged to explain or make sense of an event by interpreting information (Interpretation) from their project, and offering a value judgement or claim

(Judgement) based on their interpretations of the project. LP2 also aimed to prepare the participants for the following learning prompt (LP3), by familiarising the participants with thinking at the cognition levels Interpretation and Judgement.

Results

| Table 5-2: Minor Reflective Report 2+3 LP2 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=34) | 2 | 19 | 34 | 33 | 4 | 0 |
| Total percentage of responses coded at this cognition level | 0.8% | 7.3% | 62.7% | 28.1% | 1.1% | 0.0% |

Examples of participant responses that align at the targeted cognition level

Cognition level targets: Interpretation and Judgement

The following participant responses typify the targeted cognition level

Interpretation:

- “Some areas of my work I was glad to hear feedback on as it reassured me that I knew what was not working and discovered areas that I was unaware were so problematic.”
- “So overall it was a positive result from predominately negative feedback, as it has made me realise the short time we have left and the important aspects to work on.”

Judgement:

- “I felt that this was the perfect interface for the slideshow as it represented the concept of the ‘glass goblet’ perfectly in that there was nothing to distract the eye from the content on display – it was purely functional.”
- “To receive positive feedback in relation to the way I had narrowed it down into an effective concept that could be executed by the deadline was very positive for me.”

Observations elicited from the data

All 34 participants were identified as responding at the cognition level Interpretation, and 97% of participants at the targeted cognition level Judgement. This result suggests all participants were made sense of events from their project by identifying and interpreting feelings about their design process (Interpretation), and almost all participants subsequently made value judgements or claims about their feelings (Judgement).

The results suggest that when participants were prompted to reflect on their feelings about the progress of their design project, most of their written responses (63%) involved identifying their emotions from their design project, that is, interpreting their design experience (Interpretation), while significantly less of their subsequent responses (28%) made a value judgement or claim about their feelings.

A small proportion of units were coded across other cognition levels.

These results are consistent with the first step of the 4-step reflective process developed by the researcher (see section 3.3.2.2.2) where the conditions for reflection-on-action are fostered by prompting the participants to pause and stand back from their design process. These results also have parallels with the second stage of the experiential learning cycle described by Boud (1994) called 'attend to feelings'.

5.2.1.3 Learning prompt 3 (LP3): Identifying and analysing critical incidents in the project

Aim of LP3

LP3 was designed to direct participants to review the descriptions of their design process, and then identify and evaluate critical incidents from their process. The aim was to foster the conditions for critical reflection by prompting the participants

to identify which aspects of their project they felt were significant and then discuss their rationale.

LP3 aimed to encourage the participant to primarily engage at the Interpretation and Judgement cognition levels, with some Summarising Description. The participants were encouraged to explain or ‘make sense of’ an event by interpreting incidents from their project (Interpretation), summarise or recount that information (Summarising Description), and offer a value judgement or claim (Judgement) about the incident. It was anticipated participant responses to LP3 would provide material from which the participant could draw when responding to subsequent LPs.

Results

| Table 5-3: Minor Reflective Report 2+3 LP3 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=34) | 2 | 25 | 34 | 33 | 4 | 0 |
| Total percentage of responses coded at this cognition level | 0.3% | 12.6% | 68.4% | 18.0% | 0.6% | 0.0% |

Examples of participant responses that align at the targeted cognition level

Cognition level targets: Summarising Description, Interpretation, and Judgement

The following participant responses typify the targeted cognition level Summarising Description:

- “I looked at how gender stereotypes and roles were portrayed in advertising and how this imagery communicated ideas and messages to a wider audience, and in turn, how these were then interpreted.”
- “When creating the layout I decided to create a loose framework for the typefaces and the critique that would accompany it.”

Interpretation:

- “The three significant incidents in my design process to this point have been the following. The first is the realisation of the major projects purpose and how this is reflected within the highway and motorcar statements. The second is the choice to follow this project in a 3d motion designed medium. The third is the choice of focusing on typography in this medium.”
- “Utilising the strength of the image to expand the ideas incorporated in the shadow work.”

Judgement:

- “This will create an item for our portfolio that is both aesthetically beautiful and conceptually deep, which will make us stand out as we have created something with conceptual substance.”
- “Moving from medieval imagery to a contemporary context and employing notions of hybridisation and current relevant issues, such as the recent anti-drug campaigns, allowed the shadow work to gain depth.”

Observations elicited from the data

The results indicate that all 34 participants explained or make sense of their project by identifying critical incidents from their design process (Interpretation). Most participants subsequently described their critical incidents by summarising or recounting information from the project (Summarising Description). Almost all participants offered value judgements or claims about the critical incidents they had identified (Judgement).

The total percentage of responses coded at each cognition level indicate almost all the participant responses (99%) occurred at the three targeted cognition levels: Summarising Description cognition level (12.6%); Interpretation (68.4%); and Judgement (18%). The results reveal the vast majority of the participants’ responses occurred at the Interpretation level, that is, most of the responses involved the participants identifying critical incidents from their design process.

In keeping with other LPs a small proportion of units were coded across other cognition levels.

5.2.1.4 Learning prompt 4 (LP4): Applying thinking from the design project to inform subsequent project development

Aim of LP4

LP4 was designed to prompt the participants to link the thinking from their responses from the previous learning prompts with thinking about the subsequent development of their design project. LP4 aimed to prompt the participants to consider how the observations they had drawn from the preceding LPs could inform subsequent development of their project.

This prompt was designed to encourage the participants to primarily engage at the Interpretation and Judgement cognition levels. Prompting the participants to identify issues from their previous reflective observations that could inform how they subsequently approach further development of their project aligns with Interpretation. This represents the participant making sense of an event or statement by interpreting information from their project. Subsequently explaining their rationale would indicate an ability to offer a value judgement or claim from the project, which aligns with Judgement. It was anticipated this LP would provide material on which the participants could draw when responding to subsequent LPs and subsequent development of their design project.

Results

| Table 5-4: Minor Reflective Report 2+3 LP4 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=34) | 0 | 8 | 30 | 31 | 17 | 10 |
| Total percentage of responses coded at this cognition level | 0.0% | 4.1% | 43.4% | 32.6% | 13.1% | 6.7% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Interpretation and Judgement

The following participant responses typify the targeted cognition level

Interpretation:

- “This has led me to greater thought on how I am going to typographically represent this element in a way that is aesthetically suitable.”
- “Over the last two weeks, I have increasingly discovered the importance of trying to identify alternative approaches even when you are reasonably confident in the solution you have.”

Judgement:

- “By re-evaluating the issues that have surfaced, the project becomes more refined, yet the issues continue to arise for example, the founding image has been established for the shadow work, now issues regarding space and placement will be need to be addressed.”
- “Making this a regular part of the design process will, in my opinion, allow me to develop and refine my work to a much higher level.”

Observations elicited from the data

The results reveal most of the participants engaged at the targeted cognition levels Interpretation and Judgement. That is, most of the participants identified issues from their previous reflective observations that could inform how they subsequently approach further development of their project (Interpretation), and subsequently explain their rationale (Judgement).

The results indicate the participants also engaged beyond the targeted cognition levels. Some participants were identified as engaging at the cognition level Summarising Description, half of the participants at Generalisation, and a third at Abstraction. A participant engaging at Summarising Description generally represented the situation where they described the issues they had identified.

Engagement at Generalisation suggests the participants went beyond making value claims (Judgement), and presented generalising observations and/or conclusions within the context of their project. A participant engaging at Abstraction suggests they articulated a general principle or procedure that addressed wider context of their practice.

Reviewing the total percentage of responses coded at the different cognition levels, most of the participant responses occurred at the combined targeted cognition levels Interpretation and Judgement. The results further reveal that while half of the participants engaged at the cognition level Generalisation, this equated to 13% of their total responses. When reviewing the results for Abstraction where a third of the participants engaged, this equated to 6.7% of the total responses. These results demonstrate that most participants responded in a manner consistent with step 3 of the 4-step reflective process developed by the researcher, where participants connected reflections about their design process with thinking about further development of their project. Not all participants achieved this however. The results also show some participants reflected in a manner beyond step 3 and responded to LP4 in a way that had parallels with step 4. That is, some participants connected thinking about the current design project to thinking about how they might approach projects in the future.

5.2.1.5 Learning prompt 5 (LP5): Linking thinking from the current project with previous projects

Aim of LP5

LP5 was designed to encourage the participants to link thinking about their current design project with thinking about previous projects. The aim was to prompt participants to think beyond their immediate design situation and consider their project in the context of past projects. That is, how might their experiences from past projects inform the development of their current project.

LP5 had a secondary aim, which was to prepare the participant to connect thinking about their design project with thinking about possible approaches to other projects in the future. Through the process of asking the participant to consider past projects, the aim was to promote thinking beyond the immediate design project, which is the type of thinking sought in the next LP. In other words, LP5 was also designed to cognitively prepare the participants for LP6.

LP5 was designed to encourage the participant to engage primarily at the Interpretation and Judgement cognition levels. The participants were directed to identify issues from their immediate project that have parallels with past projects (Interpretation), and make value claims (Judgement) when explaining their rationale. In other words, the participants were encouraged to explain or make sense of events by interpreting information from their project (Interpretation), and offer value judgements or claims (Judgement) when explaining their rationale.

Results

| Table 5-5: Minor Reflective Report 2+3 LP5 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=34) | 0 | 10 | 33 | 21 | 15 | 8 |
| Total percentage of responses coded at this cognition level | 0% | 8.4% | 53.7% | 22.3% | 10.6% | 5.0% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Interpretation and Judgement

The following participant responses typify the targeted cognition level

Interpretation:

- “There have been many projects in the past where, after working on the same idea for a sustained period of time, I have become unable to breakout and see different approaches to the problem.”

- “The reflection process is beginning to reveal itself as a self-set map or instructions that highlight important aspects of the design process; by documenting the steps we are identifying key moments that initiate the next stage.”

Judgement:

- “This reflective process reminds me of other design briefs I have worked through however this is a more structured and formal method of the reflection process which I feel is more beneficial as it goes into more depth.”
- “I think that this major work is one of the most successful I have completed at uni[versity] as I have done a lot of research, lots of critiquing and have ended up with my work finished on time which I think meets the criteria of my target market and design concept.”

Observations elicited from the data

The results indicate almost all participants were identified as engaging at the targeted cognition level Interpretation, while most participants were identified as engaging at the targeted cognition level Judgement. In other words, almost all participants identified issues from their current project that reminded them of previous projects, however fewer participants then made value claims (Judgement) when explaining how these projects were linked.

The results reveal the participants also engaged beyond the targeted cognition levels. Some of the participants were identified as engaging at the cognition level Summarising Description, almost half of the participants at Generalisation, and some at Abstraction. A participant engaging at Summarising Description generally represented the situation where they described the issues they had identified. Engagement at Generalisation suggests the participants went beyond making value claims (Judgement), and presented generalising observations and/or conclusions within the context of their project. A participant engaging at Abstraction suggests they articulated general principles or procedures that addressed the wider context of their practice.

The results indicate the total percentage of participant responses primarily aligned with the targeted cognition levels Interpretation and Judgement. Half of the total participant responses focused on identifying the issues that link their immediate project with previous projects (Interpretation); while less than a quarter of the total responses by the participants involved making value claims by explaining how these projects linked (Judgement).

These results indicate most participants were able to consider how experiences from previous projects share commonality with their current design project, and consider how these observations might inform subsequent development of their current design project. This outcome is consistent with step 3 of the 4-step reflective process developed by the researcher, where participants connect thinking about their design project with thinking about further development of their project.

5.2.1.6 Learning prompt 6 (LP6): Linking thinking from the current project to thinking about approaches to projects in the future

Aim of LP6

LP6 aimed to promote critical reflection by prompting the participants to connect thinking from their design project with thinking about how, in light of the current design project, they might now approach projects in the future. LP6 was designed to prompt the participants to draw general observations from their design project in a manner that could inform how they might approach projects in the future. The aim was to prompt the participants to shift their cognitive focus from the immediate project context to thinking how this experience could inform approaches to the broader context of their design practice.

This prompt was designed to encourage the participant to engage primarily at the Generalisation and Abstraction cognition levels. General observations or conclusions drawn from the project by the participants in the same context as the project would align with Generalisation, while any observations that address a broader context than the project would align with Abstraction.

Results

Table 5-6: Minor Reflective Report 2+3 LP6

| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Number of participants whose responses aligned at this cognition level (n=34) | 0 | 4 | 29 | 23 | 25 | 24 |
| Total percentage of responses coded at this cognition level | 0.0% | 2.0% | 32.2% | 21.0% | 20.2% | 24.6% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Generalisation and Abstraction

The following participant responses typify the targeted cognition level

Generalisation:

- “The ideas and directions looked at may not be as good as the original concept you have, but at least you can say with some confidence that the final design is the product of a thorough process and comprehensive study into a range of different solutions.”
- “Every time I have had to construct these reflection’s my work has been better for it, and with the problem’s I faced during the closing stages of the project, I realised even with time restrictions it would of been beneficial to quickly critique and reflect if only for one hour.”

Abstraction:

- “By looking at these issues I know that in the future I should pay closer attention to the process, and making sure that I produce work in a logical way, rather than attempting to do different aspects of a project simultaneously.”
- “While I won’t be nervous about deciding on a concept early in the future, what I have learnt to do is continue the design process and keep my options open even if I feel confident with what I have.”

Observations elicited from the data

The results indicate not all participants drew observations or conclusions from their project in a manner that could inform their approach to projects in the future. This is illustrated by the results where approximately 70% of the participants were identified as engaging at the Generalisation cognition level. This represents participants drawing conclusions from their project in a manner that could inform projects in the future in a similar context, and is consistent with the principles of low-road transfer (Perkins & Salomon 1989). A similar number of participants drew conclusions from their project in a manner that could inform projects in the future, but in the broader context of their practice. This outcome is consistent with the principles of high-road transfer (Perkins & Salomon 1989).

The results from the non-targeted cognition levels indicate most participants identified aspects from their project they felt could inform projects in the future (Interpretation), fewer participants subsequently offered a rationale about their claim (Judgement).

The results reveal the total percentage of participant responses were consistent with the number of participants whose responses aligned with each cognition level. The highest number of participants engaged with Interpretation and this was reflected in the highest total percentage of responses, where as a similar number of participants engaged across Judgement, Generalisation, and Abstraction and this was reflected in a similar total percentage of responses.

5.2.1.7 Summary of the results from the minor reflective assessment tasks

The results from the minor tasks indicate that participants critically reflected on their project during the development of their project. Participants also connected reflections about their project with thinking about how they might further develop their project, and thinking about approaches to projects in the future. This occurred however to varying degrees, and not all participants critically reflected all the time.

While reflecting back on their project, participants paused and stood back from their project by summarising their design process, and considered their feelings about the development of their project.

The results indicate that participants critically reflected on their project through a process of critical incident analysis. That is, they made observations from their design process that challenged their perspective about the project. This was evident when they identified critical incidents from their design process, and explained why they believed the incidents were important to their project development.

The results demonstrate most, but not all, participants connected thinking about the design project with thinking about further development of their project. Those participants who did make these connections reviewed their project and considered how this could inform further development of their project. Many participants identified aspects from previous projects that could inform how they approach further development of their current project, however fewer participants explained their rationale.

The results further indicate that fewer participants connected reflecting about their project with thinking about how they might subsequently approach projects in the future. The participants who did make these connections identified learning from their project in a manner that could inform how they might approach a similar project in the future. That is, the learning was framed within a similar context to the project context. Some participants also identified learning from their project that engaged across a broader context than the project context by addressing issues relating to design practice.

5.2.2 THE CONCLUDING REFLECTIVE ASSESSMENT TASK

This section outlines the findings from the concluding reflective assessment task. The participants completed this report once they had submitted their design

project. The concluding task consisted of ten learning prompts and asked participants to consider their whole project. This was in contrast to the minor reflective tasks that focused on specific periods during the development of the project. To assist the participants to review their project there was some overlap in the focus of the learning prompts between the concluding task and minor tasks and participants were also specifically asked to review their responses from the three minor tasks.

The concluding task consisted of the following ten learning prompts:

- LP1. Describing their design process
- LP2. Identifying and analysing critical incidents from their process
- LP3. Looking back over the design process to identify shifts in project focus
- LP4. Linking personal feelings with the project
- LP5. Identifying patterns in the project
- LP6. Identifying learning from the project
- LP7. Considering how this learning could apply to projects in the future
- LP8. Considering alternative project outcomes
- LP9. Considering how the project could inform approaches to a similar project context in the future
- LP10. Considering how the project could inform approaches to the broader context of design practice

Due to a different course enrolment pattern, three participants were not required to complete LP1, LP2, or LP3 in the concluding reflective task. As a consequence $n=31$ for LP1-3. These participants started the concluding reflective task from LP4. That is, for LP4-10, $n=34$.

5.2.2.1 Learning prompt 1 (LP1): Describing the design process

Aim of LP1

The aim of LP1 was to foster the conditions for critical reflection by guiding the participant to return to their project by summarising or recounting their design process. LP1 also aimed to provide foundational material for further interpretation and analysis in the subsequent learning prompts of the concluding reflective task.

LP1 was designed to encourage the participant to engage primarily at the Summarising Description cognition level where the participant summarises or recounts information from their project. This may also include some engagement at the Reproductive Description cognition level, where the participant reproduces information directly from the case with no elaboration.

Results

Table 5.7 presents a summary of the analysed data collected from LP1. The data has been reported in the same manner as the minor reflective tasks (see section 5.2.1.1).

| Table 5-7: Concluding reflective Report LP1 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=31) | 31 | 31 | 31 | 30 | 0 | 0 |
| Total percentage of responses coded at this cognition level | 16.6% | 54.1% | 22.6% | 6.7% | 0.0% | 0.0% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Reproductive and Summarising Description

The following participant responses typify the targeted cognition level Reproductive Description:

- “I illustrated by hand and scanned these into the computer. The illustrations then became the icon that would be repeated in the side panel, for example, the bird cages are the repetitive pattern in the bird image.”
- “Typefaces considered included Univers, Vectora, Avenir, ARS Region, ARS Marquette, Basic Commercial, Neuzet S (R), News Gothic, Zurich, Geneva, Meta, Folio, Glasgow Daxline, Clarendon, Caslon, FF Din, Freeset, Fedra Sans, Benton Sans and Placard Condensed.”

Summarising Description:

- “Using Helvetica Neue as the basis of the Sans serif font, I had played around with how the text can be shown on the website.”
- “To give the website a more artistic feel, I had used my own gouache images within the site, as well as make the headings of some pages hand-written rather than text, to further highlight the artistic element of the magazine.”

Observations elicited from the data

The results indicate all participants who completed this learning prompt reproduced information directly from their design project (Reproductive Description), and summarised or recounted information from their design project (Summarising Description). The majority of the total participant responses occurred at the Summarising Description cognition level (54.1%). This result suggests that learners paused and stood back from the design activity by describing their design process. This is consistent with the step 1 of the 4-step reflective process developed by the researcher where the conditions for reflection-on-action are fostered by prompting the participants to pause and stand back from their design process (Reymen 2003).

The results further reveal that when asked to describe their design process, all participants sought to explain or make sense of their project by interpreting information from the design process. This aligns with the cognition level Interpretation. Most participants also went beyond interpreting their project to make a value judgement or claim, aligning with the cognition level Judgement.

5.2.2.2 Learning prompt 2 (LP2): Identifying and analysing critical incidents from the project

Aim of LP2

LP2 was designed to guide participants to critically reflect on their design project through a process of identifying and evaluating critical situations from their design process. LP2 aimed to foster the conditions for critical reflection by guiding participants to engage in a process of critical incident analysis. While there may have been numerous critical situations or critical incidents that occurred during the design project, by asking participants to identify what *they* believe were critical incidents, the aim was to engage the participant's own interpretation of their project.

LP2 was designed to encourage the participants to primarily engage at the Summarising Description, Interpretation, and Judgement cognition levels. The participants were asked to explain or 'make sense of' an event by interpreting incidents from their project (Interpretation), summarise or recount that information (Summarising Description), and offer a value judgement or claim about the event (Judgement).

Results

| Table 5-8: Concluding reflective report LP2 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=31) | 4 | 26 | 31 | 29 | 8 | 2 |
| Total percentage of responses coded at this cognition level | 1.6% | 17.7% | 51.1% | 26.0% | 3.2% | 0.3% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Summarising Description, Interpretation, and Judgement.

The following participant responses typify the targeted cognition level Summarising Description:

- “The development of my logo was a slow and arduous process that included many different levels of research and refinement.”
- “I also had to come up with a logo that would be easily implemented on these new media, and as a result I had many decisions to make regarding colour schemes and fonts.”

Interpretation:

- “The three outcomes of this design project that I believe are most significant are: the ability to interact with the interface without a keyboard or mouse; that it is simple to use and understand; and that the project can be used by anyone without needing specialised hardware or software.”
- “The second significant outcome has been an exploration of packaging design and its conventions.”

Judgement:

- “As there is a lack of alcohol advertising specifically for women, I feel my design project is successful in marketing towards an under-represented market.”
- “The most significant development within the concept was the spark of the fuse wire/rope, that small development became the soul of the entire visual concept and created the relationship between the music and the design.”

Observations elicited from the data

The results indicate all participants explained or make sense of their project by identifying critical incidents from their design process (Interpretation). Most participants subsequently described the critical incidents by summarising information from their project (Summarising Description), and almost all participants offered value judgements or claims about the critical incidents they had identified and described (Judgement).

The results show some participant responses also aligned with non-targeted cognition levels, including Generalisation and Abstraction. Those responses occurring at Generalisation represented participants moving cognitively beyond

interpreting information (Interpretation) and making value claims (Judgement), to drawing generalised observations or conclusions within the context of their project. Two participants engaged at the Abstraction cognition level, which represents participants articulating a general principle or procedure that moves beyond the design project to address wider context of design practice.

5.2.2.3 Learning prompt 3 (LP3): Looking back over the project to identify shifts in project focus

Aim of LP3

LP3 was designed to guide the participant to identify changes in their design concept statement that may have occurred during the development of their design project. By prompting the participant to compare their design concept statements, the aim was to provide a point of reference from which the participants could identify and analyse changes that may have occurred to the focus of their project. By asking participants to compare previous concept statements with the final statement the aim was to guide the participant to consider their whole project.

LP3 aimed to encourage the participant to primarily engage at the Interpretation and Judgement cognition levels. The participant was prompted to identify how the project focus may have changed (Interpretation), and make observations regarding these changes (Judgement). They were encouraged to explain or make sense of an event by interpreting information from their design project (Interpretation), and make value judgements or claims (Judgement). This approach was designed to also provide preparatory material for subsequent learning prompts in the concluding reflective task.

Results

Table 5-9: Concluding Reflective Report LP3

| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Number of participants whose responses aligned at this cognition level (n=34) | 6 | 29 | 32 | 29 | 1 | 0 |
| Total percentage of responses coded at this cognition level | 1.8% | 44.0% | 33.6% | 20.4% | 0.2% | 0.0% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Interpretation and Judgement

The following participant responses typify the targeted cognition level

Interpretation:

- “To further differentiate the final concept from the original, the uses of words and meanings have been added to summarise the concept holistically, such as 'role in the environment', 'product lifecycle', 'post-use' and 'waste'.”
- “My first concept statement dealt more with the research behind my design concept and not the graphic representation of the design solution.”

Judgement:

- “Overall, I feel the concept kept within the general parameters of branding/campaign design throughout the whole process, becoming further and further resolved and refined as time went on, which is a natural progression as part of the design process.”
- “I don't believe that my concept had really changed to another topic, but rather morphed to focus on specific facets of the Internet and web design.”

Observations elicited from the data

The results indicate almost all participants were identified as responding at the targeted cognition levels Interpretation and most participants at Judgement. This suggests that most participants made sense of their project by interpreting information from the process through the activity of identifying instances of change

in their design concept statement (Interpretation), but fewer participants offered value judgements or claims about how their concepts had changed (Judgement).

The results also indicate almost all participants were identified engaging at the non-targeted cognition level Summarising Description, representing almost half of the total participant responses (44%). This was primarily due to participants including the first and last concept statements as part of their response to LP3. As this was not new material written specifically for LP3, rather recounting the concept statements, this material was coded at the Summarising Description level.

5.2.2.4 Learning prompt 4 (LP4): Linking personal feelings with the project

Aim of LP4

LP4 aimed to engage the participants with their personal feelings about their design project by asking them to make observations about how they believed their work had developed. LP4 was designed to prompt participants to critically reflect on their design project through a process of identifying and evaluating critical incidents from their design process.

LP4 was designed to encourage the participants to primarily engage at the Interpretation and Judgement cognition levels. That is, the participants are encouraged to explain or make sense of an event or statement by interpreting information from the project (Interpretation), and move beyond re-presenting or interpreting information to offer value judgements or claims about their project (Judgement).

Results

Table 5-10: Concluding Reflective Report LP4

| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Number of participants whose responses aligned at this cognition level (n=29) | 0 | 6 | 21 | 26 | 2 | 0 |
| Total percentage of responses coded at this cognition level | 0.0% | 7.9% | 39.9% | 50.9% | 1.4% | 0.0% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Interpretation and Judgement.

The following participant responses typify the targeted cognition level

Interpretation:

- “The predominant reason why my concept statement improved has to do with the great amount of research I carried out for this project.”
- “The final concept describes a specific exploration of a manageable niche in the universe of motion design.”

Judgement:

- “These particular words are useful in that they are important in defining what areas I have considered/researched/aimed for and also resulted in for my project.”
- “I feel that my final concept is an improvement on my first as my understanding of the highway and motor car was not as clear, and as time went on I began to have a clearer understanding of the concept and what needed to be stated in the concept.”

Observations elicited from the data

Of the participants who responded to LP4 (n=29), most were identified as having engaged at the targeted cognition level Interpretation, and almost all at Judgement. This suggests that most participants explained or make sense of their project by identifying changes in their design concept statement (Interpretation), and almost all participants made value judgements or claims about their feelings associated

with the comparison of their final design concept statement with their first statement (Judgement).

5.2.2.5 Learning prompt 5 (LP5): Identifying patterns in the project

Aim of LP5

LP5 was designed to prompt participants to look back over their three completed minor reflective tasks and identify any patterns or themes that might be present, for example re-occurring critical incidents or observations. The aim was to encourage the participants to stand back and consider their whole project and identify and critically evaluate understandings embedded in their project.

LP5 aimed to engage the participants at the Interpretation and Judgement cognition levels. The participants were asked to identify patterns in their reflections (Interpretation) and explain the significance (Judgement). That is, they were encouraged to explain or make sense of an event by interpreting information from their project (Interpretation), and offer value judgements or claims (Judgement) about their project.

Results

| Table 5-11: Concluding Reflective Report LP5 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=33) | 0 | 14 | 33 | 29 | 9 | 5 |
| Total percentage of responses coded at this cognition level | 0.0% | 9.1% | 58.5% | 26.5% | 4.0% | 1.9% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Interpretation and Judgement

The following participant responses typify the targeted cognition level

Interpretation:

- “The issue of the format on several occasions was a significant pattern that emerged during the critical incidents. It became a challenging aspect of my design and resulted in significant ways of affecting the rest of the design in the areas of layout, style, reusability and functionality.”
- “There was a better comprehension of what reflection entails, and how I can better reflect on my own practice, that emerged throughout the answers given in my reports.”

Judgement:

- “In retrospect, I can thus identify that as a designer, I am someone who really values researching and finding visual references to stimulate fresh ideas for myself.”
- “Although my end results were far simpler than the references I used, I feel that my visuals were appealing in their own right.”

Observations elicited from the data

The results indicate all participants who responded to LP5 were identified as having engaged at the targeted cognition level Interpretation, however fewer were identified at Judgement. In other words, all participants explained or made sense of their project by interpreting information from their process (Interpretation) through the identification of patterns present through their minor tasks. Fewer participants however subsequently made value judgements or claims (Judgement) about the patterns they had identified.

The results demonstrate some participant responses were also aligned at non-targeted cognition levels, including Summarising Description, Generalisation, and Abstraction. Engagement at the Generalisation level represented participants making a general observation or a generalising conclusion within the context of their project, while Abstraction represented participants identifying a general principle or procedure that moved beyond the design project context to address wider context of their practice.

5.2.2.6 Learning prompt 6 (LP6): Identifying learning from the project

Aim of LP6

LP6 was designed to prompt the participants to identify instances of learning from their project. The aim was to guide the participant to identify learning in an explicit manner, that is, in a form that could be used to extend their knowledge base. LP6 was designed to provide material for the following learning prompt, LP7.

LP6 was designed to engage the participant primarily at the Summarising Description and Interpretation cognition levels. The aim was to prompt the participants to interpret information from their project (Interpretation) by identifying new learning, and then describe the learning by summarising or recounting what they had learnt (Summarising Description).

Results

| Table 5-12: Concluding Reflective Report LP6 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=34) | 3 | 20 | 33 | 28 | 23 | 16 |
| Total percentage of responses coded at this cognition level | 0.5% | 11.0% | 45.2% | 23.6% | 12.8% | 6.9% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Summarising Description and Interpretation

The following participant responses typify the targeted cognition level Summarising Description:

- “As I did not create generic classes or objects that could be reused between projects I would have to copy-and-paste between projects and try to separate the webcam code from the code specific to the experiment at hand.”
- “After the interim submission I worked very hard to get the designs done to a standard where I could show them to my client and get feedback and make the necessary changes they wanted.”

Interpretation:

- “Other important skills I have learnt include how to identify design elements that can enhance my designs, understanding my target market and how important it is to conduct research, and understanding the best approach to communicating to the target market.”
- “By constantly looking back at my project and reflecting on it, I was able to point out areas that need improvement and refine the designs much more effectively than in past projects.”

Observations elicited from the data

The results demonstrate almost all participants were identified as engaging at the targeted cognition level Interpretation, however fewer participants appeared to engage at Summarising Description. That is, almost all participants interpreted information from their process (Interpretation) by identifying new learning from their project. Fewer participants seemed to summarise or recount information from their project by describing the new learning.

The results further indicate participants were also coded to varying quantities at the non-targeted cognition levels, Judgement, Generalisation, and Abstraction. Many participants (82%) moved beyond interpreting their project to offer value judgements or claims about the new learning they had identified (Judgement). Some participants (68%) also drew generalised observations or conclusions from the new learning within the context of their design project (Generalisation), and some participants (47%) presented a general principle or procedure that moved beyond the design project context to address wider context of their design practice (Abstraction).

5.2.2.7 Learning prompt 7 (LP7): Considering how this learning could apply to projects in the future

Aim of LP7

LP7 was designed to prompt the participants to consider in what way the learning identified in LP6 could inform how they might now approach projects in the future. The aim was to prompt the participants to connect thinking from the current project with thinking about future projects.

LP7 was designed to encourage the participants to engage primarily at the cognition levels Generalisation and Abstraction. Generalisation would be achieved if participants articulated a general observation or generalising conclusion based on their learning within the context of the design project, where as Abstraction would be achieved if they drew conclusions that engaged with the broader context of their design practice.

Results

| Table 5-13: Concluding Reflective Report LP7 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=30) | 0 | 7 | 19 | 20 | 19 | 18 |
| Total percentage of responses coded at this cognition level | 0.0% | 4.1% | 23.4% | 23.6% | 24.1% | 24.8% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Generalisation and Abstraction

The following participant responses typify the targeted cognition level

Generalisation:

- “These significant aspects have taught me to analyse my design process and critically evaluate all the stages of the design process.”

- “Evaluation and reflection will play a significant part, not only will I reflect upon my design work once a brief is completed, but I will also take the time at various stages throughout the process to critically analyse the project development”

Abstraction:

- “Finally, constant evaluation of the design process is important as you can identify problems early on and resolve these effectively, therefore not having to go back and make changes when the design is nearing its outcome.”
- “Constant critique and reflection will be part of my process with my work colleagues and bosses to ensure the design concept is consistent with that of the brief and presents a solution to the problem at hand.”

Observations elicited from the data

The results reveal not all participants were coded at the targeted cognition levels. In fact engagement by the participants at the targeted cognition levels was one of the lowest of all learning prompts. Of the participants who responded to LP7, only some of the participants made responses that aligned with the targeted cognition level Generalisation. That is, 63% of participants presented general observations or conclusions within the context of the project by making observations about how the new learning could inform their approach to a similar design situation. A similar outcome was evident with the targeted cognition level Abstraction where only 60% of participant responses appeared to present general principles or procedures that moved beyond the design project to address the wider context of their practice.

When reviewing other results for LP7, there were a similar number of participants whose responses aligned at non-targeted cognition levels Interpretation and Judgement as there were at the targeted cognition levels. 63% of the participants were coded at Interpretation, and 67% at Judgement. This generally represented participants interpreting information from their project when discussing their new learning (Interpretation), and then offering a value judgement or claim about the learning (Judgement).

5.2.2.8 Learning prompt 8 (LP8): Considering alternative project outcomes

Aim of LP8

LP8 was designed to guide the participants to consider alternative outcomes to their project. The aim was to encourage the participants to think beyond their final project artefact by considering, in light of their experience, if there might have been other design solutions they could have explored.

LP8 was designed to engage the participants primarily at the cognition levels Interpretation and Judgement. LP8 aimed to prompt the participants to identify alternative outcomes by interpreting information from their project (Interpretation), and then explain their rationale through a process of offering value judgements or claims (Judgement).

LP8 was designed to provide material and cognitively prepare the participants for LP9, where they are asked to consider how, in light of their project experience, they might approach a similar design project in the future.

Results

| Table 5-14: Concluding Reflective Report LP8 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=32) | 1 | 13 | 27 | 27 | 4 | 1 |
| Total percentage of responses coded at this cognition level | 0.9% | 12.9% | 41.0% | 39.8% | 4.7% | 0.8% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Interpretation and Judgement

The following participant responses typify the targeted cognition level

Interpretation:

- “Another alternative outcome may have been to do the opposite of what I did in the end and use photography to generate typography.”
- “The biggest question I have in regards to my own work and the possible outcomes is what direction would it have taken if I had decided to stick to my original idea and produce a print document along the lines of what was described earlier.”

Judgement:

- “For this reason I feel that the design solution that I came up with is different enough that people will be able to recognise it and distinguish it from other bridal promotions but also it isn't too radically different that it will limit my market.”
- “I am quite pleased with this outcome given the troubles I had learning the theory behind the technology used to create the Computer Vision HCI, however now that this work has been completed, I tend to think it may have been more interesting trying to create one large digital work which used all of the different methods of gaining Computer Vision input as opposed to creating a series of smaller technical demonstrations.”

Observations elicited from the data

The results indicate most, but not all participants, were identified as engaging at the targeted cognition levels, Interpretation and Judgement. That is, most participants interpreted information from their project by identifying alternative project outcomes (Interpretation), and subsequently explained their rationales by offering value judgements or claims about the alternative outcomes they had identified (Judgement). The results reveal most (80.8%) of the total participant responses occurred at the targeted cognition levels.

5.2.2.9 Learning prompt 9 (LP9): Considering how the project could inform approaches to a similar project context in the future

Aim of LP9

LP9 was designed to encourage the participant to consider how their project could inform their approach to a project in a similar context in the future. The aim was to

encourage the participants to connect reflections about the their project with thinking about how they might now approach a similar design project in the future. That is, what observations and conclusions can they draw from this project that could help them when faced with a similar design project in the future? LP9 was designed to build on the observations made by the participants in the previous learning prompt, LP8.

LP9 was designed to engage the participant primarily at the cognition levels Interpretation, Judgement, and Generalisation. LP9 aimed to encourage the participant to make sense of their project by interpreting information from their experience, for example, identifying what aspects of the project could inform their approach to similar situations in the future (Interpretation), and then offer a value judgement or claim explaining why they felt this way (Judgement). Finally LP9 aimed to encourage the participant to draw generalising observations or conclusions within the context of their current project (Generalisation). For example, how their observations might help them when approaching a similar design situation in the future

Results

| Table 5-15: Concluding Reflective Report LP9 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=32) | 0 | 7 | 25 | 23 | 20 | 8 |
| Total percentage of responses coded at this cognition level | 0.0% | 5.5% | 33.0% | 31.9% | 19.8% | 9.8% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Interpretation, Judgement, and Generalisation

The following participant responses typify the targeted cognition level

Interpretation:

- “Be aware of the affecting problems during design process and react in a clear and rational approach.”
- “Firstly I would research as much as possible before I begin thinking of ideas and uninformed solutions.”

Judgement:

- “I feel like the outcome of my project doesn't do that to the best that it could have, so I need to be sure that I start a project that focuses on majority of what interests me, rather than just make it a small element of a whole project.”
- “This isn't the easiest way (trying new approaches) but I felt this time that the benefits outweighed the learning curve.”

Generalisation:

- “In the future I intend to allow more of the research to show through in the work and hopefully this will allow some of the more advanced and thought-out ideas to come to the surface.”
- “Because it takes time to fully develop a concept to achieve the desired result; from now on I will consider all stages of the design process and make corrections before implementing my concept to its environment.”

Observations elicited from the data

The results indicate that many of the participant's responses were aligned at the targeted cognition levels Interpretation, Judgement, and Generalisation, however not all participants appeared to engage at these cognition levels. Many of the participant's responses were aligned at Interpretation (78%), which generally represented participants interpreting information from their project through a process of identifying what aspects of their current project could inform their approach to similar situations in the future. Fewer participants appeared to offer value judgements or claims by explaining their rationale, that is, engage at Judgement. Even fewer participants engaged at Generalisation, that is, present

general observations or conclusions within the context of their project by explaining how their observations could be applied to a similar design situation in the future.

5.2.2.10 Learning prompt 10 (LP10): Considering how the project could inform approaches to the broader context of design practice

Aim of LP10

LP10 was designed to prompt the participants to consider how the project could inform approaches to their design practice. The aim was to guide the participants to connect reflections from the project with thinking beyond the project context, by considering how they might now approach the broader context of their practice in light of the observations drawn from their project. LP10 aimed to prompt the participants to think about their current project in a manner that could influence how they approach design projects in the future.

LP10 was designed to encourage the participant to engage primarily at the cognition levels Generalisation and Abstraction. The prompt aimed to guide participants to make observations and draw conclusions from their project and discuss how these might inform how they approach the broader context of their design practice. Observations or conclusions made in a similar context to the current project represent evidence of engagement at the Generalisation cognition level. Observations or conclusions that present a general procedure or principle beyond the context of the design project by addressing issues of design practice, represent evidence of engagement at the Abstraction cognition level.

Results

| Table 5-16: Concluding Reflective Report LP10 | | | | | | |
|---|--------------------------|-------------------------|----------------|-----------|----------------|-------------|
| Cognition level | Reproductive Description | Summarising Description | Interpretation | Judgement | Generalisation | Abstraction |
| Number of participants whose responses aligned at this cognition level (n=33) | 0 | 12 | 30 | 28 | 27 | 12 |
| Total percentage of responses coded at this cognition level | 0.0% | 6.3% | 29.0% | 36.4% | 18.8% | 9.5% |

Examples of participant responses that align at the targeted cognition level

Cognition level target: Generalisation and Abstraction

The following participant responses typify the targeted cognition level

Generalisation:

- “When you are busy working on a project it is easy to be blind to the weaknesses of the piece you are developing, reflection allowed me to see on paper how the project was progressing, which then allowed me to discern whether or not it was evolving in a good direction and at a good pace.”
- “My research into the branding strategies of some of the world's most successful cultural organisations has provided me with marketing and branding theory that I can now utilise in an industry context.”

Abstraction:

- “Therefore in order to show that I have a good understanding as to what would be required in a job in this domain, I am now able to discuss the work (my designs) with future employers; to express my understanding about 'branding strategy'.”
- “They may prove helpful in an industry or post-graduate situation in that they allow me to think about my design process as a whole, resulting in a more resolved design concept and a more successful design result in a practical sense.”

Observations elicited from the data

The results indicate most of the participants were identified as responding at the targeted cognition level Generalisation, but fewer participants responded at the targeted level Abstraction. Participant responses aligned at Generalisation typically presented general observations or conclusions within the context of the project by explaining how their project outcomes and/or reflective observations could influence their approach to a similar design situation in the future. Participants responding at Abstraction typically presented general principles or procedures that moved beyond the project context to address the wider context of their practice.

The results also reveal most of the participants were identified responding at the non-targeted cognition levels, in particular Interpretation (88% of participants) and Judgement (82%).

In summary, these results indicate most participants interpreted information from their project (Interpretation), make value judgements or claims (Judgement), and present general observations or conclusions within the context of the project (Generalisation). Substantially fewer participants however, presented general principles or procedures that addressed the wider context of their design practice (Abstraction).

5.2.2.11 Summary of findings from the concluding reflective assessment task

The results from the concluding reflective assessment task indicate participants critically reflected on their design process. Participants connected thinking from the project with thinking about how they might subsequently approach projects in the future. In a similar manner to the interim reflective task outcomes, this occurred to varying degrees and not all participants achieved this all the time.

The results demonstrate participants reflected on their design process by pausing and standing back from their project, summarising their process and considering their feelings about their project.

The results indicate participants critically reflected on their project, however not all participants achieved this all the time. Through the process of critical incident analysis, participants identified critical incidents from their design process and explain their rationale. Most participants recognised shifts in the conceptual focus of their project, or identified patterns evident in their reflective observations documented in their minor reflective tasks. Only a small number of participants however, subsequently offered value judgements by explaining why or how these shifts and patterns were significant.

Participants connected reflections about their project with thinking about possible approaches to other projects in the future, however, as when they critically reflected, not all participants achieved this all the time. Participants identified new learning from their project, however substantially fewer participants considered how this learning might inform their approach to other projects in the future. Participants who did achieve this cognitive connection, addressed both a similar context to their design project, and the broader context of their design practice. When asked to consider how their project could influence approaches to projects in the future, most participants articulated observations in a similar context to the project context, however fewer participants addressed the wider context of their design practice.

5.3 Chapter Summary

The intervention was designed to guide the participants to reflect on their project in a structured and critical way, and in a manner consistent with the principles of reflection-on-action. Through this approach the aim was to prompt participants to connect thinking from their project with thinking about how they might further develop their project and how they might approach design projects in the future.

The results from the intervention indicate that participants critically reflected on their project in a structured and critical manner both during and on completion of their design project, however this occurred to varying degrees. Many of the participants identified learning from their project, however fewer participants critically evaluated this learning. The results indicate most, but not all participants, connected reflecting about their design project with further development of their project. Fewer participants however, connected reflections from their project with thinking about how they might approach projects in the future.

The next chapter presents the findings from the eight nested case studies, which sought to gain an in-depth understanding of how individual participants responded to the intervention and to document their experience.

6 RESULTS: SEMI-STRUCTURED INTERVIEWS

6.1 Introduction

Semi-structured interviews were conducted with eight volunteers at three points during the course of the intervention. The aim was to gain an in-depth understanding of how individual participants were responding to the structured critical reflective practice (SCRIP) and to document their experience. The approach has been described in greater detail in 3.3.2.2. The reporting of each nested case study is structured to explore participant observations about:

- their design process;
- their reflective process;
- the impact the intervention had on the development of their design project;
- the impact the intervention had on their thinking about how they might now approach design projects in the future.

The reporting of each case study is concluded with a summary of the key themes to emerge from the interview data. Case study participants are identified with names, however to maintain confidentiality, their actual names have not been used.

6.2 Presentation of results

6.2.1 NESTED-CASE PROFILE INFORMATION

In summary, all eight case study participants were in the 18-22 year old age bracket, and there was an equal gender split. Their previous education qualifications were all at the NSW Higher School Certificate level. The enrolment pattern for their program of study was: five in the Bachelor of Creative Arts degree (graphic design major); one in a Bachelor of Creative Arts degree (double major of Graphic Design and Visual Arts); one in a double degree, Bachelor of Creative Arts (graphic design major), Bachelor of Commerce, and one in a double degree, Bachelor of Creative

Arts (graphic design major), Bachelor of Computer Science. See table 6.1 for further information.

| Table 6-1: Case study profile information | | | | |
|---|-------|--------|-------------------------------|---|
| Case identifier | Age | Gender | Previous education | Degree enrolment |
| Sam | 18-22 | Male | NSW Higher School Certificate | Double degree 1. Bachelor of Creative Arts (graphic design major) 2. Bachelor of Commerce |
| Thomas | 18-22 | Male | NSW Higher School Certificate | Double degree 1. Bachelor of Creative Arts (graphic design major) 2. Bachelor of Computer Science |
| Paul | 18-22 | Male | NSW Higher School Certificate | Bachelor of Creative Arts (graphic design major) |
| Emma | 18-22 | Female | NSW Higher School Certificate | Bachelor of Creative Arts (graphic design major) |
| Lisa | 18-22 | Female | NSW Higher School Certificate | Bachelor of Creative Arts (graphic design major) |
| Jacky | 18-22 | Female | NSW Higher School Certificate | Bachelor of Creative Arts (graphic design major) |
| Henry | 18-22 | Male | NSW Higher School Certificate | Bachelor of Creative Arts (double major graphic design and visual arts) |
| Betty | 18-22 | Female | NSW Higher School Certificate | Bachelor of Creative Arts (graphic design major) |

On the whole, the case study participants had limited or no design industry experience prior to participating in this research study. One exception was Thomas who indicated he had been working as a freelance designer for approximately 18 months for a variety of clients.

6.2.2 CASE STUDY PARTICIPANT: SAM

6.2.2.1 Participant background information

Based on the observations by the participant researcher, Sam performed at a high level in the subject of study in which the intervention was located. Sam also engaged effectively with the introduced intervention. While his project engagement with the principles of design was not highly innovative in itself, Sam's design process underpinning the design artefact was comprehensive, and the artefact was

realised to a high level of design resolution with clear parallels to a graphic design industry context.

6.2.2.2 Participant's observations about the design process

When asked to describe his design process during Interview 1, Sam stated it was still in development and had yet to be standardised. He felt that with each new design project he discovered alternative design methods and was continuously learning and, as a result, he had difficulty describing a standardised design process:

I find that I probably haven't yet managed to find a proven formula that I can stick to for every sort of project I do, as every time I do a new project I find a new way of doing things. My process is still ... evolving. (Interview 1)

Sam described a design process that commenced with the creation of a design concept, which he then developed in the form of paper or digital design visuals. He described a method where he paused to ensure the concept and design visuals linked together, and if not to his satisfaction, he reconsidered either the concept or design visuals, depending on which he felt needed further development.

I like the concept to be quite well established ... and then ... go to the paper or the computer and maybe try and evolve that concept further through visuals . . . eventually [I] have to tie the two together because if the two aren't together, then it's not working. (Interview 1)

During Interview 3, Sam described his design process again. He referred to working with a design brief, research, development of design concepts, and creation of design visuals. He emphasised the importance of research and how pivotal development of the design concept was to his process. Sam did not start creating design visuals until he had established his concept or idea

I've gained a better understanding of input from research. From there, for me, it's all very much based on the concept. I can't really move forward in a project until I've found that idea. (Interview 3)

When developing his concepts, Sam indicated he researched and used a process journal. He looked at design solutions that had been created for similar design contexts, including design firms he respects, and explored how these solutions had been developed and resolved:

I've looked at how other leading and respected [companies] have been branded, researched some of my more favoured design firms [to] see what sort of branding jobs they've done and the approach they've taken. [I] try to learn as much about the process they went through to see if I can pull anything out of that to help me apply to this project. (Interview 1)

Sam also discussed his research approach and the important role it played in the development of his design work. He indicated that his research served to help him understand the design sector within which he was designing. He talked about "trying to understand why it is that things work", and learning from other designers' experiences and processes.

Looking at the processes they've gone through and what's worked for them and what hasn't and trying to take those lessons and learn from them with my project. I feel it's a pretty important aspect with any sort of project. (Interview 2)

During Interview 3, Sam explained how his process differed depending on the context of the design task, and he now recognised the important role research plays in his design process.

I've always known research is important in [the design process], during this assignment I've come to a higher appreciation of that initial research. (Interview 3)

Sam indicated he followed a chronological or time-line based approach to structure the documentation of his design process. This provided a visual representation of how the project has developed:

Every time I do a variation on something or design something, I try to stick it all in, in order, so you can flick from page to page and just get a visual representation of how the project's developed. (Interview 2)

Sam subsequently discussed the importance of the role design visuals play when talking with a client. He indicated that clients do not have a design background and as a result it can be difficult for them to identify and articulate what they require; the process of presenting design concepts in visual form helped the client identify what they required or didn't require:

It's very hard sometimes for them [the clients] to see what it is they want . . . but if I then show them something that they don't like, they, at least, know what they don't like, so they can then ... leverage off that to say, I'm going to shoot more in this direction, or that way. (Interview 1)

Sam suggested an important aspect of his design process was to create a number of design variations of his concept. Through this activity of designing, and a process of trial and error, he established what he felt was working and what was not. This approach informs the refinement of the primary design solution, and gave him confidence he had selected the best solution.

With my process generally ... I [can] say, look I've done this, I've done that, it didn't work, this is why, so this is how I've arrived at this. You've exhausted all means and you can be confident that you've come up with the best outcome. (Interview 2)

6.2.2.3 Participant's observations about their reflective process

When asked to describe how he usually reflected during the development of a design project, Sam indicated he was guided by the subject curriculum structure. He compared past projects with the current project, and considered how this could impact on future design practice:

[I]t gives you a chance to look over how you've done things in the past and how you're doing them now, and where you've come from [and] where you're heading to. (Interview 1)

Sam noted that as he reached the conclusion of his undergraduate degree, the design projects were more involved. As a result, there was more time to pause and reflect on development of the design solution. In contrast, he felt rushed when completing design projects in the earlier stages of the undergraduate degree, and thought that there had not been enough time to pause and consider the work during the development of the project; once the project was completed there was time to reflect on the design experience. Sam indicated that in the final year of his degree he was pausing and "taking stock" at various stages during the design activity, to identify what was and what was not working, and to ascertain why:

I find now ... I'm ... taking stock a little bit earlier throughout the process rather than just at the end. [A] quarter of the way through, halfway through, just stopping, ... seeing is this working, is this not working, if so, why not?
(Interview 1)

Sam then indicated the reflective practice included in earlier subjects of study (in the form of written reflective reports scheduled at the end of the design projects), was an approach he enjoyed and which he was still learning from.

[Reflection is] still something I'm learning about, I'm writing those ... reflective reports after a point. I've always quite enjoyed them and done reasonably well with them. (Interview 1)

During Interview 3, Sam described how he could lose his objectivity when working on a design project for a long time; he had spent so much time on it he sometimes over-analysed the work and as a result had difficulty finalising a design solution. When this occurred, he would take some time away from the design and this helped him to view the work with "fresh eyes":

When I work on something for a long, long time you get to a point where you stop seeing it the same way ... You start to over-analyse things and you notice every little minor detail and it's good just every now and again to just have a couple of days off and come back with a fresh set of eyes. (Interview 3)

6.2.2.4 How the participant felt the intervention impacted on their design project

Sam was asked to compare reflective practice where the curriculum required him to reflect post-completion of the design project only, and the framework that required him to also reflect *during* the current design activity. He indicated reflecting during the design project had the advantage of providing the opportunity to implement changes in time to resolve the current design project. Sam also felt reflection once the design project was complete allowed him to review his design outcomes in order to improve his design practice for the next design situation:

What I've learnt [is] that the good thing about doing [reflection] as you go [is that it gives you] the opportunity to rectify anything that needs rectifying. If you only do it after a point, then sure it will help you with the next project, but it's not going to help the current one. (Interview 1)

Sam indicated during the first interview that he did not find the required reflection overly challenging. It encouraged him to maintain a process journal during the design activity, which helped him recall his design process, and in turn helped him when he was reflecting on his work. He was comfortable reflecting back over his project once he had completed a design project. As part of his standard design process he identified the successful and unsuccessful aspects of the design project so he could learn from his project:

I think I'm reasonably okay, like I can stand back from a project when I'm finished it and ... pull out the good things and the bad things ... It's not wrong to make a mistake, as long as you learn from it. (Interview 1)

Sam was asked to consider the reflection he had completed through the structured reflective tasks and if this reflection had subsequently influenced his design process. Sam indicated that it had directed him to pause from the design activity, to stand back from his work, and consider it from a different perspective:

I was pretty happy with everything, but the fact that they had stopped me and said, hang on a minute, did have the desired effect ... I looked at it ... from a different point of view. I guess that could be called reflection in a way.
(Interview 2)

Comparing his experiences writing the first reflective report with the second, Sam was of the opinion that, whilst the experiences were on the whole similar, the second reflective report was slightly easier to complete. He felt this was due to having progressed further through the development of the design project, and having a greater volume of design process material to analyse:

It's probably a bit easier [with the 2nd report] because I've actually done more. There's more stuff to get your teeth into, so it's probably a little bit easier than last time, if anything. (Interview 2)

Sam indicated during the third interview that the SCRP had guided him to identify the thinking and lessons inherent in his design project. Responding to the learning prompts had helped him recognise the thinking he had brought to his design process and identify new learning from his project:

It's not until you actually stop, sit down and have to think about it to actually construct a report ... I found that it did help in identifying what I had in mind which is kind of good habit to have. (Interview 3)

Sam agreed the three Minor Reflective Reports helped him complete the final reflective report. He had integrated elements of the minor reports into the final major report:

You definitely take aspects of those three smaller ones and integrate them into the big one for sure. (Interview 3)

Asked if he found there was a different approach required between the three Minor Reflective Reports and the final Concluding Reflective Report, Sam expressed the view that the major report did require a different approach. It asked him to consider all the minor reports together, helped him recall his design process, and provided an overview of the whole design project. This perspective helped him identify patterns from his project for further analysis.

Definitely. Just remembering significant points throughout the process, what you did at different times. Seeing something you did ... in the first report, may not have true relevance until the third [report] and it's not until you put all the 3 together that you get the big picture. You start to see patterns emerging. (Interview 3)

6.2.2.5 How the participant felt the intervention influenced thinking about how to approach design projects in the future

Prompted to consider how he might include reflection in his design practice in the future, Sam linked aspects of his university experience with an industry context. He suggested that there would be similar presentation points, for instance, where instead of presenting to teachers, he would be presenting to the client. This situation would provide a point to pause and consider client feedback, and reflect on what had and had not been successful:

I guess in an industry context there'd be similar points throughout the process ... Like [presenting a] ... concept to the client ... that would give you a chance to stop and think [and ask], why is this working, why isn't this working. (Interview 3)

Sam felt that writing reflective reports would be too artificial in an industry setting, but that using his process journal to document his reflective thinking during the design activity was a natural development of his current process:

If you're not being made to [reflect], sitting down and typing up something would seem very artificial and unnatural, whereas scribbling notes in a process journal as you go ... is something I've been doing for quite a while, so it just seems like a natural progression. (Interview 3)

When subsequently prompted, Sam indicated reflective practice was something he would include in his design process for future design projects. He stated that reflective practice would help him analyse the thinking embedded in his process and help him improve his design process and outcomes.

Yeah, as I do more and more projects in the future, continuing to do this type of reflection and [to] go back and look at decisions made and see whether all of those possibilities were considered, I think would help me rectify some stuff. (Interview 3)

Sam indicated during the third interview, he had initially found the principles of reflective practice and its relevance to his design process difficult to understand. He observed that even though the theory and principles of reflective practice were introduced through the subject curriculum, it was the activity of doing the reflective activities that provided the framework for him to understand the principles of reflection, and recognise the relevance and benefit reflection had for his design practice.

It is very hard to understand [the SCRP], or understand how it would work in an industry context, until you've finished it, and you start to see the bigger picture. So I don't know if [the lecturer] can do much more ... it's just a case of doing it and seeing where it takes you and seeing what you learn. (Interview 3)

During the third interview Sam also indicated that the structured critical reflective practice (SCRP) had helped him to learn about himself as a designer, and he now

had an improved understanding of his design process. He referred back to the first reflective report where he recalled having difficulty describing his design process. This was an issue he had not previously fully considered, but he now felt that he had a better comprehension of his design process, including what improvements he could make to his design process for future design situations:

I think I've learnt more about myself as a designer . . . As a result of these reflective tasks ... I've learnt ... to a better degree, my own personal process and the way I do things. I've identified problems in it, things that I need to rectify in the future. (Interview 3)

Sam was asked to recall a statement he made in his first interview that he reflected back over a design project once it had finished to identify what he might improve for the next project. He was then asked, having completed this design project and the accompanying reflective reports, whether he might now reflect in a different way. Sam stated he now had an improved understanding of the process of reflecting on the project outcomes, and was a process he would implement in future practice:

No, not as much as I think I'll do in the future. [The reflection has] always been there, but there hasn't been quite the same emphasis on it ... Having been made to do it has opened my eyes to its positives and positive uses. (Interview 3)

6.2.2.6 Summary of findings

Sam demonstrated through the interviews a good grasp of fundamental principles of the design process and reflective practice. Sam indicated the SCRP had helped him learn from his design project in a more effective manner than he had in past projects. He felt he now had an improved understanding of the value of reflective practice, including how it helped him think about his design process more effectively, identify and analyse the thinking inherent in his design artefact, and lead to better project outcomes. He felt the activity of completing the introduced

reflective reports had helped him understand the principles of reflection, and recognise the relevance and benefit for his design practice.

6.2.3 CASE STUDY PARTICIPANT: THOMAS

6.2.3.1 Participant background information

Based on the observations by the participant researcher, Thomas was a high performer in the subject of study. His engagement with the principles of design was innovative with a high level of experimentation. Thomas had a greater focus on research outcomes rather than an applied or industry outcomes focus, and was planning to continue to further study at an Honours level. As a consequence his design project had a greater focus on research, concept development, and prototyping than many of his peers. Thomas had been undertaking freelance design work for the previous 18 months.

6.2.3.2 Participant's observations about the design process

When asked to define his design process, Thomas indicated it was an iterative process that usually involved: meeting the client to clarify what was required; identifying comparative design work; a research phase; developing design concepts or roughs; and refinements:

First I'd have a meeting with the client, and then see what they want, what they need and see if I can get any comparisons to exist in... if I'm doing a website, see what kind of websites [the clients] like. I would research that field a bit more [to] see what's happened in that field recently. Then I'll produce a series of [design] roughs based on what the client thinks and which field they want me to further develop. I'll continue along that area. It's usually an iterative process from thereon in, a series of meetings with clients to see what they think. (Interview 1)

Elaborating further, Thomas indicated he worked predominately in the digital realm; he was comfortable working directly in a digital work environment and he felt it gave him a different result:

I work almost exclusively on computer. There are a lot of people who say that working by hand is a more traditional method of doing things ... but for the way I work I find it's better to just [use the] computer the whole way. It produces a different looking field but it's distinct. (Interview 1)

When asked during Interview 2 how he was documenting his design process, Thomas said that he had implemented an automated backup system:

To keep track [of my process], I'm using ... a content version system. Every five minutes [it will] save a backup of my work to date and so for any period of time I just go back and see where I was up to with that work. (Interview 2)

It would appear that Thomas's documentation of his design process relied largely on this automated backup digital file system, as opposed to writing notes, for instance. When asked if he ever went back and looked at the design work or whether he had a sense of how it was developing, Thomas stated that he would often go back and make significant changes to the direction of the design. When this happened he was able to return to the backup files:

I can go back and say "Alright, from here this is where I diverged ... I'll go back from this source file and start in a different direction". (Interview 2)

6.2.3.3 Participant's observations about their reflective process

Thomas indicated he reflected during his design process, but not necessarily intentionally, or in a formalised written manner like the introduced reflection for this study:

I don't have any formalised form of reflection, I'm not writing reports or anything along those lines, though quite often I'll find myself just thinking about it, not really intentionally. (Interview 1)

During the second interview Thomas again referred to reflecting in an unconscious manner during the design process. When asked if he was making an active decision to reflect, Thomas observed that he was, although not necessarily consciously aware of this at the time:

Well, certainly not written reflection ... I suppose I am doing some reflecting to say, 'This is the point where I made that diversion, perhaps I could have gone this way.' (Interview 2)

Thomas indicated he also reflected at the beginning and the conclusion of a design project. He referred to thinking about the client brief for a period of time before responding, and reflecting back over the finished project to consider the final design outcomes in relation to the client needs and how he might remain in contact:

I've usually given myself quite a lot of time to think about what [the client] wants and how I'll go about implementing that ... After completing a job I will [consider] whether that was actually really what they wanted or how I can stay in their mind. (Interview 1)

Thomas described having an emotional attachment to his design work, and to detach or stand back from the design project required a period of time. Thomas stated he found this process did not happen immediately when the design project was submitted.

When you're working on something as often as designers have to ... it would be unreasonable to not have some attachment to it. ... I know that there are some people who, as soon as it's done ... their attachment with the work has gone, but for me I do need a bit of time. (Interview 1)

Thomas noted that when switching his attention between concurrent design projects, he stepped away from the individual projects, allowing a conscious detachment from the design project, although this happened in an unconscious way.

Switching to and from different projects I am giving myself time away from [my student] project and I'm working on an external client's website for example, and so that's forcing me to separate myself from the work ... But, again it's not a conscious effort. (Interview 2)

Detaching emotionally from the design project also surfaced later in Interview 2 when Thomas was asked how he was responding to the project feedback from staff and peers. Thomas indicated that he did not find the feedback process difficult because he felt he could detach emotionally from his project:

I certainly don't feel invested in it at all. Because I see mine more as an exploration of the field - I'm still within the area that I wanted to explore, it's just a different aspect of that area, so I don't feel that way. (Interview 2)

Thomas felt his reflective approach did not just occur during the activity of designing, but was also removed from the design activity. That is, he also reflected on the design project during other activities.

I don't set aside a time to [reflect], but when you're mowing the lawn it doesn't really take all of your brain cells if you think about other things. (Interview 1)

When asked if he felt he employed different reflection processes during his design project, for example comparing the reflection he undertook during the design activity and the reflection he might do while mowing the lawn. Thomas agreed that this was the case. He discussed the importance of taking time away from the project to get a "fresh look at things":

If you think about something for too long you tend to think the same things over and over and it's hard to [maintain] a fresh look at things ... I'll come back to it in the morning, you just need to stop thinking about it and then start thinking about it again. (Interview 1)

6.2.3.4 How the participant felt the intervention impacted on their design project

When asked to consider the requirement to artificially stop and reflect on the design project by writing reflective reports, Thomas indicated he felt this approach worked for him. The approach provided a structure that encouraged him to stand back and detach from the design activity or process, which in turn helped him to avoid becoming overly attached to one direction of thought.

For me [the structured reflective practice] is fine ...I feel like I need that structure. I need somebody to tell me to shut off and move onto something else, because I have a tendency [for] my mind [to] get set in a certain direction. (Interview 1)

During Interview 2, Thomas again referred to how the intervention prompted him to stand back and appraise his design process:

I do think it was good that I had to sit back and specifically look over what I've done to try and find [the critical incidents in the process]. (Interview 2)

Thomas agreed that the process of stopping or pausing during the design process had influenced the subsequent stages of his design project, however he was not sure if this had occurred intentionally or unintentionally. He indicated he felt he was thinking in a reflective manner during the design activity, but not necessarily in an intentional or conscious manner. Thomas based this observation on his experience writing the second reflective report. He observed that he had already thought about the issues he wrote about in the report during the design activity:

[A] lot of the issues I raised in the reflective report I had already thought about, so it wasn't just I came up with it on the spot as I was writing it, it was just sort of things that I hadn't actually put in writing. (Interview 2)

Thomas also indicated that the structured reflective practice helped him independently detach from the design activity; it helped him stand back from his process without relying on external prompts:

You can be working on something and then all of a sudden you realise you've reached a certain point where something needs to be done and yet because you're operating on your own, you've had no one to come in and say "Up". No alarm clock to say "Wake up now". (Interview 1)

Thomas indicated he did not usually keep a written diary or process journal, however he acknowledged the value of the written reflection tasks:

[I]t's kind of strange to write reports. I'm not the sort of person who keeps a diary or anything like that, so writing my thoughts down ... in a stream of consciousness is a little strange for me but I can see its value. (Interview 2)

When asked to consider his reflective approach to the design project, Thomas indicated that the learning prompts contained within the written reflective reports influenced the way he thought about his design project during the activity of designing:

I think I did [reflect] but I'm not sure whether I was doing that because I knew I had the assignment coming up ... I knew that I would be asked particular questions and so I was looking for these points in the process. (Interview 3)

With further probing, Thomas observed that he felt the design artefact was secondary to the design process; the design project served to represent the design process. Thomas felt, due to his research focused design approach, the reflective process played an important role in his design process:

The product was secondary. It was just to prove that my process existed. I think because of the way my project was structured [with an emphasis on research and concept outcomes, the reflection] was a necessary part of the project. (Interview 3)

When asked specifically if the SCRP had impacted on his design process, Thomas acknowledged that the reflective learning prompts directed him to think in different ways:

Well, it did definitely. Some of the questions asked, took me down trains of thought that I might not have gone down if I were directing my own reflection. (Interview 3)

Asked to compare the Concluding Reflective Report that prompted him to look back over the whole project with the Minor Reflective Reports, Thomas felt there was value in looking back over the project and reflecting on the observations made in the previous reports. The Concluding Reflective Report had prompted him to identify patterns from the Minor Reflective Reports, and this reflective process revealed he had a greater structure to his design process than previously realised:

There was a question in particular where you had to find threads [from the previous reflective reports] and so I read over them and I did find threads even though I hadn't intentionally written them to be a response to my previous reflective reports. I found that in reflecting upon my reflections I actually did have more of a structure to my work than I had realised. (Interview 3)

Concerning scheduling of the reports, Thomas was of the opinion that there should be a greater time lapse between the completed design project and the final reflective report; there was not enough time to objectively think about the finished design work.

When I'm reflecting on my own work . . . I would prefer to have more time between when I complete the work and when we reflect upon it ... 3 – 4 days

just isn't enough time to detach yourself from the project and look at it objectively.

6.2.3.5 How the participant felt the intervention influenced thinking about how to approach design projects in the future

Thomas agreed when asked that the introduced structured reflection had made him think differently about his design process. When asked subsequently if he felt he would include any of the introduced reflective process in his design process in the future, Thomas indicated he had not thought to apply the principles of reflective practice to his design practice. It was a process he employed with his computing science practice, but not to the same extent in his design practice:

I wouldn't have thought to combine this sort of reflection with creative arts, but now that I've seen that it can work it seems logical to do so. I really think that I will use it in the future. (Interview 3)

6.2.3.6 Summary of findings

Thomas demonstrated a sound understanding of design process fundamentals and was one few participants to describe the design process as occurring in an iterative manner. Thomas appeared to have a well-developed reflective process that occurred throughout the development of his design work. He was one of only a few participants who stated he also reflected when removed from the design activity, for instance while mowing the lawn. Thomas felt the SCRP had influenced the way he thought about his design project, and encouraged him to think about his design approach in different ways. While he employed the principles of reflection in his computing science practice, he had not previously considered applying this approach to his design practice.

6.2.4 CASE STUDY PARTICIPANT: PAUL

6.2.4.1 Participant background information

Paul was a high performer in the design subject of study. While his engagement with the principles of design was not highly innovative in itself, the way he applied the principles was creative, and the design process underpinning the design artefact was comprehensive. The final artefact was realised to a high level of design resolution, with clear parallels to a graphic design industry context.

6.2.4.2 Participant's observations about the design process

Asked to describe his design process, Paul indicated during Interview 1 that he usually started with a design brief or an identified problem, and then would spend a period of time thinking through the problem. This included brainstorming ideas using a visual diary, research, and development of initial design concepts. Paul also talked about identifying the outcome the client sought:

I generally will either get a brief, [or identify] the problem and I think about it a lot. . . . I start with a brainstorming session using a visual arts diary and I write down anything that comes to mind about the project . . . things that I've seen before that look like the style of the project, something that would work in a similar [way]. . . looking at the problem and [identifying] the ultimate outcome they [the client] want. (Interview 1)

Paul described how he preferred to engage or communicate with the client to establish a detailed dialogue to clearly identify what was required before developing any concept roughs. He tried to avoid the typical scenario of developing three design alternatives for the client to select from. He preferred to have the client involved in the process at an earlier stage:

I don't think [developing 3 design proposals] works as effectively as a constant discourse between the client and me. I like to map out what they want and I'll

talk to them before I even have any visuals and explain to them this is what they want and these are avenues that we can take. (Interview 1)

Paul indicated he would then develop preliminary sketches on paper before creating design visuals using computer software. The client would be shown graphic visuals at various stages to involve the client in the process and help avoid miscommunication that might result in the client unexpectedly disliking the design work:

At each point they sign off, and it's also good from a professional point, because they're constantly in on the process . . . it doesn't give [the] horror of a finished product and they go "Ah no, you've done it totally wrong and we don't like it". (Interview 1)

During Interview 2, Paul elaborated further about his research and concept development phases. He discussed using a sketchpad to aid and document concept development, and described using techniques such as brainstorming, mind maps, and lists:

With the research there are things that [are] ... constant ... I have a sketchpad and I just write whatever comes into my head . . . like mind maps and lists and things like that, and slowly pull out of that what I wanted, like the overall concept . . . (Interview 2)

6.2.4.3 Participant's observations about their reflective process

When asked if he felt he reflected during the development of a design project, Paul stated in the first interview that he was aware that during his third year of undergraduate study he consciously reflected during his design process. Paul acknowledged in the past he had been focused on the end product or outcome, rather than working through the underlying design process. He included stages in his process where he paused to consider his work and how to then proceed:

I am a lot more reflective this year, I used to ... fall into that problem of visualising the end product before I've even got there and working towards that rather than working through the process. Now I'm not like that. I prefer to ... come back and think about exactly what I've done to get to this point and from that go further. (Interview 1)

Paul indicated that as part of his design process, he would have periods of time where he stood back from the design activity. This helped him achieve a critical view of his work:

Every now and then ... I'll leave it for a day, come back and think whether it looks good still, because there's that other problem when you stare at something for 12 hours ... you ... become very critical of it, so I ... go away from it, leave it for a little bit, then come back. (Interview 2)

Paul also stated this 'standing back' from his design process helped him to identify opportunities for improvement during the development of the project:

I do think about it more, I sit back and go ... "Before I go further on, can I quickly refine things while it's at this point", so that the next point is better and I don't get to the end of the project and go, "Oh, I see this point here and I could have done something different." (Interview 2)

During the first interview, when exploring the issue of consciously standing back from the design activity, Paul indicated this could be difficult to achieve, and raised the issue of becoming emotionally attached to particular design concepts and approached, and how difficult it could be to let it go:

That's hard because sometimes you fall in love with an idea and then sit back and look at the idea and say "Well, it's not working" even though it's hard, you grow an attachment. (Interview 1)

Paul also referred to the value of standing back from the design activity to avoid becoming attached to aspects of the design process in the third interview:

I was distancing myself from it [the design process] as I design, because sometimes you kind of get a little bit ... attached to something and it's hard to just keep going. (Interview 3)

Paul was asked if he looked back on his design projects to think about what he had learnt in order to influence future projects. During the first interview he indicated this was an approach he had only recently implemented:

I do look back at what I've done ... [to] learn from perceived mistakes ... I can keep that in mind for next time I design something that would use that sort of process and elements in the design. (Interview 1)

When asked if he was reflecting in between writing the reflective reports and if so how, Paul indicated during the second interview he felt he was reflecting in a non-structured and spontaneous manner:

I don't really write it down, I'll do a certain amount of work and then I'll have a break, and then I find the next time I come back I look [at] what I've done and I just start picking it apart. I don't sit down and just say, "Now, I'm going to reflect", I just find it happening. (Interview 2)

6.2.4.4 How the participant felt the intervention impacted on their design project

When asked if he felt the introduced formalised reflective practice influenced his approach to his design project, Paul indicated that reflection had helped fine-tune his design process:

[The reflective reports] fine-tuned my process, because when I actually reflect on what I've done I can say "Well, I made an error here, that's how I can do it better in the future." (Interview 1)

Paul felt the SCRP had been beneficial as it prompted him to engage in a self-critical examination; this was difficult, yet was a valuable way to learn from his project:

[The SCRP was] helpful because I think the only way you can learn is to be critical of yourself, because if you don't perceive any problems with yourself, you'll never change it in any way and you won't get better, so I think it's good in that sense. (Interview 1)

During the second interview Paul said that he was beginning to see benefits of the SCRP and believed that while he was reflecting prior to the introduction of the reflection, he now realised that he was reflecting in a more conscious and deliberate manner:

At the very beginning I [was thinking] "What's the point?" ... I'm starting to understand that reflection is a good thing and that I always have reflected ... I'm finding that now I do make the conscious effort to reflect ... [its] been better for my design process. (Interview 2)

Paul also made the point in the third interview that he realised that whilst reflection was inherent in his design process the introduced structured reflective approach helped him to reflect in a conscious manner, which he found to be beneficial, and he had modified his design process as a result:

I have reflected a lot, because it's been part of the project ... I found that pretty positive actually, ... there's quite a few different elements of my process that I've changed and ... refined to make it more efficient ... I've found that kind of change ... has been really positive. (Interview 3)

Paul stated that he was now aware he had been reflecting at numerous points during the design process, rather than just at the end of the process, and reflecting during the design activity had the potential to make his final design outcome more successful.

Instead of reflecting at the end of the project, I'm starting to reflect at each stage of the project, which I'm finding is good, because it makes me think about what I'm going to do next as well, and hoping that at the end it makes my outcome stronger. (Interview 2)

In the third interview, Paul also observed that he was now more consciously aware of reflecting during the design activity. He recognised that he paused and stood back from the design activity to reflect, which helped him to achieve a greater critical perspective on his design activity.

[I am] becoming conscious of the idea of reflecting during my practice rather than after the practice ... To reflect you kind of have to distance yourself from it, so it's also good because ... you can take a much more critical kind of viewpoint on it, and then I find that I pick up on all the little faults early. (Interview 3)

Paul reiterated this later in the same interview:

[I am] critically analysing what I'm doing as I'm doing it, so that I can make the changes while they're at the easier stage to make. ... now I distance myself at regular intervals and critically analyse what I'm doing, rather than at the end. (Interview 3)

During Interview 3, Paul was asked if he found the thinking prompted by the Concluding Reflective Report was different to the Minor Reflective Report. Paul felt the Minor Reflective Reports encouraged him to focus within the context of the project, whereas the Concluding Reflective Report encouraged him to think in broader terms. This included reflecting on his reflective practice and engaging in a broader critical analysis than he had in the Minor Reflective Reports:

I think that the interval reflection [Minor Reflective Reports], was almost like a casual side of reflection, whereas the reflection on what I've reflected [Concluding Reflective Report] was much more critical and I distanced myself from my reflection when I was writing about it. (Interview 3)

6.2.4.5 How the participant felt the intervention influenced thinking about how to approach design projects in the future

Despite Paul's initial scepticism, he acknowledged that the reflection was improving his design process and might help him meet a career goal to become an Art Director. He felt the process of reflection could help him move beyond performing at a junior level to engage at a senior level of design:

. . . at the beginning I was just sceptical . . . I thought "Well, yeah, what's the point?" but I'm ... getting the point now ... It's good because with my goals ... in design I ultimately I want to go into [Art Direction] ... I think the designer that reflects is ... a higher up designer than the designer who just does something under the guidance of somebody else. (Interview 2)

6.2.4.6 Summary of findings

Paul demonstrated a comprehensive understanding of design process fundamentals, and was one of the few participants to refer to the role of reflection in his descriptions of the process. When describing his reflective process, Paul referred to pausing or standing back from the design activity; identifying and critically evaluating understandings embedded in the project; and drawing conclusions with the aim to inform how he might now approach projects in the future. Paul indicated the SCRP had helped him achieve a greater critical perspective of his work, and was now more consciously aware of reflecting during the design activity. Paul felt the SCRP had helped him refine his design process, and it was a valuable way to learn from his project. Paul also felt the reflection approach could help him move beyond performing at a junior design level to engage at a more advanced level of design, and help him achieve a career goal of becoming an Art Director.

6.2.5 CASE STUDY PARTICIPANT: EMMA

6.2.5.1 Participant background information

Emma had difficulty engaging in a meaningful way with the principles of design and was primarily focused on the content of her design project. This was evident in her surface approach to the documentation of her design process, and the level of design thinking and dialogue evident in class. Emma's final submission for the design project did not meet the minimum design standards for this level of study. While Emma acknowledged these deficiencies, she did not act on this feedback.

6.2.5.2 Participant's observations about the design process

Emma was asked during the initial interview to describe her design process. She referred to her experience with the NSW Higher School Certificate Design and Technology studies prior to her University studies. She discussed developing a primary design concept, and then thinking through what was involved to realise the concept. This process included research in the form of visual examples and the noting down of ideas that could inform the primary concept in rough form:

Research is the very first thing I do, even if it has nothing to do with what I aim to do, I'll pull in images and pictures from whatever I see, rather than notes ... I write very, very roughly, and then I'll go through them later and write back the most important things. (Interview 1)

During Interview 2 when asked again to describe her design process, Emma referred to her experience in the NSW Higher School Certificate Design and Technology studies, rather than her university study. She talked about her understanding of the design process from her Design and Technology studies as having a primary emphasis on concept development with the design artefact secondary, whereas in the design project she was currently developing there needed to be more of a balance between the concept and the artefact:

I started off basing [my process] around my Design and Technology [studies], the outlines from that, but I found a lot of that just doesn't develop where I should be developing in my design, whereas [the Design and Technology studies were] based a lot on the concept and it didn't really matter about the hard copy outcome at the end. Whereas this project ... I really need everything to be really developed. (Interview 2)

Emma identified two other phases in her design process during the first interview: culling ideas; and asking her peers and friends for feedback:

I usually have a lot more stuff than what I'm going to need, so I have to cut it and simplify it down ... I go through and point out the bits that I really like to keep and then I'll ask – most of the time it's people who design, because they're the people I hang around with, but I'll ask some of my friends. (Interview 1)

Later in the first interview while discussing her reflective practice, Emma indicated her approach to documenting her design process was not very effective:

I probably don't record [my process] as I should. I'm pretty hopeless with keeping a designer diary, so it ends up as bits of paper all over the place; it's all in a folder, but not [organised] terribly well. (Interview 1)

When asked during the third interview about her reflective approach, Emma made the statement that she always writes things down, that she was very focused on keeping records of her process. While this might appear to contradict previous interview statements, it may indicate that Emma has modified her approach to the documentation of her process in response to the formal requirements:

I'm anal about it, because you think of so many little things that you don't think are important back then and you could forget about everything, [so I] write it down. (Interview 3)

In discussing progress of her design project during Interview 2, Emma indicated that she received a lot of feedback from her presentation, but had not yet acted on this as she felt she needed to implement major changes to her project. The changes Emma described primarily involved a shift in the project content:

It's going pretty well with the minor submissions, I got a lot of feedback not just from the lecturers but from everybody in class so that's helped a bit but I haven't really moved on from that ... because I pretty much have to redesign the whole project now. Because I'm doing [an instructional book] I had to completely change it to make it like more nutritional. (Interview 2)

The issue of not acting on project feedback was also evident in Interview 3. When asked how her project concluded, Emma indicated she was very happy with it, but she had not received a positive response during the final class presentation. Emma indicated she was disappointed by the negative response, although she acknowledged that there were issues highlighted from previous feedback she had not followed through due to what she felt was a lack of time management:

I was really happy with how it ended up but I got absolutely smashed in my final presentation. It was really, really disheartening because I was happy with it, everyone I talked to ... pointed out things that ... could have been better. There were a couple of things I hadn't ... followed through and done the most I could with, but I guess that comes back to my terrible time management skills. (Interview 3)

Emma observed she had become emotionally attached to her work and implies this might have impacted on her inability to make changes to her design work:

Yeah, definitely when looking at [my design project] objectively, I'd invested a lot more emotion in it than I thought I did, so telling me that I needed to change, I could see myself saying no I want to keep it ... You put that much effort and work into it that you want to keep it there. (Interview 2)

When questioned further during Interview 3, Emma discussed a development that occurred with her design concept when she decided the cookbook should have nutritional information integrated into the recipes. She then referred to the amount of research she undertook to implement this change. When discussing these issues however, her focus was around the development of the project content rather than any issues involving the principles of design relating to designing instructional publications:

I changed my concept a tiny bit ... it went from just being a kids cookbook to like I had to work in about nutrition, which I thought was a really good idea to be brought in. Research took a big chunk out of my work ... like all the recipes that I had, I had to look through them with all the nutritional information stuff in it. (Interview 3)

6.2.5.3 Participant's observations about their reflective process

When asked what part reflection played in her design practice, Emma indicated she felt she did not consciously reflect. When the interviewer summarised her responses to this prompt by saying, "So, generally, you'd say you probably don't consciously spend time reflecting; would that be fair?" Emma replied, "Yeah, yeah, definitely."

Emma did however refer to her approach of reflecting back over her project once it was finished as a way of learning for the next design situation:

I think [once] the design's pretty much finished, you're looking over it going "Well, what could I have done a lot better?" What can I learn from that project that I can implement in the next one? (Interview 1)

When prompted Emma indicated she reflected between university projects, because she was required to, however she did not do this with her work outside of her university study. In Emma's opinion, the commercial environment was different because it involved a client and a financial transaction:

I do [reflect] for the university stuff, because most of the time they say “Have a look back at it” but the stuff like that I do outside of [university] I don’t tend to reflect on it as much. I just do it and then – mainly because I’m doing it for the money ... I just finish it. (Interview 1)

6.2.5.4 How the participant felt the intervention impacted on their design project

When asked how the first reflective assessment task impacted on her design process, Emma felt it was helping her think consciously about her work during the development of the project, and it should help her with the final reflective report scheduled for the end of the project:

Reflecting ... like we have to do for this [report] I think it’s a really good idea because I don’t consciously [reflect], [it is] making me look at it every step of the way, not just at the end when I’m all finished. It’s forcing me to reflect. I think it makes the documents that you have to put [together] right at the end of [the project] a lot easier to structure. (Interview 1)

Asked during the second interview to consider her second Minor Reflective Report in relation to the first Minor Reflective Report, Emma indicated when reviewing the first task, she was surprised at what she had written. She acknowledges the benefit of taking some time away from the design activity and implies this helps achieve a clearer perspective on the approach to her design project:

Emma: Yeah, actually I’ve just been reading through it going “no, why did I write that?”

Interviewer: Are you surprised at the kind of things that have changed since then?

Emma: Yeah, definitely, it really forces the idea that you really need to put it aside for a while and come back to it later and have a look at some of the things you’re doing. (Interview 2)

Emma subsequently acknowledges her reflective observations are not addressing issues in her design project that need resolving. That is, it would appear she is not critically engaging with her design process:

That's the problem with my interim submission. I wasn't reflecting on it ... I was focusing on what I had and not developing it, not looking at the issues really. I tend to think that all the reflection I do is ... "ah that's cool, that looks good", but I'm definitely not looking at it going "that could possibly be [re]worked".
(Interview 2)

Another recurring theme that emerged was Emma's observations about documentation of her design process. Emma acknowledged her documentation approach was largely visual and would benefit with more text entries. She indicated text entries would have the benefit of reminding her why or how the visuals she had collected were meaningful at that time. She indicated printing visual records provided a sense of productivity, but without accompanying text describing what was represented in the visuals, their meaning and significance could be lost:

Writing words would be a lot [more helpful] but I need to have that written, what I'm feeling about the images while I'm there, not coming back and going "what did I even do that for, why was I thinking that?" (Interview 2)

During the third interview, Emma stated the Minor Reflective Reports were beneficial because they guided her to record her design process in written form, and not rely on her memory. She felt this approach was beneficial when completing the Concluding Reflective Report that prompted her to look back over the whole project:

You're just relying on your memory and I don't like that because my memory's - I have to write things down, I'm terrible. Yeah, I like the structure. I thought it was really good because you started off small and as you were working more stuff into [the reflective reports] you still included it but it forced you to bring in the new stuff and really open it up. (Interview 3)

During Interview 3, Emma was asked what she had learnt through the introduced reflection process. She indicated she reflected during the prescribed reflective assessment tasks, however while other students identified critical incidents from their process, she felt there were no critical incidents in her process:

I reflected when we had to hand things in ... I went back several times to look at the feedback. I didn't have a lot of problem stuff, because a lot of the other [student presentations] I was listening to ... a lot of really big things had come up and ... really [affected] their work ... but nothing huge happened in my project, it went along swimmingly I suppose. (Interview 3)

Emma indicated she found the SCRP approach beneficial. Compared to previous subjects of study where there was only one reflective report required at the conclusion of the design project, she felt the three Minor Reflective Reports helped her to complete the final reflective report in a more concise and succinct manner:

With the 3 [Minor Reflective Reports], each time I reflected I brought up new things ... I think the Major [Reflective Report] we got from the 3 [minor reports] was ... more concise and succinct than when just doing it right at the end. (Interview 3)

6.2.5.5 How the participant felt the intervention influenced thinking about how to approach design projects in the future

Emma indicated she felt the reflective process helped with her university study, however it would not apply in the same way in an industry context:

I think having this reflection now [in my University studies] will really prepare me a lot better, even though I probably won't be doing this sort of reflection [in an industry context]. (Interview 1)

During the third interview, Emma was asked if elements of the SCRP could be incorporated into her standard design process. She expressed that view that she

would not change her current design approach as her primary problem was with time management: “Probably not change anything because I think I have a lot of problems with my time. That’s my main problem”. (Interview 3)

6.2.5.6 Summary of findings

Emma demonstrated a grasp of some of the fundamental stages of the design process and reflective practice but felt that generally she did not consciously reflect during the development of the design project. She stated she thought about her projects with the aim to learn for future design projects, however only because this was an assessment requirement. Emma felt the SCRP guided her to consciously think about her work during the development of the design project, but found it difficult identifying critical incidents from her design process. Emma did not feel the SCRP could impact on the broader context of her design practice as her primary problem was with time management.

6.2.6 CASE STUDY PARTICIPANT: LISA

6.2.6.1 Participant background information

Lisa was a high performer in the subject of study. Her final design project submission had a greater research focus, as opposed to an applied or industry ready design artefact. It was not until late in the project development however that she realised this and subsequently shifted her project focus. This shift also coincided with a swing to a more independent approach to her learning, and greater personal ownership of her project. The resolution of her final design artefact reflected this late shift, that is, while a high level of thinking and experimentation was evident, the representation in project form was not as well developed as it could have been.

6.2.6.2 Participant's observations about the design process

Asked to describe her design process, Lisa explained during the first interview that once she had the client brief, she would analyse the brief, which usually involved further discussions with the client or teacher and re-defining of the brief if necessary. She then researched and developed rough design visuals, before finally articulating the design in a digital form:

Generally, I prefer to research before I do anything else, so I go into the internet and I look up a subject of whatever the brief requires me to look into, or I go to the library or go to museums or whatever resources I can find.

(Interview 1)

Lisa described a design process that involved numerous meetings with the client or teacher to clarify what was required and to keep them informed of the design development. Regular contact with the client also served to ensure the design stayed aligned with their aims:

Generally I ask [the client or teacher] what they want and then I go step-by-step and go back and show them ... and then it comes back to me and back to them. So that I can clarify with them exactly what they want so that none of my time's wasted ... and none of their time's been wasted by me doing all of this work and then they're saying, "That's not what I asked for." (Interview 1)

During Interview 3, Lisa reiterated that she always started with research, before beginning to develop concepts, and then created design visuals. Lisa described two distinct research approaches; text-based and visual research:

Generally I always go to research first. [I undertake] text-based research, and then I look at visual references of things that have been done that might be similar, before I start moving on to develop my own visuals. (Interview 3)

Lisa indicated her design process involved a lot of work by hand, which included sketching in a process diary and she felt that her design process was informed by a visual arts approach:

Yeah, everything by hand . . . generally I work by hand in sketching and drawing in my books, so it's more visual art process. (Interview 1)

During Interview 2 Lisa reiterated that she was using a process diary to record development of her project. She felt this method of documenting her design process in a written form helped develop her concepts and clarify her thinking, explaining "[I] can always figure out my concept of what I'm doing through writing, more so than just trying to sort out all the information in my head". During Interview 3, Lisa again discussed the importance of a visual diary to her process, and how this assisted her learning.

6.2.6.3 Participant's observations about their reflective process

Lisa indicated she reflected back over her process once she had completed it to identify other possible concepts or approaches:

Generally, at the end I might think ... and say, "That would have been a great idea, I wish I'd opened up more and thought of something else that I could have done." or "Other solutions seem a bit more obvious." (Interview 1)

Later in Interview 1 Lisa indicated she did not like having to complete reflective assessment tasks on conclusion of the project as had been required in previous subjects of study. "I don't want to think about a project any more once it's over" (Interview 1). This reluctance to write reflective assessment tasks, appears more to do with the scheduling at the end of the design project. Lisa explains she had run out of energy by this stage of the project and had trouble objectively reviewing her work. She would prefer to reflect back over her design project a couple of weeks later, or the start of the next session of classes (1-3 months later):

[I'm] sick of having to do the reflective work, and especially because the reflective assessments are always right at the end, and you are at the end of your string ... Maybe, if it was a couple of weeks later, or even the start of the next semester ... maybe I'd be able to think about it more clearly. (Interview 1)

During Interview 1, Lisa stated she became absorbed and attached to her work due to the passion she invested during the development of the project:

I do get very absorbed in my projects ... I put a lot of passion into my work ... I do get quite attached to it, but I do also get involved, I get excited about what I'm doing, it's not just, "Ah, yeah, that's a solution for that project." (Interview 1)

Later in the interview, Lisa again referred to how difficult she found it to stand back and achieve an objective perspective of her design project:

I find it really difficult to try and step back from the project so that I do have an objective look about them, I don't tend to do that. In the process I get a bit too caught up in it. (Interview 1)

This attachment to her work was explored further in Interview 1, where she explained she could become overly attached to a concept. By reflecting she realised this, and recognised there may have been other options from the project she could have explored:

Once I get the idea in my head I'm quite stuck on it and I think it's a good idea, but it's only until I've finished ... that I look back and I can say, "Maybe that wasn't the best thing to do, maybe I should have done it this way." (Interview 1)

Lisa referred to reflecting on her design project removed from the design activity. She described a reflective strategy where she would think about her project while travelling home on the train:

My concept was always revised. Every week I'd sit on the train on the way home and I'd go, "Oh my god, I need to put that in my concept." (Interview 3)

Lisa indicated that she found reflecting in the later stages of the project a harder process because it was primarily focused on developing visual solutions, which she found more challenging. She explained she found reflecting easier in the earlier stages of the project where there was a greater focus on research, as she had a greater confidence with her research skills:

The second half of the semester was more difficult to reflect, because during the first half of the semester it was all research ... I knew exactly where to go ... in the second part of the semester it ...if my visuals weren't working I found it more difficult to know where I had to go next. (Interview 3)

In the third interview, Lisa described a process whereby she constantly questioned the issues identified through her research, and thought about how this could impact on her design project:

[I reflect] all the time . . . after I'd read something, I'd say, "Okay, what effect does that piece of text have on my work? Do I agree with it, do I disagree with it?" (Interview 3)

6.2.6.4 How the participant felt the intervention impacted on their design project

Lisa indicated that, while she felt reflecting in a structured manner during the project (First Minor Reflective Report) was an improvement on only reflecting in this manner at the end of the project, she was not sure what the outcomes from the reflection would be because she was still immersed in the process:

I think it's better than having to [reflect in a structured manner] at the end [of the project] ... [reflecting] quite early, I think, is a better tactic, but I'm not too sure what the outcomes will be, because I'm currently [still] in the process as well. (Interview 1)

During the third interview however, Lisa indicated that the three Minor Reflective Tasks were beneficial as a way to reveal and document the design process underpinning her design project:

The reflective reports were useful in that I could actually write down everything that I'd learnt and then I could see at 3 different stages where I was. (Interview 3)

While completing the first reflective report Lisa found it difficult identifying three critical incidents from her design process. She was not sure what constituted critical incidents. In this situation she tried to establish what incidents in her process the design staff thought were critical as opposed to what she felt was important:

I think one of the questions was [identify] 3 significant points. I don't know what 3 significant points are ... It's trying to find the value that, [design staff] put on specific moments in the design process.
(Interview 1)

Lisa indicated she felt more comfortable completing the second Minor Reflective Report, as the design project had developed further and she had a better understanding of what the project involved. Comparing her experience between the first and second Minor Reflective Reports, Lisa felt not enough material had been developed at the time of the first reflective report to support meaningful analysis of the design process:

I feel more comfortable talking about my project at this stage [completion of the second Minor Reflective Report] because I've done X amount of research and I feel like I know what I'm talking about now, whereas in [for the first report] it was so new. (Interview 2)

Lisa explained during the second interview she had not initially fully understood the aim of the SCRP. She was confused about whether she should be focused on her

reflections about the project, or the design activity associated with her design project:

I think I was one of those people who was confused [during the first reflective report], because I thought it was about the act of reflection and not necessarily about how my project was going at that stage.

(Interview 2)

During the third interview when asked about her experience across the SCRP, Lisa stated she found the first question in all the reflective reports, asking the students to articulate their design concept was beneficial. The process requiring her to repeatedly write down her concept helped her clarify and refine her concept statement. Encouraging her to stand back from the design activity and consider what she was trying to achieve, helped her to articulate her concept in a more concrete manner than her previous practice:

I think the reflective reports made me sit down and say, “Okay, what is your concept?” ... I’d have to write that down, so that was helpful for me. (Interview 3)

Lisa expanded on this point again later in the interview. She explained having to continually rewrite her design concept helped her to articulate it with greater effectiveness than her previous approach using mind maps. Writing the statement meant it was expressed in a more concrete form than her previous approach:

Instead of me just having a mind map ... I actually have something written down ... It’s like having something concrete, normally I work in a more fluid way, so the concept still develops, but this ties me down to write something.

(Interview 3)

When asked if she had referred to the three Minor Reflective Reports when completing the Concluding Reflective Report, Lisa explained she had not as she had deleted her files. She acknowledged she now regretted this and she had to rely on notes when completing the major report:

I didn't, I wish I had, but I'd actually deleted the files so I was stressing because I'm going, "What did I write in the first reflective report, I really can't remember." But ... I'd actually written some stuff in the second report on the train on the way home, so I did have some references for what I'd written (Interview 3)

Lisa subsequently said that she noticed differences between what she perceived or remembered about her process, and what was evident in the documentation in her visual diary:

What I perceive as what I did is very different to what I've written in my [visual] diary. (Interview 3)

6.2.6.5 How the participant felt the intervention influenced thinking about how to approach design projects in the future

Lisa appeared unsure how to apply the thinking from her project to thinking about projects in the future. She could see how thinking about the next phase of design during the project was beneficial, however was unsure how her observations from the design project could inform projects in the future:

In the first and second reports, it was good, because I could see where I needed to go next, this [final] report, I was like, "Well, I've got nowhere to go, I need to go and set out a whole new set of guidelines to further develop my project if I were to take it into post-graduate studies." (Interview 3)

6.2.6.6 Summary of findings

Lisa demonstrated a grasp of some of the fundamental stages of the design process, and was one of only a few participants who indicated that there was an iterative nature to the design process. Lisa felt she continually thought about the development of her design project during the activity of designing, although she stated she found it difficult to stand back to achieve an objective perspective on her

design process. She was one of only a few participants who stated she reflected on her design project while removed from the activity of designing, for instance, while travelling home on the train. Lisa stated she reflected on the completed design project to consider if there might have been other design outcomes.

Lisa stated the IRRs provided a more effective way to document her design process than her past practice. She felt the written approach of the reflective reports helped her to achieve a greater objective perspective on her design project. She indicated she found identifying critical incidents from her design process difficult, and did not see the relevance of some of the learning prompts, although towards the later stages of the intervention she had a greater appreciation of the value of the SCRP. Lisa appeared unsure how the SCRP could influence the approach to her design practice in the future.

In summary Lisa appeared to have a good grasp of the fundamentals of reflective practice, however her approach was primarily focused within the project context. Lisa did not seem to grasp how her reflective thinking could inform her approach to the broader context of her design practice. While Lisa demonstrated a high level of thinking in her design project, this did not translate to making connections from her project with thinking about how this experience could inform her approach to projects in the future.

6.2.7 CASE STUDY PARTICIPANT: JACKY

6.2.7.1 Participant background information

Jacky was a high performer throughout the design project and she engaged effectively with the introduced intervention. Her project explored the principles of branding, and while this was in itself not highly innovative, the engagement with these design principles was thorough, and the design process underpinning the design artefact was comprehensive. The design artefact was realised to a high level of design resolution with clear parallels to a graphic design industry context.

6.2.7.2 Participant's observations about the design process

Jacky described her design process during the first interview in the following steps: assessing the design brief from the client to ensure she fully understood what was required; a research phase including a broad survey of the field, followed by targeted research engaging with specific details of the client brief; developing the design responses; obtaining feedback on the design proposals; further refining the designs; and then completion of the final design solution:

I start by assessing the brief, going over the brief and making sure I understand every part of it and what's involved, and then I'll probably go on to research. A broad field of research and then move ... into specific [areas] that I have to do. Then from there just implementing the design I guess, feedback and then refining it a little bit more and then the final outcome. (Interview 1)

Jacky explained the documentation of her design process involved a visual diary that included written notes, and digitally produced design roughs saved to her computer:

I keep a visual diary and I save my roughs on the computer. I write a lot of notes down [from] websites or books. (Interview 2)

6.2.7.3 Participant's observations about their reflective process

When asked what role reflection played in her design process, Jacky made observations based on her previous university experience, when she had been required to complete a reflective report on conclusion of the design project. Jacky explained this process helped her identify problems she might have only been subconsciously aware of during the design activity, and supported an objective perspective of the project:

[This reflection] forces you to outline what the problems were, because you might know them subconsciously. You narrow it down and pinpoint what the problems specifically are. You don't just go "That was annoying because I had to work with those people" you go "Well, it didn't work when I worked with these people because of this and this." (Interview 1)

Jacky agreed that as a result of the SCRP she reflected back over her project. She indicated that while she may have been aware of issues inherent in the project, she was reluctant to return to it once it was complete. The requirement to complete the reflective reports helped her return to the project and identify lessons for future projects:

Yeah, because you know what the problems were in the assignment but once it's finished you just don't want to think about it. [The reflective report] forces you to go back there, and then next time you're a little bit more ... mindful.
(Interview 1)

Jacky indicated there are always critical moments in any design process where she had to make decisions that would impact on the direction of the design project:

There's major turning points in the design and a lot of instances in the design process where you come to crossroads and ... "I could take this kind of a visual path, or maybe I could go this way" and a lot of the times those two paths are very, very different.

Interviewer: And you've got to make a decision?

Jacky: Yeah. (Interview 1)

Jacky explained during Interview 2 how she undertook considerable research and review of her design work. Asked if she was reflecting during this process, Jacky described a process where she would pause when she felt the design was not working to her satisfaction. Through this process she identified what she thought was not working and why, and returned to her research to seek alternative solutions:

I'll do some experimentation and the fact that it's not working, you have to reflect on it and identify what's not working and then research the part of it that's not working. (Interview 2)

6.2.7.4 How the participant felt the intervention impacted on their design project

Jacky felt the SCRP was helping her review her design process, "I think it's good because it forces you to continually question yourself and why you're doing this". (Interview 1)

When stepping back from her design project to complete the first reflective report, Jacky discussed how she initially she felt that because the design project was in the early developmental stages, there would be modest design activity on which to reflect. As she responded to the learning prompts contained in the reflective report, however, she realised there was a higher level of activity inherent in her design process than she had first thought:

One of the questions that I was just doing, it says "What has been a significant aspect?" and I'm like, "Well, there hasn't really been any" but then I realise that there have been many significant aspects. When you're forced to talk about it, you realise there has been. (Interview 1)

In the second interview Jacky again referred to how the process of completing the reflective report helped her recognise the thinking inherent in her design project. As with the first reflective report, she initially thought there were no critical incidents in her process, however as she reflected back over her project, Jacky realised there were critical incidents she could analyse. Jacky explained that when she was in the activity of designing it could be difficult to recognise her thinking as she was so caught up in the actual activity of designing. She found it difficult to detach from her project and think about her design process during the design activity:

When you're forced to identify 3 [critical incidents] and [you think] ... "I don't have any" and then [you think] ... "Yes, I do" ... Sometimes it's hard to work that out. You get so attached to your work and you get so caught up in it. It's hard to step back. (Interview 2)

Jacky discussed the reflection she undertook during the development of her design project and pointed out that the reflection that occurred during the design activity was not a process she was always consciously aware was happening:

You ... look at it and think "Ah, this doesn't look good" ... and then you research more but you don't really actually stop and think "Ah, I'm reflecting on what's not right in this" and taking it further.
(Interview 2)

Jacky felt there were similarities between conversations with other people and the reflective reports. Both approaches helped her clarify aspects of her design process that were not immediately obvious to her:

Sometimes you can't work out where you're going wrong until somebody asks you a specific question and I think that that's what is helpful about this writing it down process. (Interview 2)

During Interview 3, Jacky expressed the view that the critical incident analysis component present in the reflective reports led her to recognise the value of the class presentations: "I realised [by] making us nominate all these critical incidents, maybe I wouldn't have realised that the presentations were so critical" (Interview 3). This observation informed her approach to the final class presentation:

Had I not reflected, [I'm not sure] what it would have turned out like, but I do know that when forced to write the critical incidents, every time on the page it said "Presentation". I didn't communicate [effectively] ... those two times, and so you can't help but find a link there. (Interview 3)

Jacky observed that the reflective reports scheduled during the design activity offered the opportunity to make an immediate impact on the current design project so that “there’s opportunity to fix it, it’s not just hindsight anymore” (Interview 3).

Jacky indicated that the scheduling of the final report was too soon after the project; she was still fatigued and not yet sufficiently emotionally detached from the project to reflect in an objective manner:

I’ve seen it so many times that I can’t even appreciate it whether it was successful or not because it’s so fresh in my mind. I think maybe my last reflections would be a bit better if maybe I did them in a couple of weeks.
(Interview 3)

Jacky explained she had greater difficulty completing the final report because there were not the unresolved issues evident when completing the previous reflective reports. Through the process of completing the final report, she observed that she had realised she was contented with the final outcome and had resolved the problems to the best of her ability at that time. She concluded that the reflective reports scheduled during the design activity helped her identify the inherent problems in the design work, from which she developed solutions at the time, compared with only completing reports once the artefact had been submitted.

Jacky felt that reviewing the Minor Reflective Reports assisted her to complete the Concluding Reflective Report by helping her recall and clarify her process:

“[The Minor Reflective Reports] were really helpful to use because I would have forgotten about so many things. I looked back to see what I thought the significant outcomes had been ... [the reports] had really given me some clarity” (Interview 3).

6.2.7.5 How the participant felt the intervention influenced thinking about how to approach design projects in the future

Jacky felt the SCRP had made an immediate impact on her design project by prompting her to think about her design process during the development of the project. She felt reflecting in this way during the project was more beneficial than only reflecting at the end of the project as she had done with previous subjects of study, and would help her grow into a better designer.

[Only reflecting at the end] ... stalls you growing as a designer, whereas doing it this way I managed to fix something by the end, and so I didn't have to fail to learn from my mistakes (Interview 3)

Jacky felt the SCRP would have more value in an industry context as it would help her solve problems during the project as apposed to only evaluating where she went wrong at the end of the project, meaning she could only modify her approach for the next project. She felt this reflective approach would help her become a better designer in a shorter period of time:

I guess in the industry it could be to my advantage. Knowing how to do this, it takes me less time to grow into a better designer. Instead of failing this project and thinking back at the end "Ah, what did I do wrong?" and then the next project to try and fix that; you can fix it in the first project. (Interview 3)

Jacky expressed the view that the SCRP had given her a framework in which to self-evaluate her design work and approach to practice. It had provided a structure to appraise her work, which would support her transition from the university context where she relied on teaching staff, to the industry context where she would need to do this evaluation herself. She concluded that she was now better prepared for industry practice as she could work with greater independence.

You need to examine yourself. I'm going to be out in the world now, there's not going to be a teacher saying "Ah, you got this mark for your assignment

because you did this, this and this wrong.” ... I guess now I’m going to have to do that for myself, and this was useful in that respect. (Interview 3)

Jacky elaborated further, acknowledging that the process of reflecting on her own design work and approach to her practice without the structure provided by the university environment would be difficult. However as a result of the SCRP, she was now more aware of how she reflected, and would be in a better position to recognise the reflective thinking inherent in her design process. From this platform she could now extend the reflective dialogue from her current practice of identifying a problem and determining a course of action, to also include a questioning of “why” the problem might exist in the first instance:

I think that it would be hard though because we get forced to [reflect at University] and it would be an easy thing to forget to do. I’ll pay more attention to [my reflection] ... instead of just going “Ah, that was bad, I’m just going to do this”. I’ll go “No, why was it bad?” and think through it. (Interview 3)

6.2.7.6 Summary of findings

Jacky demonstrated a sound understanding of the fundamental stages of the design process and described a reflective process that included pausing from the design activity, and identifying and critically evaluating understandings embedded in the project. Jacky felt the introduced reflective approach had helped her objectively detach from her project, and recall her process and thinking represented in the project. She stated she was now more consciously aware of the reflective process and was now in a better position to recognise the reflective thinking inherent in her design process. Jacky indicated the IRRs assisted her to identify problems in her design during the design activity, and helped her complete the CRR. She stated the SCRP had guided her to self-evaluate her design work and improve her approach to design practice. She felt the learning she identified by completing the reflective reports could be applied to a similar situation in the future. She now felt she could

work with greater independence and this would help the transition from university to industry.

6.2.8 CASE STUDY PARTICIPANT: HENRY

6.2.8.1 Participant background information

Henry was a committed student, however he spent much of the project struggling with the relationship between the principles of design and the crafting of his design artefact (including content development). While Henry engaged in widespread experimentation, thinking about his project, researching, and discussions with design staff, this activity was primarily focused on the artefact. It was not until late in the project that Henry started to successfully engage with the principles of design, however there was very little time remaining to resolve the design project as a whole. As a result, at the final project submission stage, the design artefact was underdeveloped, and did not realise the full potential of the design concept. This outcome was also evident in Henry's design process documentation, which revealed a primary focus on issues specifically relating to crafting of the artefact, and limited engagement with the principles of design.

6.2.8.2 Participant's observations about the design process

Describing his design process during the first interview, Henry indicated that he initially discussed with the clients what they required, to gain an understanding of their perspective and the way they were thinking. Henry talked about research as a means to support his concepts, and he stated he spent considerable time thinking about the design problem before beginning to represent the thinking in a physical forms:

I try to really see what the customer wants and always try and get in their head and look at things from how they want. I'll even do things for them that just help me to learn how they think ... I try and look at a lot of examples, but I try

to let whatever happens come out of the idea ... I tend to think a lot about it before I act on it physically. (Interview 1)

Henry described how he made a conscious decision to sketch his concepts on paper first as computer-generated designs can look too developed. In the early developmental stages of the design project, he felt they could restrict conversations with the client:

I try not to get on the computer until I've worked a sketch on paper first because I think a pencil sketch or something that you've drawn by hand leaves more room for imagination ... when [work] starts to get hard graphic edges on it, it seems too concrete [and the clients] get a bit scared. (Interview 1)

6.2.8.3 Participant's observations about their reflective process

Henry felt the process of reflection was something that had to be learnt, and it was difficult to verbalise the reflective process:

I think it's something that you have to learn how to do. I'm finding it easier. I was doing a bit of it last year, but for a lot of designers, it's trying to explain it verbally, that's the tricky thing. (Interview 1)

When asked if he feels he reflects on his completed work to consider alternative design outcomes, Henry initially indicated he felt this was a good approach, but did not currently implement this reflective process: "No, but I think that'd be a good way to do it, to see different possibilities" (Interview 1).

Henry indicated that when he stepped away from the design project he naturally reflected. He felt this process helped him to view his work through fresh eyes:

[Reflection] happens naturally when I walk away from [the design project]. I find definitely giving the work [some] space, you can come back and see it fresh. (Interview 1)

Henry described an approach where he consciously stood back from the design project to think about his process. He felt he was subconsciously thinking about his work, and standing back from his project helped him recognise this thinking. The lines and forms in his surrounding environment could trigger this reflective thinking:

I try to actively think about it, but it's such that it is sitting there in your subconscious and everything that you look at you relate it to that. I look around this room, it's just chairs and tables, but ... you see shapes and lines and things differently when you've been working with them. (Interview 1)

Henry described a practice of working in limited periods of time and then taking time away from the project to help maintain an objective view of the work:

I tend to work in bursts, so it's 3 days or so and then a week off or something to give [the work] that breathing space. If you are on it every day you start to doubt what you've done. It's important to have a distance. (Interview 2)

He later discussed the value of taking time away from the design work as it afforded a process of background thinking, which allowed the opportunity for broader consideration of the design work:

I like to start [the work] and do something and just go away, not really thinking of it, but it's in the back of my mind and just do other things ... Because it's there in the back, you notice things that could specifically feed into it. (Interview 2)

Henry felt the class presentations had triggered a process of reflection. He discussed how the formalised process of presenting his design work to an audience triggered a process of standing back from the design work and viewing the work from an external perspective:

It was mainly the feedback and the act of having to present [the work] formally really assists in being able to put yourself outside as an audience and look at your own work. (Interview 2)

6.2.8.4 How the participant felt the intervention impacted on their design project

At the time of this third and final interview, Henry had not yet completed the Concluding Reflective Report due to a project submission extension. As a consequence many of the questions relating to the Concluding Reflective Report were not asked and this has impacted on the quantity of material reported here.

When asked during the first interview how the SCRP impacted on the development of his design project, Henry highlighted the benefit of having to document his process in written form. He identified how this helped him recall his design process and he expressed surprise at what he had forgotten.

I've realised it's worthwhile because I've kept notes so far. I've had mental blanks today trying to recall things, I look back through my notes and it's surprising the things I've forgotten. (Interview 1)

Engagement with the design process was a theme that also evident in Interview 2. Henry felt he had gained an improved understanding of his design process through the process of writing the reflective reports and the thinking this triggered.

I thought about things I didn't really consciously think that I was doing, so that's what this is more about, becoming conscious of the process. (Interview 2)

Henry had been experiencing difficulty deciding on a final design concept and he indicated this could be a frustrating situation, however he had learnt a significant amount about the design process. Henry indicated this greater understanding of the design process was an important learning outcome for him:

I could easily feel a lot of frustration over this session, but I just try and put myself into the future and think “well, if I get a bad mark, what the hell”, because I’ve learnt so much about the design process.

(Interview 2)

During the third interview engagement with the design process was also raised. Henry indicated the reflective reports helped him identify and describe his design process in an explicit manner. This helped him when looking back over his process as he sought to solve problems arising during the development of the design project:

[The reflective reports] highlighted a lot more about the process that you can analyse and if you get stuck along the way, you can [review] a certain part and you’re back on track. (Interview 3)

Henry indicated that he had greater difficulty completing the second reflective report than the first. He felt he did not have the same volume of material to work with as he’d had at the first report. Although more work had been completed, he felt the project had not developed to the same extent:

It’s becoming harder and harder to write these reflective reports. At the point in the second [report] I didn’t have that much in material because not that much had changed from what I was in the first one, apart from more work that I’d done. (Interview 2)

6.2.8.5 How the participant felt the intervention influenced thinking about how to approach design projects in the future

When asked if he reflects while designing, Henry agreed that he did, and suggested that the SCRP took his practice a step further than his standard practice, “I find a lot of us do it anyway, but this is analysing and streamlining the process.” (Interview 1)

Henry stated the process of writing the reflective reports had helped him identify what he had learnt from the project in a manner that he felt he could apply as part of his standard approach to designing:

Most of [my reflections] have been about what I've learnt. To pin that down, it can be quite abstract sometimes and to really write down and define what you've learnt can help it to stick in there as a new habit. (Interview 3)

6.2.8.6 Summary of findings

Henry demonstrated an understanding of the fundamental stages of the design process. He felt he continually reflected during the design process, and paused and consciously stood back from the activity of designing to think about his project. Henry also discussed spending time removed from the design activity to engage in a process of background thinking to support broader consideration of the design work.

Henry felt the SCRP had helped him to identify and explore issues inherent in his design process in an explicit manner, which had helped him solve problems arising during the development of the design project. The process of writing the reflective reports had helped him document and think about his design process, which helped him learn from his design project in a more effective way. He felt the SCRP had helped him identify what he had learnt in a manner that he could use when approaching projects in the future.

6.2.9 CASE STUDY PARTICIPANT: BETTY

6.2.9.1 Participant background information

Betty was a high achiever in this subject of study. She effectively engaged with the relevant principles of design in line with her project aims and she successfully applied these principles through to the making of her design artefact. The project

had clear parallels to a graphic design industry context in relation to the primary focus, with the exploration of secondary applications for the artefact demonstrating an innovative level of design thinking. The design process underpinning her design artefact was comprehensive.

6.2.9.2 Participant's observations about the design process

In describing her design process, Betty indicated once she had the “topic” or design brief, she entered a research phase that included surveying the client’s competitors. She then developed design concepts using a sketching process, presented the concepts and received feedback from the client, and then refined the designs:

I will do some background research . . . then I’ll just do a few different sketches, a few different variations ... and then narrow it down from there as far as what works and what doesn’t work . . . and then get a response from the client, and then it’s ... an elimination process from then on. (Interview 1 & 2)

Betty indicated she usually started her design process using paper, both in sketch and text form, as a way of visualising her ideas, and also used such techniques as brainstorming and mind-map diagrams to help the concept development phase:

I usually start on paper ... I illustrate on paper or even I write ... just to get some ideas on paper . . . Text, words, brainstorming, diagrams with ... mind-maps, they tend to work as well. (Interviews 1 & 2)

When asked if she approached her projects in a university context differently to how she might approach an industry context, Betty stated she was more thorough with her university design work as she felt she could spend more time developing the project, whereas in an industry context she thought there would be shorter time constraints:

Yeah, most of time university projects are a little bit more thorough within their research and within their outcomes ... because there’s a deadline, [the

industry context is] usually faster than a university project ... the process might not be the same or in-depth. (Interviews 1 & 2)

Betty described her concept development process. She described a situation where she created a “flow” in her thinking and the concept “just came out”. She had a number of ideas related to her design concept, and she used her mind-mapping technique to stand back and understand her concept in a broader perspective. From this approach Betty identified a core concept to provide a primary focus for her project:

I think I had a lot of ideas in my head of this concept and I needed a way to map it out . . . the way that I ... visualise a concept is by looking at it as a whole, so I decided what was the most important ... core concept. (Interviews 1 & 2)

6.2.9.3 Participant’s observations about their reflective process

Betty described how she would pause and physically step away from the design work for a period of time, and then look back over what she had completed. “I reflect by doing something and then walking away and taking some time or some space . . . and then look back at it” (Interviews 1 & 2). Her reflective approach might include further research or talking to other people, including the client, to get a broader and more objective perspective:

I would reflect in ways [like] doing further research ... just to get a broader sense or something ... or [seek] responses from several different people, including the client. I’d try and get more of an objective response from other people’s opinions and interpretations.
(Interviews 1 & 2)

Betty explained she sought opinions from what she called creative and non-creative sources, including her family and friends, to facilitate a “generalised view”. From this position she would make her own interpretation of the collected opinions:

I'll get the opinions [from] my Mum or my sister or boyfriend or friends.
Definitely, creative people and non creative people, so that way I can get a
generalised response and then I'll make my own interpretation of what I like.
(Interviews 1 & 2)

Betty pointed out that she looked back over the design project and thought about what she might have done differently, "all the time". While she would often be disappointed with the project outcomes, Betty acknowledged that this was a developmental process that identified new learning from the project:

All the time, I tend to look back and think "oh, no, I can't believe I designed that", but each project requires skill and it's a process of developing skill, so I'll often look back going, "I could have done that so much better" because of the skill that I've learnt now to get to this point. (Interviews 1 & 2)

Betty indicated it was possible that she might apply new learning to future design projects: "I can probably take basic elements from projects, every project, and apply them to the situation." When prompted further, Betty described a situation where she transferred the learning from one project to another. She had worked on a university design project, which she felt allowed her time to research the surrounding issues and identify new learning. She later applied that new learning to a design project in an industry context:

I was designing posters for a project that we did at University ... and I was able to research what the poster was about and what it was for and how a poster works as far as it being medium of communication. I learnt from that initial response ... and then I was able to apply it to an actual outside project that I had developed with another client. (Interviews 1 & 2)

6.2.9.4 How the participant felt the intervention impacted on their design project

Betty indicated that she felt comfortable engaging in the reflective process of completing the first and second reports:

I thought I was a little bit vague with my response [for the first reflective report] because I didn't really give examples that much, but otherwise it was easy for me to answer the questions. (Interviews 1 & 2)

Betty indicated that being required to artificially pause from the design project and complete the reflective reports did not have a negative impact on her design work, although she felt limiting the time spent on the formalised reflection was important:

I wouldn't say disruption in a bad way. It's good if I only allocate a certain amount of time to [reflecting] ... I don't mind taking time to do it now, as long as it doesn't take too long. (Interviews 1 & 2)

Betty agreed that the structured reflection in the form of the Minor Reflective Reports she completed during the activity of designing had influenced her design process; it had helped her to document her design process with greater effectiveness:

In the past we've done reflection projects at the end of the [design] project and if I don't write things down I will tend to forget about it and not be able to reflect as accurately as I could have. (Interviews 1 & 2)

After completing the first Minor Reflective Report and not having written notes to refer back to, Betty subsequently modified her process approach and documented the design process leading up to the second Minor Reflective Report.

[Discussing the first Minor Reflective Report] As long as I could remember things, because I have a bad memory ... but it was alright, it was fine for me to sort of think back, it wasn't too far in the past to forget.

[Discussing the second Minor Reflective Report] The good thing is I have jotted down steps in my process ... it was good to look back and see what I did as far as the process goes. (Interviews 1 & 2)

During the third interview, Betty discussed how the SCRP helped her recognise her own personal design process and realise that different designers have different processes: "... understanding your own process more, perhaps in a personal way, realising that just everyone's different". She now recognised the value of the three Minor Reflective Reports and how they helped her document her design process. They provided objective evidence of her process and she did not have to rely on subjective judgements or assumptions when writing the final reflective report:

I used [the Minor Reflective Reports] in the sense that there was a point in time where I was honest at that time, so I can't ... look back and maybe judge or assume what I did back then, so that's why I used them. (Interview 3)

Betty made the point that the structured reflection had helped her step back from the design activity and review her design activity. She described how this process helped her to identify if she could be approaching the design project in a more efficient manner:

I'm able to look back and look at what I'm doing as a whole ... It helps me to learn more about what I'm actually doing and how I can be more efficient ... I tend to waste time, you get really into it and then you don't realise, ooh, got to move on. (Interviews 1 & 2)

Betty felt the Concluding Reflective Report made her reflect in numerous ways. She described using reflective tools that included pausing from the design activity to consider her actions in the current situation, seeking feedback, engaging other creative people in dialogue, making greater use of concept or mind mapping techniques, and experimenting through trial and error:

I found the reflection process [of the Concluding Reflective Report] ... made me reflect in many ways. I was utilising my resources and the tools that reflecting

allows you to use quite a lot. Not only was I getting feedback, asking questions from people, discussing with other creative people, I felt like I was doing mind maps more so, I was experimenting. I wish I'd experimented more, because now I believe that experimenting is like a trial and error kind of situation.

(Interview 3)

Betty expressed the view that she had gained an understanding and awareness of the way she designed. She described a process of standing back from the design activity with the intent to achieve a broader perspective on any problems that might have emerged. She felt that what in the past she might have thought was procrastination might actually be an engagement in the process of reflection:

What I gained from [the SCRP] was an understanding that I'm reflecting ... gaining an awareness of what I'm actually doing ... a realisation that I might have been procrastinating when there was a problem, but realising what I was doing ... [was] reflecting. (Interview 3)

Betty felt the SCRP helped her think in greater depth about what she was doing during the design activity. Rather than primarily focusing on getting the design completed as she might have done in the past, the reflective process led her to question her design approach during the design activity:

When you reflect ... you're stopping and you're thinking about it and you're questioning, "what's happening, what can I do better, why am I doing this, how can I improve on it?" (Interview 3)

Betty discussed the way the SCRP helped her problem solve. In the past she could come up with a creative concept, however, she felt she could struggle to solve problems that emerged during the implementation of the concept:

One of the most important things for me in reflecting is trying to solve problems, because that's what usually happens when you reflect, you ... want to improve it and a problem may get a bit challenging. (Interview 3)

Betty explained that the introduced reflection helped her reflect during the development of her design project, not just reflecting at the end of the project as with past projects. This had the advantage of allowing her to improve her project as she progressed: “I was not just leaving [the reflection] to the end. It was a process that I was able to make improvements while I could”. She felt this reflective process influenced the direction of her project and the outcomes:

Without those points in time, I probably wouldn't have gone in the direction that I did, or solved the problem that I did, or utilised the short time span that I had. (Interview 3)

Betty provided an example from a previous subject of study where she felt the design work would have benefited from the introduced reflection during the development of the design project. She described a situation where she was not happy with the outcome of the final design project and noted that if the design team had paused during the design activity to reflect on the design work, the final outcomes might have been improved:

One [previous design project] ... I wasn't happy with the outcome and the group wasn't either. I really... think it's because we didn't have that time to reflect ... we need[ed] to stop and say “look, where is this project going?” (Interview 3)

Betty subsequently made further observations about her project through writing the final reflective report. Through the process of responding to the learning prompts in the report, she recognised there were aspects in her project she could have improved further and other directions she could have taken:

Looking back at it now, I was realising that there could have been things that I could have improved on, I could have done this change, I could have gone a different direction. (Interview 3)

6.2.9.5 How the participant felt the intervention influenced thinking about how to approach design projects in the future

Betty indicated that she would incorporate the principles of reflection when approaching design projects in the future. She thought she might not be employ the introduced reflection in an industry context, however she felt she now had a greater awareness of the value of reflection and when she should consciously apply it:

I don't know if I'd do the same [reflection] when I'm leaving University ... but I would definitely utilise a different strategy or something next time when I design. I'll probably be more conscious of what reflecting means and try and utilise that process by myself more . . . and just be conscious that maybe I do need to reflect if I'm at a point where I am not getting anywhere or I'm stuck.
(Interview 3)

6.2.9.6 Summary of findings

Betty demonstrated a sound grasp of design process fundamentals and described a process that had parallels with the Double Diamond Process Model described by the British Design Council (2005). She described a reflective approach that included pausing and standing back from the design activity with the aim to get a more objective perspective of her work. Betty felt she regularly looked back over the project and thought about what she might have done differently, and felt reflection helped her learn from her project in a way that could also inform how she might approach projects in the future.

Betty stated the IRRs had influenced the approach to her design process and helped her document her process with greater effectiveness. She felt the IRRs led her to question her design approach during the design activity, and prompted thinking that helped her improve the project as she progressed. Betty indicated the process of completing the reflective reports had helped her step back from the design activity, look back over her project in an emotionally detached manner, and achieve a broader perspective of her work. She believed she now had a better

understanding of the reflective process, and considers what in the past she had thought was procrastination, might be an engagement in the process of reflection. Betty felt she would incorporate the principles of reflection in her design practice in future, however was not sure how she could employ the SCRP in an industry context

6.3 Chapter Discussion

6.3.1 INDUSTRY EXPERIENCE

On the whole the participants had very limited industry experience. No participant had worked in a full-time industry capacity, however most participants had completed some design commissions in various forms. Most of the participants described their industry experience as having completed some small design commissions, while one participant indicated he had been undertaking freelance commissions for the previous 18 months.

6.3.2 OBSERVATIONS ABOUT THE DESIGN PROCESS

When comparing the participant descriptions of the design process with the Double Diamond Process model (Design Council 2005) different levels of understanding were demonstrated. Most participants demonstrated an understanding of the fundamental phases of the design process, although to varying levels. One participant (Henry) demonstrated a simplistic understanding of the design process, while Paul on the other hand demonstrated a comprehensive understanding. One participant (Emma) primarily referred to what she had learned about the design process from her studies prior to entering university. While most participants described their design process in a linear manner, Thomas and Henry referred to the process as iterative. Elements of the design process that were identified by the participants included reference to: a client brief; concept development; research;

design or visual roughs; implementing design roughs; client meetings and presentations.

6.3.3 APPROACH TO REFLECTIVE PRACTICE

The findings suggest the case study participants did not feel they necessarily consciously reflected, or reflected in a structured manner during the activity of designing. The initial descriptions of their reflective practice provided by the case study participants were simplistic, however with prompting, most of the case study participants described their practice in more detail. This could suggest that their reflective practice was largely intuitive, that is, while they were aware they reflected, they were not necessarily aware in an explicit manner how and when they reflected.

While some stages of reflection were common across all participants' descriptions of their reflective practice consistent with the 4-Step reflective process described by the researcher, for example, the process of pausing and standing back from the project with the aim to achieve an objective perspective of their work, not all stages were described by all participants.

A common reflective stage described by the participants was the process of reflecting back over their project once it was finished with the aim to learn from their project. As the participants progressed through the interviews it was clear that although they all felt they reflected back over their design project once it was finished, this occurred to varying degrees. Almost all cases draw observations from their project in a manner that addressed principles of design, for instance issues of typography, or publication layout. For some participants, their observations remained within the context of their project, while others shifted their observations beyond the project context and engaged with the broader context of their practice. The one exception was Emma, whose thinking was primarily focused on issues of project content and on the whole did not engage with the principles of design.

There were some distinctive features evident in those case study participants who appeared to have a more developed reflective practice. A common thread was thinking about past projects with the aim to inform development of the project. Some participants also thought about their project in a manner that could inform their approach to other projects in the future. Thomas, Lisa, and Henry specifically referred to thinking about their project while removed from the design activity, for example while mowing the lawn, or travelling on the train.

6.3.4 IMPACT OF THE STRUCTURED CRITICAL REFLECTIVE PRACTICE (SCRP)

The SCRCP appeared to have varying levels of impact on the case study participants' reflections and the development of their projects. Most of the participants felt the SCRCP helped them to identify the thinking inherent in their design project. This was evident with those participants who had either a well-developed reflective practice, or improved their reflective practice over the course of the intervention.

Most participants felt the SCRCP helped them critically reflect on their project. That is, they felt they reflected on their project in ways that challenged their perspective about their project. This critical reflection was evident with Thomas who already had a well-developed reflective practice prior to the intervention, and those participants who improved their reflective practice during the intervention.

During the course of the intervention, the case study participants reflected with differing impacts on the advancement of their projects. Most participants reflected in ways that resulted in advancement of their projects, typically evident when they critically reflected, however, not all achieved this. Lisa critically reflected, however this was primarily focused within the project context and she was resistant to thinking beyond the project context. Henry spent a lot of time reflecting on his project, but there seemed a disconnect between his reflections and his ability to apply this thinking to his project in a manner that advanced the project. Emma on

the other hand, appeared to have a simplistic reflective practice, her thinking occurred at a surface level, and she did not critically reflect on her project in a manner that resulted in an advancement of her project.

6.3.5 IMPACT OF THE STRUCTURED CRITICAL REFLECTIVE PRACTICE (SCRP) ON PARTICIPANT'S THINKING ABOUT FUTURE PROJECTS

Linking thinking about the project to thinking about future projects was a theme evident in many of the observations made by the case study participants. Henry felt the SCRCP could have some impact on his design practice, but did not appear to link his reflective thinking to the development of his project to the same level as the other participants. Thomas, who appeared to have a well-developed reflective practice prior to the study, further refined his reflective practice (RP), which included linking his design RP with his computing science RP.

Most participants linked their reflections from the project to thinking about future projects. The participants who made this observation were among those who critically reflected on their project. That is, their reflective thinking helped them critically engage with the principles of design and apply this thinking to their artefact in a way that improved their project. Through this reflective thinking process they linked their reflections from the project to thinking about future projects.

Not all participants linked the reflections from the project to thinking about future projects. While Lisa critically reflected on her project, she did not apply this thinking beyond the project. She indicated she was not sure how she could apply the SCRCP to an industry context. Emma did not critically reflect on her project in a manner that helped her move her thinking from a focus on project content. She did not engage with the principles of design, nor think beyond the project in ways that resulted in improvements in her project.

6.3.6 THE PICTURES THAT EMERGE FROM THE CASE STUDY PARTICIPANTS

The SCRP had varying levels of impact on the case study participants' projects, and on closer examination a number of different pictures emerge.

Sam, Paul, Jacky, and Betty all achieved a project outcome that was realised to a high level of design resolution with clear parallels to a graphic design industry context, although Betty's artefact extended further by also layering over her project, issues of sustainability. These participants all commenced the intervention with an undeveloped level of reflective practice and were initially unsure about how to engage with the SCRP, however with guidance, they responded to the learning prompts in a critical manner. These participants felt the SCRP had helped them think about their design process more effectively, and identify and analyse the thinking and learning inherent in their project. By the end of the intervention all case study participants felt the SCRP helped them learn from their project in a more critical manner than they had in past projects, and they felt their project outcomes were realised to a higher level as a result. It was evident from their reflective tasks that: they were engaged with the principles of design inherent in their project; they critically reflected; and achieved transfer at low road and high road levels. These participants all felt the SCRP had a relevance and direct benefit for their design practice.

The picture that emerges from Sam, Paul, Jacky, and Betty's experience suggests that SCRP can support learners to improve their reflective practice in a number of ways. The SCRP supports learners to identify the thinking inherent in their project, and prompts them to reflect on their project in a critical manner, and in a way that informs the development of their project. Their experience also suggests that SCRP can help learners connect reflections and learning from their project with thinking about projects in the future, and thinking about the broader context of their design practice. Teachers should be aware that learners with an undeveloped reflective practice may benefit from further support in the early engagement stages with SCRP as they learn how to reflect in a more structured and critical manner.

A different picture emerges when unpacking Thomas' project experience. He was also a high performer, however his project had a greater research focus and depth of engagement with the principles of design than many of the other participants. His final design artefact was innovative and had a high level of experimentation, with the intention to use the project to springboard into Honours level study. Thomas had a developed reflective practice prior to commencing the intervention, and was engaged with the SCRP quickly and with minimal guidance. He was one of only a few participants who stated he also reflected on his project when removed from the design activity (he provided the example of thinking about his project while mowing the lawn). Thomas felt the SCRP had influenced the way he thought about his design project, and encouraged him to think about his design approach in different ways. When considering the implications for his design practice, Thomas realised he could employ his approach to reflective practice from his computing science studies to his design practice.

Thomas' experience suggests that for those learners with a pre-existing developed reflective practice, the SCRP may still have a role to play, however not to the same level as those with an undeveloped level of reflective practice. It is likely that these learners will not require the same level of teaching support as others, and they may engage with the SCRP in a more self-directed manner.

Lisa was another participant who had a greater research focus and depth of engagement with the principles of design in her project artefact, however she did not make this shift in her focus until late in the project. Prior to engaging with the intervention Lisa had on the whole an undeveloped reflective practice. She felt she typically reflected during the development of a design project, and stated she had difficulty standing back from the design activity to achieve an objective perspective of her work. Like Thomas, Lisa discussed a process where she would reflect when removed from the project (she talked about reflecting while travelling home on the train). Lisa felt the SCRP helped her think about the design process more effectively,

and identify and analyse the thinking and learning inherent in her project. Initially Lisa demonstrated a resistance to the SCRP and she states she found identifying critical incidents from her design process difficult, and did not see the relevance of some of the learning prompts, however towards the later stages of the intervention she demonstrated a greater appreciation of the value of the SCRP. Lisa acknowledged the SCRP helped her stand back from her project and achieve a greater objective perspective, and connected thinking about her project with thinking about further development of her project. She did not however appear to grasp how her reflective thinking could inform her approach to other projects in the future or the broader context of her design practice. That is, while Lisa demonstrated a critical level of reflection she did not connect reflections about her project with thinking about how they could inform her approach to other design situations in the future.

Lisa's experience suggests that although a learner may demonstrate a high level of thinking through the design project, this does not necessarily mean they will successfully engage with a structured and critical approach to reflective practice. Lisa's experience also suggests that while a learner might connect reflecting from the project with reflecting about further development of the project, this does not necessarily mean learners will connect their reflections with thinking about projects in the future or in the broader context of practice. Lisa's resistance to the SCRP suggests that some learners might not see the value of the SCRP, and may engage late, or not at all, despite a teachers best efforts to address the situation.

Henry was enrolled in a double major degree, studying both visual arts and graphic design. While Henry was a committed student, he spent much of the project struggling with the relationship between the principles of design and his design artefact. That is, he was primarily focused on the making of the design artefact and had difficulty connecting this work with the principles of design practice. His project artefact was largely illustrative in nature and Henry had difficulty locating the work in an industry context. Most likely as a result of these factors, Henry's final design

artefact was unresolved. While Henry's reflective practice was largely undeveloped prior to the intervention, he did discuss spending time removed from the design activity to engage in a process of background thinking to support broader consideration of the design work. Henry felt the SCRP had helped him to identify and explore issues inherent in his design process in an explicit manner, and this had improved his ability to solve problems arising during the development of the design project. He also felt the SCRP had helped him identify what he had learnt in a manner that he could use when approaching projects in the future.

Henry's experience suggests that the quantity of thinking by the learner does not necessarily equate to a quality of thinking or the ability to critically reflect in a way that advances the project. This outcome suggests a learner might spend considerable time reflecting on their project, however, this does not necessarily mean they will critically reflect, or connect their reflections from the project in a way that advances the development of the project, or think about their project in the broader context of their practice.

Emma's experience was quite different to the other case study participants. She had difficulty engaging in a meaningful way with the principles of design and her final project artefact did not meet the minimum standards required for this level of study. Emma had difficulty making sense of new ideas that were presented, and was primarily focused on issues of content rather than engaging with the principles of design (in her case the principles associated with publication design). Emma's prior reflective practice was undeveloped and although she thought about her project with the aim to learn for future design projects, she did this only because this was an assessment requirement.

While Emma felt the SCRP helped her think about her project, she stated she found it difficult to identify critical incidents from her design process. Despite acknowledging this concern, she did not appear to shift her thinking away from surface issues and critically reflect in a way that advanced her project. This outcome

was also echoed in her inability to achieve transfer. While she felt it was beneficial to connect thinking about her project with thinking about approaches to future projects or the broader context of her practice, she did not feel the SCRP was useful in this instance as her primary problem was with time management. The reflective tasks demonstrate that while she engaged with the SCRP, her thinking was largely at a surface level and she did not engage at a critical reflective level.

The outcome from Emma's experience suggests that engagement with SCRP does not necessarily mean the learner will reflect at a critical level, nor reflect in a way that helps them engage with their project artefact in a deeper manner. The SCRP may help a learner identify issues of concern or aspects of their project that require further attention, however this does not necessarily mean the learner will apply these reflections in a meaningful way to the development of their project artefact, or to thinking about how this might influence approaches to projects in the future.

6.4 Chapter Summary

Prior to the commencement of the intervention, the case study participants had very limited industry experience, and demonstrated different levels of understanding about the design process. The descriptions of their approach to reflection suggest that on the whole their reflective practice was largely intuitive, they did not reflect in a structured way, and they were not necessarily explicitly aware how they reflected.

Most participants felt the structured critical reflective practice (SCRP) helped them critically reflect on their project, and that it supported them to identify the thinking inherent in their process. They felt the SCRP had helped them learn from their project in a more critical manner than they had in past projects, and their project outcomes were realised to a higher level as a result.

From the interviews it was apparent that the participants when supported by the SCRP, critically reflected on their process by challenging how they thought about their project. The participants also connected their reflections from the project with thinking about further development of their project, and thinking about future projects. However, not all participants made these connections in ways that helped them advance the development of their project.

The interviews further reveal that those learners with a developed level of reflective practice, may engage with the SCRP in a more self-directed manner, and may not require the same level of learning support as other learners. It is also apparent that although a learner may demonstrate a high level of thinking in the design project, this does not necessarily mean they will successfully engage with a structured and critical approach to reflective practice. Nor does the quantity of thinking by the learner necessarily equate to a quality of thinking or the ability to critically reflect in a way that advances the project. Many participants described an emotional attachment to their projects that, in some cases, persisted well beyond completion of the artefact. In these cases particularly, the SCRP gave participants a way to step back from their projects, view them more objectively, and in some cases take opportunities for improvement that would otherwise be lost.

7 DISCUSSION AND CONCLUSIONS

7.1 Introduction

This chapter presents the outcomes of this study. It includes a discussion of the findings framed by the research questions, and conclusions from the study. Limitations of the study are considered, implications for research and theory are discussed, and the implications for practice in design education are also considered. The chapter concludes with a brief summary.

7.2 Discussion and Conclusions

This study sought to understand how a structured and critical approach to reflective practice can support graphic design students to learn from their project in ways that foster the conditions for transfer. A reflective framework was developed to guide learners to critically reflect on their project in specific ways and was implemented in a third and final year graphic design subject. The main research question asks:

How do graphic design students learn from a project when supported by a structured and critical approach to reflective practice?

Three sub-questions were devised to unpack the main research question:

- Sub-question 1: How do learners reflect when supported by a structured and critical approach to reflective practice?
- Sub-question 2: What impact did learners' reflections have on the development of their projects?
- Sub-question 3: How do learners' reflections influence their thinking about their design practice?

7.2.1 SUB QUESTION 1: HOW DO LEARNERS REFLECT WHEN SUPPORTED BY A STRUCTURED AND CRITICAL APPROACH TO REFLECTION?

The findings from this study demonstrate that when supported by a structured and critical approach to reflective practice, students reflected on their design process in a way that is consistent with the principles of reflection-on-action (Lawson 2006; Reymen 2003; Schön 1983). This was evident when students deliberately paused to think back over their design process, evaluated the understandings that they had brought to the development of their project, and considered how they might now approach further development of their project or design projects in the future. Stages one and two of Reymen's reflection-on-action are discussed below. Stage three is discussed in sub-question three due to its focus on design practice.

Pausing by participants, to reflect back over their design process, was evident in this study when they responded to the reflective assessment tasks. Guided by the learning prompts in the tasks, participants described their design process in an explicit manner by writing a summary of their activity describing: the development of their design concepts; their research; stages of their schemata (such as concept sketches, design roughs, and prototyping); and crafting stages (implementation of design roughs and prototypes into the final artefact). In this study all participants demonstrated this type of reflection.

When participants evaluated the understandings they brought to the development of their project, they did so in ways that were consistent with the cognition levels Interpretation and Judgement (described in the cognition taxonomy, Section 3.3.3.1.2). Interpretation was evident when participants sought to explain or make sense of an event or statement by interpreting information from the project. This typically was represented when participants identified what they considered to be critical situations (Reymen 2003) in their design process. Judgement was evident when participants sought to explain or make sense of an event or critical situation by moving beyond interpreting information to offering a value judgement or claim. This was evident for example when a participant recognised that the introduction of

a specific graphic element had been influential to the development of the project (Interpretation) and then explained their reasoning (Judgement), or recognised a shift in their approach (Interpretation) and then explained why they felt the shift was significant (Judgement). This study reveals that learners can reflect in a manner consistent with the identified cognition level Interpretation, but not all are likely to reflect in a manner consistent with the cognition level Judgement. This suggests that more support may be needed to assist learners make Judgements from their reflections.

This study also demonstrates that a structured and critical approach to reflective practice can support students to reflect on their project in a critical manner. This outcome has parallels with what Mezirow (1990) describes as critical reflection where the learner critiques the presuppositions on which their beliefs have been built in a way that leads to a transformation of perspective. This outcome also responds to common criticisms of reflective practice where reflective thinking by the learner can often be non-critical and non-reflective in nature (Hatton & Smith 1995; Johns 2006; Kember et al. 2007; Moon 2004). In this study critical reflection was evident when participants challenged their thinking in an analytical manner, such as identifying critical situations (Reymen 2003) from their design process for review, and then challenging their thinking about their approach to that situation. Evidence of critical reflection was prevalent. An example of this level of reflection was when a participant reflected on why a project outcome did or did not happen, or considered alternative approaches or other points of view of the project. Importantly, they questioned their reasoning in an analytical manner. A typical reflection by participants in this study involved questioning the application of type in their project. This was evident when participants, through their questioning, challenged their own views on the principles of typography in a way that resulted in a change to how they thought about typography. This form of reflection resulted in a broadening of their perspective about typography. It should be noted that whilst this study demonstrates that graphic design students can critically reflect when supported by a structured and critical approach to reflective practice, addressing

concerns of limited evidence-based research demonstrating critical reflection (Hatton & Smith 1995; Kember et al. 2007), this finding is dependant on how critical reflection is defined and the specific context in which the study is located.

Further, this study has parallels with the findings of Hatton and Smith (1995) and Kember et al. (2007), who conclude from their studies that critical reflection is unlikely to occur frequently. It is important to be aware that in this study, not all participants reflected in a critical manner, nor did participants critically reflect all the time, however, the study found that one way to support critical reflection is through critical incident analysis (Ghaye & Lillyman 1997; Tripp 1993). Critical incident analysis aligns with the principles of reflection-on-action described by Reymen (2003), where designers evaluate the design work by analysing critical situations in their design process. In this study, this form of evaluation was evident when participants reviewed their project, identified critical moments in the development of their project, and then made value judgements or claims about why they thought the incidents were critical. For example, some participants identified elements of their artefact that would benefit from further refinement, like their application of type or their page layout approach. Other participants identified aspects of their process that they felt they could improve, for example, acting on the feedback from class presentations, or considering alternative solutions to the design problem. Having identified actions they could take, those participants who reflected in a critical manner also explained their reasoning in a way that involved a change in their perspective about the project. For example, participants explained why they should modify their approach to the application of type, or why they should apply the feedback received from the class presentations. This finding demonstrates that prompting learners to analyse critical situations from the design process is an important way to support them to reflect on their project in a critical manner. Previous studies have explored the benefits of prompting designers to identify critical situations from the design process (Badke-Schaub et al. 1999; Reymen et al. 2006; Wallmeier et al. 1999), however, these studies do not specifically link critical incident analysis and critical reflection as this study has done.

A further finding from this study indicates that the motivation to reflect varied not only amongst participants, but also varied for individuals between the separate reflective tasks. This was particularly evident for those participants who, where not convinced about the merits of the reflective tasks, preferred to remain centred in the activity of designing, and were reluctant to pause to record their reflections. Many participants warmed to the reflective practice as it unfolded, whilst for others their primary focus remained on the creation of the design artefact. This may be related to the fact that core modes of learning in project- and studio-based learning are traditionally non text-based, and students are likely to have varying abilities to articulate their reflections in written form. James (2007) reminds us that it is not unusual to find a tension evident in the studio classroom for both students and faculty, between writing and the practice of designing. A further consideration is that learners' success or otherwise to express their reflections in written form, relies on their capacity with written language (Moon 2005), which may have also impacted on the level of motivation participants in this study brought to the reflective tasks.

Notwithstanding issues of motivation, in this study, participants engaged more effectively with the reflective practice once they had completed the first reflective assessment task. Many participants were unsure how to respond to the first reflective task, and required support to complete it, but on the whole, participants sought less support for the second task, and many completed the third task without involvement from the teacher. This finding indicates participants became comfortable with the reflective assessment tasks as the project progressed. As learners are typically familiar with the learning-by-doing approach common in project-based learning (Dorst & Reymen 2004), one may assume that this approach to learning would be an effective way for design students to learn about reflective practice. The findings from this study support this assertion.

The findings also indicate that scheduling of reflective practice in a project- and studio-based learning environment, requires careful consideration. In this study during the project most participants identified aspects of their project that they felt could inform how they approach their practice in the future. However, in the final reflective task, completed after the project artefact was submitted, fewer participants achieved these forms of reflections. It is not clear why this might be the case, however one issue to consider is learner motivation. In a project-based learning environment the artefact is typically a primary focus for learners and this is where their major investment of energy often occurs (Lawson 2006). Some case study participants indicated they had difficulty finding the motivation to complete the final reflective task after they had submitted their project artefact. The case study outcomes also suggest that for some participants, more time to emotionally distance themselves from the artefact may have been beneficial. A further issue to consider relates to the time required to complete the reflection (Reymen 2001). These findings suggest that further investigation into scheduling of reflective tasks in relation to artefact scheduling is needed to gain a better understanding of the relationships between learner motivation, reflective practice, and project- and studio-based learning.

7.2.2 SUB QUESTION 2: WHAT IMPACT DID LEARNERS' REFLECTIONS HAVE ON THE DEVELOPMENT OF THEIR PROJECTS?

Findings from this study demonstrate that students can connect their reflections about the project with thinking about further development of their project. In this study these reflections occurred in a critical and non-critical manner. It was evident that those participants who reflected critically, challenged their thinking about the project in an analytical manner, which ultimately resulted in a change in perspective about the project. This transformation in perspective typically provided options for subsequent development of the project that the participants had not previously considered. On the other hand, those participants who connected their reflections with further development of the project, but in a non-critical way, implemented solutions within their existing frame of reference (what they already knew), and

would often employ a trial and error approach to problem solving. This resulted in limited further development of the project when compared to those who critically reflected. This is an important outcome and supports the research of Mezirow (1990) and Moon (2004) who found achieving a transformation in perspective has the potential to support the development of new learning.

While this study demonstrates that participants connected their reflections about the project with thinking about further development of their project, this did not always occur in a consistent way. Analysis of the interview transcripts reveals four patterns of reflection: a participant who critically reflected from the beginning of the project; participants who critically reflected when supported by the first reflective task; those who critically reflected late in the project after completing repeated reflective tasks; and those who did not critically reflect despite completing the reflective tasks.

From the beginning of the project Thomas reflected on his project in a critical manner by questioning his process in a way that challenged his view of the project, and then applied this thinking to inform further development of his project. He demonstrated a more conceptual approach to his project, that is, he focused more on the development of project concepts and engagement with the principles of design practice and theory, than he did on the crafting of his project. While Sam, Jacky and Betty also reflected on their project in a critical manner, this was not readily apparent until they had completed the first reflective task. These participants demonstrated an initial uncertainty while completing the first reflective task, whereas Thomas approached the first task with greater confidence. The interviews reveal it was the experience of completing the first reflective task that supported Sam, Jacky and Betty to connect their reflections in a critical manner with further development of the project.

Some case study participants took longer to achieve similar outcomes. Initially both Paul and Lisa failed to question their approach in a way that challenged their

thinking about the project. However, late in the project having completed the second reflective task, the nature of their reflections shifted, and they both critically challenged their views about their project. For example, Paul, when trying to resolve his branding project, initially focused on changing the form of his artefact rather than challenging his approach to the project. Through the process of completing the second reflective task, he managed to question his approach in an analytical way, which resulted in a shift in how he thought about his project. In this instance his reflections shifted from a primary focus on the artefact to a broader consideration of the principles of branding. This shift in focus supported a broader perspective of his project, which in turn supported the development of alternative project solutions, advancing his project. In this instance the repeated nature of the reflective tasks appeared to support Paul to critically reflect and link these reflections with further development of the project. Some learners may require more time than others to critically reflect and will benefit from the inclusion of multiple reflective tasks. This outcome supports the findings of Kember et al. (2007), who found that critical reflection can require a period of time to occur, and extends them by demonstrating that reflecting in a critical manner may take learners differing periods of time. Consequently, learners may require different levels of support and educators should take this into consideration when designing supports to encourage critical reflective practice.

Evidence from this study showed that not all case study participants connected their reflections in a critical manner that further developed their project. For example, while Henry spent a lot of time reflecting on his project, this appeared to be primarily focused on issues of content and the process of crafting his artefact. While he questioned his approach to the project, he did not achieve this in a critical way. He appeared to be engage with his project primarily in a way that had parallels with the final Develop and Deliver stages of the Double Diamond Design Process model (Design Council 2005)(discussed in Section 2.2.1.1), with limited design activity that had parallels with the first two stages, Discover and Define. A similar situation was evident with Emma, who's final artefact did not develop sufficiently to

meet the minimum requirements for the project. In these two instances, the introduced reflective framework failed to help these participants critically reflect in a way that advanced their project. Further research is required to understand this outcome and investigate whether this challenge can be overcome.

7.2.3 SUB QUESTION 3: HOW DO LEARNERS' REFLECTIONS INFLUENCE THEIR THINKING ABOUT THEIR DESIGN PRACTICE?

The findings from this study show that when guided by a structured and critical approach to reflective practice, students can make connections from their reflections about the project with thinking about their approach to design practice. These reflective connections occurred in both a similar design context to the project, and in the broader context of design practice. Importantly, not all participants made these connections, nor did those making these connections do so consistently.

Students made connections through their reflections by thinking about how their learning could inform their practice, in a similar context to the current project. This was evident when they identified learning they felt could inform similar projects in the future. One example that supports this was when some participants working on a publication project, reflected on what they had learnt about typography in this context, and then connected these reflections with thinking about how they might now approach the application of typography for future publication projects. This outcome has parallels with the principles of low-road transfer described by Salomon and Perkins (1989) which is where skills and knowledge learned in one context can be readily applied to another similar context.

Most participants in this study made connections in a manner consistent with low-road transfer, although when prompted to explain why they thought these connections were significant, fewer participants could explain their reasoning. It is not clear from this study why this occurred, and further research is needed to understand this outcome.

One of the most significant findings from this study is that some students connected their reflections from the project with thinking about the broader context of their design practice. This was evident when participants identified learning from the project that could be applied to design situations beyond the project context. A tangible example was when participants shifted their reflections from a focus on applying typography in a publication project to reflecting on how they could now approach typography in different project contexts, such as interface design, or poster design. Even more excitingly some participants shifted their focus away from projects to consider the more generalised context of their design practice. For example, considering a modification to their design process by deciding that in future they would make a deliberate decision to consider alternative concepts throughout the development of the project, or create more prototypes of their artefact to test their ideas further. The introduction of a structured and critical approach to reflective practice, supported learners to connect reflections beyond their project context to other projects contexts and/or their design practice. This could be interpreted as similar to the principles of high-road transfer described by Salomon and Perkins (1989) where knowledge is applied in a context that is different to the learning context.

Perkins & Salomon (1989) argue high-road transfer relies on mindful, deliberate abstraction of principles, either in advance of its new application or by recalling past experiences in light of a new situation, and abstracting relevant principles retrospectively. This also parallels with the work of Bransford and Schwartz (1999) who highlight the importance of preparation for future learning as a means to encourage transfer, demonstrated by the ability of learners to draw observations from their project in ways that support transfer to future projects. This study suggests that reflective practice, as it was introduced in this study, can foster the conditions for transfer by prompting learners to think about their project and articulate their learning in ways that can be applied to future projects and their practice. This outcome also aligns with the third stage of reflection-on-action as

described by Reymen (2003)(and discussed in research question one) where through their reflections, learners consider how they might now approach further development of their current project or future projects and their practice.

This study highlighted that some participants required repeated opportunities to reflect before achieving high-road transfer. For example, Lisa's reflections were largely focused on the development of her project. The interview transcripts reveal she was resistant to connecting these reflections with consideration about her practice, and she questioned the value of the reflective practice, particularly when prompted to consider how her project could inform other projects in the future. However, in the final reflective task she engaged with the reflective practice in a more positive manner, and she connected her reflections about the project with thinking about her practice. This outcome suggests learners may require repeated opportunities to reflect before they connect their reflections with thinking about approaches to their future practice. While further research is required to fully understand this outcome, one issue that should be considered is that learners may be resistant to the introduction of a structured and critical approach to reflection, and as a consequence, strategies may be required to address these concerns.

The study also demonstrated that not all students are likely to achieve high-road transfer. For example, in Emma's case the reflections related primarily to the development of content for her project and concerns about time management. She acknowledged in some instances that she had considered issues relating to how she could modify her design process, however she failed to address these issues through her reflections or the project. She felt her approach was largely successful despite acknowledging that major concerns had been identified about her project during the class presentations. In this instance the reflective practice supports did not support this participant to reflect in a manner that could be identified as preparing her for high-road transfer. Further research is required however to fully understand this outcome, which could include further examination of how the

reflective practice supports could be modified to better support students such as Emma.

7.2.4 DISCUSSION SUMMARY

This study demonstrates that a structured and critical approach to reflective practice supports students to learn from their projects. The findings show this form of reflective practice can support students to reflect in ways consistent with the principles of reflection-on-action. The findings further demonstrate that learners can reflect critically when supported by a structured and critical approach to reflective practice, however not all learners are likely to achieve this. The outcomes of this research also reveal that a structured and critical approach to reflective practice can foster the conditions for transfer by supporting learners to connect their reflections from the project with reflecting about approaches to further development of their project, and approaches to their design practice. In this study this occurred in ways that are consistent with the principles of both high-road and low-road transfer (Salomon & Perkins 1989) however, not all learners are likely to make these reflective connections.

7.3 Limitations of the study

The primary limitation of the study relates to the number of students who participated. While all the students enrolled in the subject of study participated in the research, this total number was thirty-four. Such participant numbers are not unusual in qualitative inquiry, however this form of research has been criticised for the inability to include a wide range of data for analysis (Tashakkori & Teddlie 2003). This potential criticism has been mitigated in this study through the triangulation of data by collecting multiple data sources, through a mixed-methods approach, with the aim to support broader analysis of the case study. However, despite the use of both qualitative and quantitative methods, the low number of participants in this study does mean there are risks the findings may not generalise

to other settings. That is, the findings may be unique to the relatively few people included in the research study (Johnson & Onwuegbuzie 2004).

A further limitation of this study relates to issues of subjectivity on the part of the researcher. While the mixed-methods approach employed in this study, is one way to address subjectivity (Creswell 2007), inevitably, the coding of the data, the findings and the conclusions drawn from this study come from a single perspective, that of the researcher. To address these limitations: the researcher's perspective on teaching and learning has been described to identify personal biases, and the research strategies (for example data verification strategies) employed in this study are documented in a detailed way (see Chapter Three). Issues of subjectivity were considered for example when coding participant responses to the reflective assessment tasks. The coding of the tasks relied on the researcher's interpretations of the participant's reflections and aligning these to the different levels in the cognition taxonomy. The researchers response to this issue was to default to a lower cognition level if there was any doubt about which cognition level the participant response should align to, and crosschecking through peer review of sample coding. While some margin for coding error must be acknowledged, this concern has also been addressed through the use of multiple data sources and subsequent analysis methods to provide corroborating evidence.

A further limitation of this study relates to the introduced reflective practice. While the design of the intervention was informed by the literature and developed in some depth, alternative forms of reflective practice were not introduced. As a consequence, the findings from this study are dependant on how the participants interpreted this one intervention. For example, this study employed a written approach to reflection, and although researchers have argued the benefits of this approach (Hoover 1994; Moon 2005), it has been suggested that students are likely to have varying abilities to articulate their reflections in written form (Moon 2005). In design education this is particularly relevant as the core modes of learning are traditionally non text-based (James 2007).

One final limitation to consider is that transfer of learning was not measured. This study aimed to address concerns relating to the missed learning opportunities that can occur in traditional studio-based and project-based learning environments, in ways that impact on the likelihood transfer of learning may occur between projects. While this study did not provide evidence that transfer between projects occurred, the findings do demonstrate that transfer can occur during the project, and that a structured and critical approach to reflective practice can foster the conditions for transfer to other projects and thinking about design practice.

7.4 Implications for theory and research

This study has significant implications for graphic design education theory and research. Despite the wide spread application of project- and studio-based learning in graphic design education there are few empirical studies that examine their efficacy. In the multiple project curriculum common in graphic design education, project- and studio-based learning approaches rely on transfer of learning to be effective, yet there is little evidence to suggest that the process of transfer within this setting is either understood, or actively supported with a proven methodology.

This study contributes significantly to graphic design education theory and research through a robust and systematic, evidence-based investigation of project- and studio-based learning. This is achieved through the design and application of a theoretically sound methodology in the form of a structured and critical approach to reflective practice, that examines how students can be supported to engage with, and transfer, the learning opportunities present within a project. The empirical nature of the research means this study has the potential to inform the broader field of design research and other fields of research that specifically examine project- or studio-based learning, reflective practice, and transfer.

The findings from this study also suggest potential topics for further research. Participants in this study, identified outcomes from their project that they felt could

inform how they approach their practice in the future, however, in the final reflective task, fewer participants achieved these forms of reflections. It is not clear why this occurred, however some of the case study participants indicated they had difficulty finding the motivation to complete the final reflective task after they had submitted their project artefact. In project- and studio-based learning environments the artefact is typically a primary focus for learners, and as a consequence this is where the major investment of their energy usually occurs. It may well be that in this learning environment, participants lacked the same levels of motivation to engage with the final reflective task as they did with the minor tasks. This finding has parallels with more recent research by Lawson and Dorst (2009), who found that many organisations employed reflective practice for post-project analysis, but still failed to transfer knowledge. They identify the issue of post-project depression and suggest that psychologically the designer or design team are unlikely to be in the right frame of mind to reflect on the project once it has finished. The researchers note “one possible way forward is to require teams to perform a review of recent relevant projects at the beginning of each new project” (Lawson & Dorst 2009, p. 288). Further research is needed to understand any psychological factors that may impact on the graphic design student’s reflections during the project, verses at the conclusion of the project.

A structured and critical approach to reflective practice, like the practice developed in this study, may support learners to improve their self-directed learning skills, which in turn may assist them to become better independent learners. This can be particularly useful in an industry setting where the opportunities for learning are unlikely to be as structured or directed as in an educational setting. Further research is needed to understand any links that might exist between reflective practice and self-directed learning skills, and how this might impact on a learners preparedness for transfer.

Fostering the conditions for transfer through a structured and critical approach to reflective practice has the potential to support designers to learn from their

projects in ways that may help them increase their levels of design expertise. Dorst and Reymen (2004) maintain that in a design context, little is known about how to stimulate the development of expertise and further research is needed to understand the development from novice to expert designer. More recent research by Lawson and Dorst (2009) examines the phenomenon of design expertise in greater detail. One element they identify as central to the development of design expertise is reflective practice. In light of the findings from this study, there is considerable potential to further examine the relationship between a structured and critical approach to reflective practice and the development of design expertise.

Another consideration regarding expertise includes the concepts of low-road and high-road transfer (Perkins & Salomon 1988; Salomon & Perkins 1989), which may represent forms of thinking that differentiate the novice level designer from the expert level designer. The way novice designers reflect on their design project may have parallels with the principles of low-road transfer, whereas the expert designer may reflect in ways that have more in common with high-road transfer. However, further research is needed to understand these possible relationships.

In this study the structured reflective practice supported participants to reflect on their project in a critical manner, however not all participants achieved this, nor did participants reflect critically all the time. While it was possible to identify those participants who reflected critically and those that did not, it was not clear from this study why this occurred. Further research is needed to understand this outcome. This could include investigating whether the reflective framework requires further development, or exploring if learner motivation is a factor. Would those participants in this study who did not reflect critically, benefit from further learning support for instance, or are there any identifiers in these participants' backgrounds that might provide clues to their failure to reflect critically?

The results from this study also reveal that while participants interpreted their project by identifying events from their project for subsequent analysis, fewer participants made judgements about their project by explaining the significance of the event. Why this occurred is not directly apparent and further research would be beneficial to examine this outcome.

7.5 Implications for practice

The findings from this study indicate that structured reflective practice can support learners to make connections in explicit ways between their project and their learning. This has important implications for educators employing traditional approaches to project-based and studio-based learning where learners typically focus on the artefact as the primary outcome (Kvan 2001; Lawson 2006), where it is seldom clear what the student has actually learnt (Dorst & Reymen 2004). For those learners who are having difficulty connecting the project and their learning, structured and critical reflective practice may serve a further role by revealing to the learner, and the teacher, the connections not being made, and then providing a framework in which to address the issue(s). Structured reflection can provide points in time where the teacher and learner can discuss the situation and explore possible solutions.

The cognition taxonomy developed for this study has the potential to not only serve as an analysis tool, but also a learning tool for students and teachers. The cognition taxonomy may support learning from the project by providing descriptors to identify the different forms of thinking in the learner's reflective observations in an explicit manner. This outcome has implications for educators. For instance if learners are having difficulty achieving specific forms of reflective thinking (generalisation for example), aligning their responses to the cognition taxonomy may provide a point of feedback and discussion with teaching staff. This may offer the opportunity to identify for example, missing steps in the learner's reflective thinking approach. Guiding learners to construct their reflective responses

employing multiple levels of thinking consistent with the cognition taxonomy, could be one means of supporting them to understand the different forms of reflective thinking. Further research is required however to establish the validity of this claim and to understand the impact this might have on learners' reflections.

In this study, participants benefited from the experience of completing multiple reflective assessment tasks as it offered opportunities to learn to reflect, and served as an important training process that helped the participants understand and develop their reflective practice skills. Educators employing a structured and critical approach to reflective practice should be aware that the experience of completing a reflective assessment task is an effective way to help learners grasp the concepts of reflective practice. A multiple reflective task approach during the development of the project affords the learner the time to practice their reflective skills so that if prompted to reflect back over the whole project, they are better equipped to enhance the quality of their reflective engagement. This observation supports Moon (1999) who indicates that assessment tasks generally require more guidance in the beginning, and also supports the work of Reymen who found "the effectiveness and efficiency gained by using [reflective practice] might increase when the same designers use the design method more often (after some time, the designers will be less focussed on the design method itself and more on the reflection process)" (2001, p. 102).

In this study participants identified the thinking they applied to their project, but not all evaluated this thinking. This outcome indicates that learners are likely to describe and interpret their project, but fewer are likely to offer value judgement claims or draw generalising conclusions. This has important implications for educators who may need to consider additional learning support for some learners to help them evaluate their thinking about the project. This might include improved forms of feedback for instance, or providing reflective case studies for learners to analyse. In this study the principles of reflective practice were introduced to the students during the project, and consequently there was limited opportunities to

address these principles. Further consideration could be given to introducing reflective practice in a more formalised way, such as a separate subject of study, where the principles of reflective practice can be studied in greater depth. Another approach may be to introduce the principles of structured and critical reflection in the first year of the program curriculum (rather than the final year as occurred in this study) such that these skills are embedded in the design students' design process from the beginning of their study.

When employing a structured and critical approach to reflection, educators should be mindful of learners' motivation to engage with the practice. In this study it was evident not all participants engaged with the final reflective task as thoroughly as the minor tasks scheduled during the development of the artefact. Some participants may have lacked the motivation to engage with the concluding reflective task once the artefact had been submitted. This suggests educators should carefully consider the scheduling of reflective tasks in relation to scheduling submission(s) of the artefact.

7.6 Conclusion

The application of project- and studio-based learning in graphic design education is widespread, however researchers have argued that in these approaches there are missed opportunities for learning. Traditional approaches to these forms of learning, focus primarily on the design artefact as the primary measure of learning, and as a result, it can often be unclear what the students have actually learnt, nor can they articulate what they have learnt. In turn, this can impact on the likelihood that they will transfer their learning to other projects. In the multiple project approach to graphic design curriculum this becomes a significant issue.

The outcomes from this study indicate that reflection, introduced as a structured and critical practice, can support graphic design students to engage with the learning opportunities present in the design process in ways that foster the

conditions for transfer. The outcomes suggest critical reflection has a key role to play in fostering the conditions for transfer.

In its most successful form, a structured and critical approach to reflective practice, can support students to reflect critically on their project in ways consistent with the principles of reflection-on-action, and in ways that foster the conditions for transfer consistent with the principles of both high- and low-road transfer. In this study this was evident when learners paused from their project, thought back over their design process, and explored in an analytical way, the understandings they had brought to the development of their project. These outcomes were further evidenced when learners connected their reflections from the project with thinking about how they might approach further development of their project, design projects in the future, and the broader context of their design practice.

The study reveals however that not all learners are likely to achieve these connections, nor are they likely to achieve these connections all the time. Whilst prompting learners to evaluate their design process through interpreting information from the process and making value claims or judgements can support critical reflection, learners are however less likely to make judgements. More support may be needed to help them achieve this form of reflective thinking.

Further, the outcomes suggest that prompting students to draw generalisations from their reflections supports them to think about their projects in ways that foster the conditions for transfer. This study demonstrates that reflective connections consistent with low-road transfer occur relatively readily, however reflective connections indicative of high-road transfer are less common.

Importantly, learners may take differing periods of time to reflect critically, and some will gain considerable benefit from the inclusion of multiple reflective tasks, particularly where they have a previously undeveloped, or no prior, reflective practice.

The outcomes of this study support reflective practice as an important tool in design education. For example, learners who have difficulty engaging with the thinking from their project can benefit from structured and critical reflective practice. It provides an opportunity for the learner, and their teacher, to identify the connections not being made, and further, provides a framework in which to address the issue(s). However, how the reflective practice is implemented within the curriculum is likely to have bearing on its ultimate success. Clearly an important way to help learners grasp the concepts of reflective practice is through the activity of reflecting, but how reflective tasks are scheduled within the curriculum with respect to artefact scheduling requires careful consideration. In addition, the cognition taxonomy developed for this study has real potential to not only serve as an analysis tool, but also a learning tool for students and teachers.

Not all students within this study benefited from the introduced reflective practice and it is not clear why some critically reflected and others did not. Further research is needed to fully understand this outcome. This could include, for example, investigating whether the reflective framework requires further development, and whether learner motivation was a factor.

In this study the conditions for transfer was less apparent in the final concluding reflective task than the tasks completed during the project. Issues such as post-project depression and scheduling maybe factors in this outcome, however further research is needed to understand this outcome.

Finally, fostering the conditions for transfer has the potential to support students to learn from their projects in ways that may help them to increase their level of design expertise, and also may support them to become better independent learners. Such an outcome would be extremely valuable in preparing students for professional life, however further research is needed to fully explore these ideas.

The findings of this study are a significant addition to the limited research on project- and studio-based learning in graphic design education, particularly in the consideration of the role a structured and critical approach to reflective practice can play to foster the conditions for transfer. The evidence-based nature of this study also contributes to the broader field of design education, and advances the research in project- and studio-based learning, reflective practice, transfer, and the relationships that exist between them. The limited research linking these areas and the widespread application of project- and studio-based learning indicates there remains much to learn.

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APPENDIX A: PROJECT INFORMATION SHEETS

INFORMATIONS SHEETS FOR COLLECTION OF PARTICIPANT ARTEFACTS

University of Wollongong



Project Information sheet: Student Assignments

PROJECT TITLE:

Advancing Graphic Design Pedagogy: Employing a reflective framework to enhance learning in graphic design tertiary education

RESEARCHER:

Grant Ellmers

Faculty of Creative Arts, University of Wollongong

Dear student

You have been asked to participate in the Reflection and the Graphic Design Process Research Project conducted by Grant Ellmers from the Faculty of Creative Arts at the University of Wollongong. The aim of this study is to gain a better understanding of the role of reflection in the design process and learning of design principles. The results of the study will improve understanding of how teachers can better support students in the design classroom.

If you consent to participate, your Reflective assignments submitted for DESN302 Commercial Graphic Design Practice B, will be used to help understand how design students

reflections on the design process might develop throughout the duration of a design project. Any assignment material that might be drawn upon will be utilised in a confidential manner and any identifying information will be edited or amended to protect your identity.

The following measures will be adopted to protect the identities of participants in the study:

data collected will be stored securely in a locked filing cabinet in the researchers office in the Faculty of Creative Arts, and will only be accessed by the researcher
only statistical findings and confidential quotes will be used in publications arising from this study.

These activities will not impact on any assessment. Your participation in this research is voluntary. You are free to refuse to participate and may withdraw from the research at any time by advising Grant Ellmers. Your refusal to participate or withdrawal of consent will in no way affect your relationship with the Faculty of Creative Arts or University of Wollongong, or affect your participation in this subject.

If you have any enquiries about the research, you can contact the researcher by phone on 4221 4270 or by email at grant_ellmers@uow.edu.au. If you have any concerns or complaints regarding the way the research is or has been conducted, you can contact the Ethics Officer, Human Research Ethics Committee, Office of Research, University of Wollongong on 4221 4457.

QUESTIONNAIRE INFORMATION SHEET

University of Wollongong



Project Information sheet: Survey

PROJECT TITLE:

Advancing Graphic Design Pedagogy: Employing a reflective framework to enhance learning in graphic design tertiary education

RESEARCHER:

Grant Ellmers

Faculty of Creative Arts, University of Wollongong

Dear student

You have been asked to participate in the Reflection and the Graphic Design Process Research Project conducted by Grant Ellmers from the Faculty of Creative Arts at the University of Wollongong. The aim of this study is to gain a better understanding of the role of reflection in the design process and learning of design principles. The results of the study will improve understanding of how teachers can better support students in the design classroom.

If you consent to participate you will be asked to complete a confidential survey at the beginning of session.

In addition volunteers are called to participate in 4 interviews (approximately 30 minutes each) spaced throughout the session. With permission the interviews will be audio recorded. To ensure impartiality is maintained, someone other than myself will interview you and your responses only identified by your survey code. You will have the option to view your interview transcripts if you wish to do so.

The following measures will be adopted to protect the identities of participants in the study:

- data collected will be stored securely in a locked filing cabinet in the researchers office in the Faculty of Creative Arts, and will only be accessed by the researcher
- only statistical findings and confidential quotes will be used in publications arising from this study.

These activities are not part of any assessment. Your participation in this research is voluntary. You are free to refuse to participate and may withdraw from the research at any time by advising Grant Ellmers. Your refusal to participate or withdrawal of consent will in no way affect your relationship with the Faculty of Creative Arts or University of Wollongong, or affect your participation in this subject.

If you have any enquiries about the research, you can contact the researcher by phone on 4221 4270 or by email at grant_ellmers@uow.edu.au. If you have any concerns or complaints regarding the way the research is or has been conducted, you can contact the Ethics Officer, Human Research Ethics Committee, Office of Research, University of Wollongong on 4221 4457.

APPENDIX B: CONSENT FORMS

QUESTIONNAIRE CONSENT FORM

University of Wollongong



Survey Consent form

PROJECT TITLE:

Advancing Graphic Design Pedagogy: Employing a reflective framework to enhance learning in graphic design tertiary education

RESEARCHER:

Grant Ellmers

Faculty of Creative Arts, University of Wollongong

I have been given information about the *Advancing Graphic Design Pedagogy Research Project* conducted by Grant Ellmers from the Faculty of Creative Arts at the University of Wollongong. I have had an opportunity to ask any questions I may have about the research and my participation. I have been informed that this activity is not an assessable component of the subject. I understand the survey responses are confidential and any identifying information will be edited or amended to protect my identity.

I understand that if I consent to participate I will allow my responses to the surveys to be collected in a written format.

I understand that the following measures will be adopted to protect the identities of participants in the study:

- data collected will be stored securely in a locked filing cabinet in the researchers office in the Faculty of Creative Arts, and will only be accessed by the researcher
- only statistical findings and confidential quotes will be used in publications arising from this study.

I understand that my participation in this evaluation research is voluntary, I am free to refuse to participate and I am free to withdraw from the research at any time. My refusal to participate or withdrawal of consent will in no way affect or my relationship with the Faculty of Creative Arts or University of Wollongong, or affect my participation in this subject.

If I have any enquiries about the research, I can contact Grant Ellmers by phone on 4221 4270 or by email at grant_ellmers@uow.edu.au. If I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, Office of Research, University of Wollongong on 4221 4457.

By signing below I am indicating my consent to participate in the *Advancing Graphic Design Pedagogy Research Project* conducted by Grant Ellmers as it has been described to me in the information sheet. I understand that the data collected from my participation will be used for academic publications and I consent for it to be used in that manner outlined above.

Signed

Date

.....

...../...../.....

Name (please print)

.....

PARTICIPANT ARTEFACT COLLECTION CONSENT FORM

University of Wollongong



Subject Assignment Consent form

PROJECT TITLE:

Advancing Graphic Design Pedagogy: Employing a reflective framework to enhance learning in graphic design tertiary education

RESEARCHER:

Grant Ellmers

Faculty of Creative Arts, University of Wollongong

I have been given information about the *Advancing Graphic Design Pedagogy Research Project* conducted by Grant Ellmers from the Faculty of Creative Arts at the University of Wollongong. I have had an opportunity to ask any questions I may have about the research and my participation. I have been informed that this activity is not an assessable component of the subject.

I understand that any assignment material that might be drawn upon will be utilised in a confidential manner and any identifying information will be edited or amended to protect my identity.

I understand that the following measures will be adopted to protect the identities of participants in the study:

- data collected will be stored securely in a locked filing cabinet in the researchers office in the Faculty of Creative Arts, and will only be accessed by the researcher
- only statistical findings and confidential quotes will be used in publications arising from this study.

I understand that my participation in this evaluation research is voluntary, I am free to refuse to participate and I am free to withdraw from the research at any time. My refusal to

participate or withdrawal of consent will in no way affect or my relationship with the Faculty of Creative Arts or University of Wollongong, or affect my participation in this subject.

If I have any enquiries about the research, I can contact Grant Ellmers by phone on 4221 4270 or by email at grant_ellmers@uow.edu.au. If I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, Office of Research, University of Wollongong on 4221 4457.

By signing below I am indicating my consent to participate in the *Advancing Graphic Design Pedagogy Research Project* conducted by Grant Ellmers as it has been described to me in the information sheet. I understand that the data collected from my participation will be used for academic publications and I consent for it to be used in that manner outlined above.

Signed

Date

.....

...../...../.....

Name (please print)

.....

INTERVIEW CONSENT FORM

University of Wollongong



Interview Consent form

PROJECT TITLE:

Advancing Graphic Design Pedagogy: Employing a reflective framework to enhance learning in graphic design tertiary education

RESEARCHER:

Grant Ellmers

Faculty of Creative Arts, University of Wollongong

I have been given information about the *Advancing Graphic Design Pedagogy Research Project* conducted by Grant Ellmers from the Faculty of Creative Arts at the University of Wollongong. I have had an opportunity to ask any questions I may have about the research and my participation. I have been informed that this activity is not an assessable component of the subject.

I understand that if I consent to participate I will allow my responses to the interviews to be collected in written and audio formats. I also understand that I may view the interview transcripts if I wish to do so.

I understand that the following measures will be adopted to protect the identities of participants in the study:

- data collected will be stored securely in a locked filing cabinet in the researchers office in the Faculty of Creative Arts, and will only be accessed by the researcher
- only statistical findings and anonymous quotes will be used in publications arising from this study.

I understand that my participation in this evaluation research is voluntary, I am free to refuse to participate and I am free to withdraw from the research at any time. My refusal to participate or withdrawal of consent will in no way affect or my relationship with the

Faculty of Creative Arts or University of Wollongong, or affect my participation in this subject.

If I have any enquiries about the research, I can contact Grant Ellmers by phone on 4221 4270 or by email at grant_ellmers@uow.edu.au. If I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, Office of Research, University of Wollongong on 4221 4457.

By signing below I am indicating my consent to participate in the *Advancing Graphic Design Pedagogy Research Project* conducted by Grant Ellmers as it has been described to me in the information sheet. I understand that the data collected from my participation will be used for academic publications and I consent for it to be used in that manner outlined above.

Signed

Date

.....

...../...../.....

Name (please print)

.....

APPENDIX C: QUESTIONNAIRE

University of Wollongong



QUESTIONNAIRE

PROJECT TITLE: Advancing Graphic Design Pedagogy: Employing a reflective framework to enhance learning in graphic design tertiary education

Researcher: Grant Ellmers
Faculty of Creative Arts, University of Wollongong

DATE: 30th July 2007

| General participant information | | |
|---------------------------------|-----------------|---------------------|
| Identification Code: | | [Birthday DDMMYY] |
| Male | | [] |
| Female | | [] |
| Age | 18-22 | [] |
| | 23-30 | [] |
| | 30+ | [] |
| Previous education | Year 12 | [] |
| | TAFE | [] |
| | Undergraduate | [] |
| | Other | [Please indicate] |
| Design industry experience | None | [] |
| | 1 yr or less | [] |
| | 2-3 yrs | [] |
| | More than 3 yrs | [Please indicate] |

Questionnaire

The design process

These questions ask you about the process a designer commonly follows when developing design solutions/projects.

1. Describe what do you think of as 'the design process'.
(Take as much space as you need)

2. Do you always follow the process you have just outlined?

Strongly agree []

Agree []

Undecided []

Disagree []

Strongly disagree []

3. Do you think understanding the design process leads to a better design outcome?

Strongly agree []

Agree []

Undecided []

Disagree []

Strongly disagree []

Reflection during the design process

These questions are also about the design process, although they specifically ask about how you may or may not reflect on your work during the development of your design project.

4. Some designers say reflection is important part of the design process.
How would you define reflection? (Open-ended question)

5. I reflect on my work during the development of a design project

At all stages []

Often []

Undecided []

Occasionally []

Not at all []

6. Reflecting on my work as I develop the design project can help me achieve a better final outcome.

Strongly agree []

Agree []

Undecided []

Disagree []

Strongly disagree []

Reflecting on the completed design project

These questions relate to the final reflection phase that occurs once the design project has been completed and how we learn from those experiences. This phase involves reflecting on the project by standing back from the project, articulating the design process, and making observations about the experiences that led to the final design outcome. When you have outlined and analysed your design projects for the reflective report assessment task in past subjects, you are engaging with this phase of reflection.

7. Some designers believe this final reflection on the completed project helps them to learn from the project outcomes and experiences. Do you agree with this statement?

Strongly agree []

Agree []

Undecided []

Disagree []

Strongly disagree []

8. Why do you think that? (Open-ended question)

9. Do you think describing the design process in a written format helps you to clarify the process you followed?

Strongly agree []

Agree []

Undecided []

Disagree []

Strongly disagree []

10. Taking time after the design project has been completed to observe and analyse the final project outcomes can help me identify what I have learnt.

Strongly agree []

Agree []

Undecided []

Disagree []

Strongly disagree []

11. How might this apply to your practice? (Open-ended question)

12. Reflecting back over my design project and identifying what I have learnt could help me solve future design problems.

Strongly agree []

Agree []

Undecided []

Disagree []

Strongly disagree []

APPENDIX D: REFLECTIVE ASSESSMENT TASKS

MINOR REFLECTIVE ASSESSMENT TASK PROJECT BRIEF

| The Reflective Practitioner: Minor reflective task 1-3 |
|--|
| Project Description Describe your design process and the project outcomes of your major design project in DESN312. Identify significant moments of the design process. Discuss why and how this might help you refine your design approach. Address your response using the headings supplied below. |
| Part 1 <ol style="list-style-type: none">1. Briefly outline your design concept for DESN3122. Summarise your design process undertaken between the seminar presentation and the interim design submission to create your design response/project for DESN312 (use bullet points).3. Summarise the feedback you received regarding your interim design presentation (use bullet points).4. How do you feel about the feedback you received from your presentation?5. How do you feel about the progress of your design project to this point?6. |
| Part 2 <ol style="list-style-type: none">1. Identify three significant aspects (critical incidents) of your design process to date.2. Describe these critical incidents and explain why you think these aspects are significant.3. |
| Part 3 <ol style="list-style-type: none">1. How might the issues identified through the reflective process (from Parts 1 and 2) help you further develop and refine your design project? Why do you think this?2. Do these issues remind you of any previous experience? If so how?3. In light of these issues, are there aspects of your design technique/process you would approach differently in the future? If so how?4. |

CONCLUDING REFLECTIVE ASSESSMENT TASK PROJECT BRIEF

| The Reflective Practitioner: Concluding reflective task |
|---|
| <p>Project description</p> <p>Describe your design process and the project outcomes of your major design project in DESN312. Identify significant moments of the design process. Discuss why and how this might help you refine your design approach. Address your response using the headings supplied below.</p> |
| <p>Part 1: Design process</p> <ol style="list-style-type: none">1. Outline your design concept for DESN312.2. Outline three primary references including their relevance (include visual representations).3. Describe the design process that lead to the completion of your major design project (include visual representations).4. Identify and describe three significant outcomes of your design project. Discuss why you believe these outcomes are particularly significant.5. |
| <p>Part 2: Looking back</p> <p>Compare your concept statement from the first reflective task with your final statement.</p> <ol style="list-style-type: none">1. How has your concept changed? For instance this might include the focus of your statement, or how you have expressed your concept.2. Do you feel your final concept statement is an improvement on the first? Why? <p>Look back over your responses to the three minor reflective tasks.</p> <ol style="list-style-type: none">3. What patterns do you see emerging? For instance this might include noting changes to how you perceived the progress of your project, or threads that emerge from the identification and discussion of critical incidents.4. |
| <p>Part 3: Learning</p> <ol style="list-style-type: none">1. Identify and describe three things you have learnt during this project (this includes the work for DESN312 and the reflection in DESN302).2. How might you apply this learning to future design situations?3. |
| <p>Part 4: Future</p> <ol style="list-style-type: none">1. Now you have completed your project, do you see any alternative outcomes? Why?2. Is there anything you would do differently in the future when approaching a similar design situation? Why?3. How might the final outcomes from your design project (DESN312) prepare you for industry or post-graduate study?4. How might your reflections/observations from the reflective tasks (DESN302) prepare you for industry or post-graduate study? |

APPENDIX E: INTERVIEW QUESTIONS

SEMI-STRUCTURED INTERVIEW QUESTION SHEET

Interview Questions

Q. 1. To start with, could you tell me about what's happened with your design project since we last spoke, which was just after your interim presentation?

- Is there much that you've changed since the interim presentation?
- What did you get in the way of feedback from the final presentation? (probe for fellow students as well as teachers)
- Follow up general comments

Q. 2. Have there been any particular challenges in these last few weeks of your design project?

Q. 3. As you were going through this final phase of the project did you find yourself reflecting in a different way, or differently to before?

Q. 4. Do you think that reflecting throughout your project in this ways has brought out anything in particular? (probe: Made you think in a particular way?)

Q. 5. In the first interview I asked you about your design process, how would you describe it now? (probe: Has is changed?)

Q. 6. Did the process of having to reflect throughout cause you change your design process?

- Or your design/concept?
- Do you think differently about the way you design?

Q. 7. Is there anything you've learned or reflected on that would cause you to do something differently in the future?

Q. 8. Do you think you'd reflect in this on-going way in your future design projects/work?

- How would you do it?

Q. 9. Do you think your process of reflecting at the end of the project is different to what you've done before in previous subjects?

Q. 10. Is there anything about the way we structured the tasks that you think we should do differently or better in the future?

- Anything we could explain better?
- What about writing the final report, did you use the three reflections you did along the way?
- Did you take a different approach to the final reflective report?

Q. 11. Is there anything we haven't covered that you're like to add?