How and Why Do Undergraduate Physiotherapy Students Use Reflection in Learning and Practice?

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I, Meredith Jane Willmott, certify that:

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This thesis does not contain work that I have published, nor work under review for publication.

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ABSTRACT

Introduction

The capacity to reflect on learning and within practice is an essential requirement for physiotherapists in Australia. Although teaching, assessment and perceived outcomes of reflection in undergraduate physiotherapy clinical learning environments have been researched, there is little known research in relation to the development of the skill of reflection over the physiotherapy course from the academic environment, prior to clinical learning, through to clinical experiences.

Purpose

The main purpose of this research was to explore how and why pre-clinical (PC) and clinical (C) level physiotherapy students use reflection in learning and practice in order to gain a sense of what is occurring within those cohorts and how higher education may be able to better prepare students’ development and use of reflective thinking.

Method

A cross-sectional, exploratory, mixed method research design was used by combining quantitative data from two validated questionnaires; the Reflection-in-Learning Scale (RLS)\(^1,2\) and the Reflective Thinking Questionnaire (RTQ),\(^3\) and qualitative data from individual interviews (n=12). The participant sample was drawn from an undergraduate physiotherapy program at a single university in Western Australia (n=122). Two cohorts of students were studied, one cohort at the PC level of learning and the other in the final year of their course, the C level. Data analysis included Mann Whitney-U statistical tests to compare the questionnaire scores between PC and C cohorts of students and thematic analysis applied to the qualitative interview data.
Results

The quantitative results showed no significant difference in self-reported use of reflection in learning between the PC and C cohorts of students. With respect to reflective thinking, the only statistically significant difference was students with prior tertiary level education had significantly higher RLS scores (p=0.017) than students who were secondary school leavers.

Using Kolb’s cycle of experiential learning as a theoretical lens, results from the individual interviews revealing students’ ‘concrete experiences’ (where the students are reflecting) showed PC students predominantly provided examples of previous personal experience, educational activities and study practices, while C students drew on their rich and diverse clinical experiences. The dominant trigger to engage in ‘reflective observation’ and ‘abstract conceptualisation’ for both cohorts of students (why the students are reflecting) was extrinsically motivated in order to achieve in summative assessments. Although less common, C student triggers included more intrinsic motivations such as professional competency, altruism, patient advocacy and reactions to conflict, tension or dissonance during clinical placement. The timing of ‘reflective observation’ (when the students are reflecting) showed that PC students were more likely to reflect after the ‘concrete experience’ (reflection-on-action) or even after an accumulation of events that had led to a negative outcome. C students had more examples of preparing and planning, or, reflection-in-preparation as well as reflection-in-action linked to clinical experiences although both these mechanisms were less frequent than reflection-on-action. Lastly, the depth of reflection (how the students are reflecting) showed that PC students mostly used content and process reflection, whereas female C students were more likely to extend their ‘reflective observation’ and ‘abstract conceptualisation’ to the deeper, premise reflection.
Discussion and Recommendations

Physiotherapy students require time and space to develop reflective thinking throughout their course. Depth of reflection is impacted by the types of experiences students are exposed to, as well as educators’ pedagogical approaches. This study demonstrates that there are few formal ‘concrete experiences’ in the PC level (classroom) that address the affective domains of learning, which is key to development of critical reflection. The dominant trigger to reflect across both cohorts was for extrinsic reward which illustrates current educational focus on outcomes leading students to perceive value in assessed skills and knowledge. Triggers that were intrinsic, patient-centred or originated from conflict and/or cognitive dissonance included the affective domains and were more likely to result in greater depths of reflection. The results suggest using intrinsic triggers in the planning and development of educational activities that foster reflective thinking. The timing of reflective thinking in relation to the experience should also be developed further to include reflection-in-preparation and reflection-in-action, to complement the more common reflection-on-action. Educators who are skilled at facilitating and guiding students through reflective thinking and who foster safe, socially inclusive and supportive learning environments are also a key to these recommendations. In order to adequately prepare and foster deeper levels of reflection in physiotherapy students; consistent exposure, guidance and opportunity to practise reflective thinking should be included and scaffolded throughout the PC and C learning environments. Reflective learning strategies that extend beyond cognitive and psychomotor domains of learning to include affective learning that includes intrinsic triggers to reflect are also fundamental to these recommendations.
Conclusion

The results from this study provide a valuable contribution to the growing literature on reflective learning and practice in physiotherapy education by providing useful and tangible recommendations for embedding the development of reflective thinking throughout the curriculum, including at a pre-clinical and clinical level of learning.
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CHAPTER ONE: INTRODUCTION

Background to study

“Learning without reflection is a waste. Reflection without learning is dangerous.”
Confucius

This study was conceived by the researcher to explore how and why undergraduate students use reflection in learning and practice. The genesis of the topic arose from the researcher’s experience as educator of undergraduate physiotherapy students at various levels of learning. The researcher was interested in exploring the differences in reflective thinking between pre-clinical (PC) and clinical (C) level physiotherapy students. ‘How’ students use reflection relates to timing and depth. ‘Why’ student use reflection relates to the experiences and motivations that trigger the student to reflect. Exploring these factors would assist the researcher to gain a sense of what is occurring within those cohorts and how higher education may be able to assist students to develop and use reflective thinking throughout their course in preparation for professional practice.

The ability to reflect in the workplace is an essential graduate attribute in health professions education.\textsuperscript{5,6} Reflection is linked to ethical, professional and clinical practice and can be defined as a process of revisiting\textsuperscript{7} and thinking about experiences and ideas and considering them in relation to previous knowledge, values, beliefs and perspectives.\textsuperscript{8-10} The outcome may validate previous understanding or create dissonance,\textsuperscript{11} trigger new ideas and perspectives\textsuperscript{12} and result in actions for change.\textsuperscript{10,13}

Reflection is essential in order to diagnose learning needs for continual professional development as well as to recognise professional limitations and scope of practice.\textsuperscript{6,14-16} Reflection is also essential when bridging the link between theory and real practice.\textsuperscript{17-19}
Therefore, development of reflective thinking is essential for an individual to learn from experiences they encounter and potentially impact future learning and experiences through to professional practice.

In higher education of health professions students, the development of reflective thinking is often not prioritised until workplace experiential learning or clinical placement begins\(^\text{20}\) which commonly occurs in the later part of the course. During clinical placements, undergraduate students and their clinical educators tend to focus on task based clinical skills and practice, time management, prioritisation of caseload, clinical reasoning, assessment and treatment procedures.\(^\text{21}\) There is often little time set aside for the student to critically reflect on how they are conducting themselves in the clinical setting.\(^\text{21,22}\) Unfortunately, the opportunity to explore, discuss and reflect on their relationships with their clients and within the team and how this may be affecting themselves and their patient care\(^\text{23}\) is limited or neglected. For example, during a physiotherapy course, students may be too busy or not skilled in reflecting on issues where their values and assumptions are being challenged and this may limit their capacity or ability to think beyond their own perspective. Previous research has shown barriers to reflection can include limitations in time, motivation and skill for their clinical educators to model reflection.\(^\text{21,22,24}\) Essentially, in order to learn from experience, the “opportunity to reflect and think, either alone or in the company of other people”\(^\text{25(p15)}\) is all that is required. Facilitation to attend to the thoughts, ideas, and emotions that the experiences may trigger is also a critical factor.\(^\text{25}\)

Development of reflective thinking in the academic learning environment, prior to clinical placement, is important and should be embedded vertically within the health professions curriculum.\(^\text{19,22,26-28}\) That is, to ensure the development of reflective thinking in preparation for clinical learning, activities that facilitate the use reflection should be
included throughout the curriculum in all units of study, at all stages of learning. The benefits to students include reflecting on the effectiveness of their study and learning practices, analysing their motivations and/or barriers to learning, critically analysing their values, prejudices and assumptions and how this may impact their professional practice including how previous knowledge and experiences impact their current learning. This is important in adult learning, as it facilitates diagnosis of learning needs and actions in order to make changes in attitudes and perspectives and bridge the link between theory and practice.\textsuperscript{19} It is therefore essential that reflective thinking is modelled by educators and students are given opportunity to practise reflection regularly in their studies prior to clinical practice. This creates scaffolding for their reflection from the classroom to practice which is both useful and meaningful.\textsuperscript{13,22,26,29,30}

**Significance of study**

This study is significant in two ways. Firstly, there is limited evidence of how undergraduate Bachelor of Physiotherapy students use reflection prior to clinical practice. In this study, the researcher explored both PC and C level undergraduate physiotherapy students’ use of reflection to gather evidence of how different learning environments, in the classroom (PC) and in clinical practice (C), promoted reflective thinking within an undergraduate physiotherapy course. An extensive literature review only found one study\textsuperscript{31} where the use of reflection was explored comparing PC and C level physiotherapy students and aligned with the current study. This was a longitudinal qualitative study of 21 physiotherapy students from two universities and explored students’ professional development and learning from the beginning to the end of their course, with reflection being one of four main themes common across all interviews. There were two other studies that compared PC and C level physiotherapy students; however, the outcomes of these studies did not mirror the intent of the current study. A
study by Roche and Coote\textsuperscript{32} explored physiotherapy students’ perceptions of reflection via focus groups before and after a newly introduced reflective practice module and after a subsequent clinical placement. While this study identified themes of use of reflection, the comparison between levels of learning was not a focus of the research paper. A second study by Stewart and Richardson\textsuperscript{5} focussed on student and educator perception of summative assessment of reflection tasks. Other studies of physiotherapy students at different points in their course focussed purely on students at the clinical level of learning.\textsuperscript{18,20,33}

In order to address this knowledge gap, the current study gathered in-depth data, via qualitative and quantitative methods, on how and why physiotherapy students at both PC and C stages of learning use reflection. The intention was to gain clarity on how current educational experiences of the participants at different stages of learning may trigger use of reflective thinking within their course. This may inform future educational strategies to assist physiotherapy students to develop reflective thinking throughout the duration of the course in preparation for professional practice.

Secondly, the ability to reflect on learning and within practice is an essential stand of practice and requirement of registration for physiotherapists in Australia. The Physiotherapy Board of Australia (PBA), in conjunction with the Physiotherapy Board of New Zealand include the role of the “Reflective practitioner and self-directed learner”\textsuperscript{6(p23)} in the bi-national physiotherapy practice thresholds. The key competencies associated with this standard for practice (Role 4) state that registered physiotherapists in Australia are able to:\textsuperscript{6(p23)}

4.1 assess their practice against relevant professional benchmarks and take action to continually improve their practice
4.2 evaluate their learning needs, engage in relevant continuing professional development and recognise when to seek professional support, including peer review
4.3 efficiently consume and effectively apply research and commit to practice informed by best available research and new knowledge
4.4 proactively apply principles of quality improvement and risk management to practice
4.5 recognise situations that are outside their scope of expertise or competence and take appropriate and timely action

Enabling components identified within these competencies call for the effective use of critical self-reflection, self-awareness, identification of knowledge and skill gaps and action to ensure maintenance of standards of practice. Furthermore, reflection is a requirement of registration via the Australian Health Practitioner Regulation Agency (AHPRA) which is the organisation that controls, accredits and registers physiotherapists in Australia in partnership with the PBA.

In addition, the PBA’s Code of Conduct states in subsection 1.2 “Professional values and qualities”\(^{14}(p2)\) that “Professionalism … includes self-awareness and self-reflection. Practitioners are expected to reflect regularly on whether they are practising effectively, on what is happening in their relationships with patients or clients and colleagues, and on their own wellbeing.”\(^{14}(p2)\) Also, the guidelines for Continuing Professional Development, provided by the PBA, state that self-reflection is central to “planning of professional development, goal setting and reflection on possible changes to practice as a result of learning.”\(^{15}(p5)\) AHPRA asserts that physiotherapists need to document their reflections on how their professional development activities impact on their practice and ongoing development.\(^{15}\)

In an educational context, the Australian Physiotherapy Council (APC) is the independent national body that accredits physiotherapy education programs in Australia. The APC enforces and applies the physiotherapy practice thresholds\(^{6}\) along with other accreditation standards. It is therefore evident that educators within physiotherapy programs must ensure their graduates are prepared to meet these standards.
To create sustainable life-long learners, higher education must foster learning environments where students are motivated and prepared to reflect and make decisions about their own learning needs. This creates an environment where the student is not reliant on the teacher to drive identification of learning needs, allowing the student to judge their own work and practice against appropriate standards, and know how and where to seek appropriate resources and strategies for learning. More in-depth knowledge of how physiotherapy students are using reflection in different learning contexts is essential to develop and evaluate higher education curriculums to ensure students meet this professional development requirement prior to graduating as a physiotherapist.

**Purpose of study**

The purpose of this study was to provide more in-depth knowledge and understanding of ‘how’ and ‘why’ undergraduate physiotherapy students at different stages of learning use reflection during their course. This was achieved by gathering more specific data about the timing and depth of reflection (how) as well as the experiences and motivations that trigger reflection (why) in these cohorts of undergraduate physiotherapy students. The focus of the study was to explore students’ reflective thinking specifically related to their learning environments, educational experiences and learning strategies. As this was a cross-sectional, “snap shot” via quantitative and qualitative methods, the outcomes and changes in behaviour related to the examples of reflective thinking provided by the participants were not able to be thoroughly explored.

The study was also designed to identify if there were significant differences in self-reported use and/or engagement in reflection in physiotherapy students at different stages of learning. In addition, identifying if other demographic qualities of the
participants such as; gender, age, and previous level of learning would impact self-reported use and/or engagement in reflection.

From the quantitative and qualitative results, the intent was to provide a valuable snapshot as to the motivations and use of reflection in these cohorts of students. This may inform the design and development of future educational strategy recommendations to assist students to develop deeper levels of reflection to enhance their learning and prepare for professional practice.

The three research questions that guided this research study are:

1. How and why do undergraduate physiotherapy students use reflection in learning and practice?
2. What are the differences in self-reported use of reflection between pre-clinical and clinical level students, genders, current courses of study and previous level of education in undergraduate physiotherapy students?
3. How do any identified differences relate to their educational experiences and what can be learned from this?

Defining reflection in this study

For the purposes of this study, the researcher defines reflection, or reflective thinking as a process of revisiting and thinking about experiences and ideas and considering them in relation to previous knowledge, values, beliefs and perspectives. The outcome of this reflective thinking may validate previous understanding or create dissonance, trigger new ideas and perspectives and result in actions for change.

To deconstruct this definition, in terms of the study scope and methodology, how students use reflection relates firstly, to when participants, engage in the …process of revisiting and thinking about experiences and ideas... That is, the timing of reflective
thinking in relation to learning experiences and learning environments they are exposed to. This element is linked to the qualitative data collected via individual interviews.

Secondly, how the students use reflection also relates to the depth of reflective thinking. Within the above definition, depth is related to …considering (the experiences and ideas) in relation to previous knowledge, values, beliefs and perspectives.\textsuperscript{8-10} The outcome of this reflective thinking may validate previous understanding or create dissonance,\textsuperscript{11} trigger new ideas or perspectives\textsuperscript{12}... That is, how deeply the student reflects relates to how extensively they link and question their previous understandings to the experiences or ideas being explored and whether they attend to the validation or dissonance this reflective thinking creates. This element links to both the quantitative and qualitative data collected.

Why students use reflection, with respect to the above definition relates to ...experiences and ideas... For the purposes of this study, educational experiences, learning and teaching strategies and learning environments may motivate or trigger students to engage in reflective thinking. Determining how these triggers and motivations impact how students use reflection in their learning and practice provides opportunity to understand how current educational design within this course may influence development of reflective thinking. This element links mostly with the qualitative data.

What is not explored thoroughly due to the methodological design being a “snapshot” of the cohorts of students who participated in the study is whether the participants’ reflective thinking …result(s) in actions for change.\textsuperscript{10,13} This limits the ability to draw conclusions on the outcomes or impact on future learning and practice of reflective thinking examples communicated by the participants.
Glossary of terms

**Reflection or Reflective Thinking:** A process of revisiting and thinking about experiences and ideas and considering them in relation to previous knowledge, values, beliefs and perspectives. The outcome may validate previous understanding or create dissonance, trigger new ideas and perspectives and result in actions for change.

**Undergraduate physiotherapy student:** A person who is enrolled in an educational institution programme accredited by a governing body and leading to an entry-level degree in physiotherapy.

**Clinical placement:** A structured, extended workplace experience supported by clinical educators. Students are supported to gain clinical experience with clients and with a scaffolded approach, gradually become responsible to manage their own caseload in preparation for professional practice. Students in this study often refer to clinical placement as ‘prac.’

**Pre-clinical (PC) student:** A student who is currently at the early stage of their course such that they have not experienced a clinical placement as described above.

**Clinical (C) student:** A student who has experienced clinical placements as described above. In this study, the students were in their final year of their course where the majority of learning takes place in the clinical environment.

**Clinical educator:** A physiotherapist who is responsible for the support and education of a physiotherapy student while they attend clinical placement. Students in this study often refer to clinical educators as ‘clinical supervisors’ or simply, ‘supervisors.’

**Kolb’s cycle of experiential learning:** A structure of learning that describes a process whereby individuals may learn from the experiences they are exposed to by effectively reflecting on the experience, integrating those reflections with theory and knowledge.
leading to planning for future experiences based on what has been learned by the
previous steps in the cycle. This will be discussed further in Chapter Two.

**Structure of thesis**

In the first chapter, the background, significance and purpose of this study, outlining the
research questions and defining some key terms and concepts have been discussed.
Chapter Two presents a review of relevant literature in relation to the theory and models
of reflection as well as studies that explore the use of reflection in health professions
students in higher education. In the concluding section of Chapter Two, Kolb’s cycle of
experiential learning is introduced as the theoretical lens through which the results,
discussion and recommendations of this study are communicated.

The methodology used in this study is presented in Chapter Three. In this chapter, the
research design, data collection and analysis process is clearly presented and justified.
Chapter Four presents both quantitative and qualitative results. The quantitative results
provide extensive analysis of the data set. The qualitative results present analysis of the
rich and complex data collected through individual interviews of twelve participants.

From analysis of the results, the discussion and implications in relation to similar
research is presented in Chapter Five. This chapter is presented from an educator’s
perspective, discussing what the results reveal about current educational practices in
relation to the development of reflective thinking at different levels of learning. Lastly,
in Chapter Six, recommendations for future educational and curriculum design are
described and supported by relevant literature. From here, the limitations of the study,
recommendations of possible future research and the concluding statements of the thesis
are presented.
CHAPTER TWO: LITERATURE REVIEW

Introduction

This literature review has three purposes. Firstly, it explores theories and models of reflection that underpin this research study, that is, the seminal works that influenced the researcher’s knowledge, understanding and perspective with regard to how and why individuals may use reflective thinking. Secondly, it reviews and critiques relevant research that explores the use of reflection within the tertiary education setting, in particular physiotherapy courses in Australia and internationally in order to highlight the gap in research that this study aims to address. Lastly, the theory of Kolb’s cycle of experiential learning is summarised as an introduction to the theoretical lens through which the qualitative results, discussion and recommendations are analysed and presented.

In reviewing the literature, many search strategies were employed. Electronic databases including the Education Resource Information Centre (ERIC), EBSCO, the Cumulative Index for Nursing and Allied Health Literature (CINAHL), PubMed and ProQuest were used extensively, along with Taylor and Francis online, Wiley Online Library, Scopus and Sage journals online. The key search terms included reflection, reflective thinking, learning, physiotherapy, physical therapy, health profession, higher education, tertiary education, and student. Ovid SP alerts and Scopus Search alerts were set up to capture new literature with respect to the search terms and key journals including Adult Education Quarterly, Advances in Health Sciences Education, Assessment & Evaluation in Higher Education, International Journal of Higher Education and Journal of Nursing, Education & Practice were consistently reviewed via JournalTOCS alerts. In addition, seminal works, theses and books associated with reflective thinking and
learning were accessed via The University of Western Australia “Onesearch” database and The University of Notre Dame “Summon it” database.

**Theories and models of reflection**

Several theories and models of reflection have been developed and described in the literature. These theories and models aim to provide conceptual and practical frameworks to understand this active and inquisitive learning approach. One theorist that significantly influenced the researcher was Jack Mezirow and the “Transformation Theory.” An origin of this theory was evident in Mezirow’s 1981 article where he described adult education program development as focused on “task-oriented learning common to the ‘technical domain’ of learning to control and manipulate the environment.” Mezirow later termed this “instrumental learning” He believed there was a disconnect, or lack of adaptive approach to the other important domains of learning being; “social interaction…and perspective transformation.”

He believed that it was important that educators facilitated consideration of social issues and cultural discrepancies to challenge “psycho-cultural assumptions behind habituated ways of perceiving, thinking, feeling and behaving.” For the researcher, this linked with the perceived lack of integration of emotional, socio-cultural or affective domains of learning across all units in the curriculum in the PC stage of learning.

Mezirow also linked the development of domains beyond the “technical” to the self-directed adult learner as “one who is aware of the constraints on his efforts to learn and progressively decrease(s) their dependency on the educator.” Being skilled at identifying learning needs and barriers to learning is essential for the autonomous learner and this requires reflection beyond cognitive and psychomotor learning domains into affective or emotional domains.
To clarify the domains of learning, the cognitive domain relates to intellectual and thinking processes, with Bloom’s taxonomy from basic levels to higher order thinking being: “knowledge/(recall), comprehension, application, analysis, synthesis and evaluation.”\(^{39}(p161)\) The psychomotor domain relates to active skills, with the associated Blooms taxonomy hierarchy being: “observation, imitation, practicing, mastering and adapting.”\(^{39}(p161)\) Lastly, the affective domain of learning relates to attitudes and emotions, with the Bloom’s taxonomy levels being: “receiving (listening), responding, valuing (advocating, defending), organisation and characterisation (judging).”\(^{39}(p161)\)

Cognitive domains of learning are often the focus of educational design,\(^{40}\) and in health professions, such as physiotherapy, there is also emphasis on skill acquisition, the psychomotor domain. In contrast, the affective domains are often ignored in educational design\(^{40}\) and this, therefore, influences the development of deeper levels of reflective thinking that requires attention to emotions, feelings, values and attitudes.

Mezirow believes that reflection is predominantly triggered by the need to solve a problem.\(^{9}\) Dewey\(^{41}\) also states that reflective thinking “needs…a state of perplexity, hesitation, doubt…”\(^{41}(p9)\) and Boud, Keogh and Walker\(^{12}\) espouse that for adult learners to be prompted to reflect, an experience or series of events that trigger “loss of confidence in or disillusionment with one’s existing situation”\(^{12}(p19)\) needs to occur. A problem may be acknowledged by attending to the discomfort or a dilemma that arises and challenges previous knowledge and perspectives which Mezirow describes as “meaning structures.”\(^{9}(p223)\) Meaning structures may be loosely held beliefs, values and concepts through to long held assumptions by which one may define oneself within their psychosocial environment.\(^{9}\) Therefore, the problem that an individual is exposed to may significantly impact if reflective thinking is triggered as well as the depth of reflective thinking.
Furthermore, Mezirow\textsuperscript{9} indicates there are three ways of reflecting on a problem that is based on the work of Dewey. Firstly, there is reflection on the content of the problem or content reflection.\textsuperscript{9(p224)} This is defined as gathering the evidence from which the problem is based. Secondly, there is reflection on the process of problem solving or process reflection.\textsuperscript{9(p224)} For example, what problem solving strategies were used and were they effective? How could the problem have been tackled differently? Lastly, and most importantly for potential transformative learning, is reflection on the premise of the problem or premise reflection.\textsuperscript{9(p224)} For example, why does this problem exist? How does this problem challenge assumptions, values, beliefs and ideas that one previously understood to be true? How might this differ from others’ points of view? This type of reflection requires a willingness and capacity to question and challenge not only one’s own perspective and assumptions but also another’s. The first two levels of reflective thinking, content and process reflection, align most cohesively with cognitive and psychomotor domains of learning. When reflecting on experiences, these depths of reflection explore what is happening and how it is happening. The deeper level of reflective thinking, premise reflection, connects with the affective domain of learning and when linked to experience explores why it is happening. This has the potential to lead to greater understanding and impact on future practice and learning. In learning environments, as well as in professional practice, the development and use of all three levels of reflection provides a basis for autonomy and self-directed learning,\textsuperscript{10,13} a key element of professional development in physiotherapists.

Mezirow also discusses pedagogical frameworks in the development of reflective thinking. In order to effect meaningful change or engage in “transformative learning,”\textsuperscript{9(p226)} recognition of a changing point of view or perspective\textsuperscript{9,10} must be communicated and acted upon. These actions are central to transformation theory whereby the individual or collective “follow the cycle…systematically examining
existing options, building confidence through competence in new roles, acquiring knowledge and skills to implement one’s plans and provisionally trying out new roles and relationships” 38(p20) in order to transform perspective and new ways of acting or being. Mezirow9 indicates that “communicative learning”9(p225) is required to cultivate critical thinking and reflection. Communicative learning is a collaborative endeavour to, ideally, reach a consensus on understandings, meanings, values and beliefs, considering the impact of assumptions, in a safe learning environment where rational discourse is encouraged and supported.9,10 Discourse is essential to reflection and Mezirow defines discourse as a “special kind of dialogue in which we focus on content and attempt to justify beliefs by giving and defending reasons and by examining the evidence for and against competing viewpoints.”9(p225) It can be seen that “communicative learning”9(p225) goes beyond the cognitive and psychomotor domains (more aligned with Mezirow’s “instrumental learning”9(p225)) and into the affective domains of learning. Critical reflection of assumptions is central to development of autonomous and critical thinking in adults.37 Workplace demands the development and cultivation of these attributes so that the individual has the capacity to adapt to changing conditions of employment10 and “educational interventions are essential to ensure the learner acquires the understandings, skills and dispositions essential for transformative learning”10(p11)

There are some critics of Mezirow’s Transformation Theory. Cunningham42 contended Mezirow’s separation of adult and child/adolescent learning, whereas Collard and Law43 felt that Mezirow’s theory emphasised the individual learner and their own perspectives, ignoring the important collective social issues. Mezirow9 acknowledges that his Transformation Theory is “idealized”9(p222) but contends that “critical reflection and rational discourse” which are central to his theory, are particular to adult learning. Additionally, it is relative to the issues and experiences presented to the learner that will influence the breadth and depth of transformative learning. It is important to ensure that
the educator facilitates consideration of social issues and “cultural discrepancies” that “challenge the psycho-cultural assumptions behind habituated ways of perceiving, thinking, feeling and behaving.”

While it is Mezirow’s Transformation Theory that has influenced the researcher with respect to depth of reflective thinking or, as Mann, Gordon and MacLeod describe as the “iterative dimension,” it is both Schön and Kolb that have influenced the researcher’s thinking on the processes and timing of reflection. Mann et al., describe this as the “iterative dimension.” Kolb’s cycle of experiential learning will be described at the end of the literature review as a basis for reporting the qualitative results of this study.

Schön described a number of types of reflection that associate with the timing of reflective thinking with respect to the experience. Central to his theories is the experience that triggers reflective thinking as well as setting of that experience. He contended that reflective thinking is complex and needs to be adaptive as “the problems of real-world practice do not reveal themselves to practitioners as well formed structures…but as messy, indeterminate situations.” This is so true in health professions practice with many interwoven social, environmental, psychological and emotional factors associated with the patient and their health condition. Added to this, the health practitioner’s own beliefs, values and perspectives, as well as the constraints of the health service also serve to add complexity and context to problems and issues that arise. Schön believed that development of reflective thinking was essential to take higher education graduates beyond the level of technician, to an adaptive and professional practitioner.

Firstly, Schön described two types of reactions that occur within the experience. These are “knowing-in-action” and “reflection-in-action.” “Knowing-in-action” is where the
individual recognises, within a situation, that their experience and knowledge allows them to act appropriately. These instances may become habitual, automatic and develop in complexity as the practitioner becomes more skilled.7 “Reflection-in-action” is stimulated by “experiences, pleasant or unpleasant, that contain an element of surprise.”7(p26) The individual needs to attend to the “surprise” and pause to think within the situation, create problem solving strategies and test them by “experimenting” (quote) within the situation. Lastly, Schön described “reflection-on-action” where the individual retrospectively attends to affective, cognitive and metacognitive elements of an experience and explores the issues with respect to influencing problem solving and future practice.7,44

The theories presented so far, link to this study as they provide background to how and why individuals may use reflective thinking in order to learn from experience and transform understanding, beliefs, values and perspectives that potentially impact future learning and practice. Prior theory has shown that reflection is not a natural or comfortable process, nor is it an inherent skill,28 especially if one lacks understanding of the benefits to practice.45-47 The development of reflective thinking requires an active approach to learning. Firstly, it is critical that the individual attends to the experience, problem or dilemma. Secondly, the individual also needs to choose to act. Learners may decide not to act for a number of reasons such as “lack of dependable information, skills needed or emotional commitment to proceed.”35(p251) It may also be “in an attempt to preserve the constancy of our usual patterns, (the individual) may respond to surprise by brushing it aside, selectively inattending to the signals that produce it.”7(p26) Therefore it is imperative that the stimulus or trigger is important or meaningful to the learner.

Issues that may be associated with students’ values or beliefs are more likely to lead to reflective thought.41
Educational researchers have found that students initially require instruction and reflection frameworks that include prompts to convert their observations or inferences to evidence based conclusions that have personal and professional meaning.\textsuperscript{46,48,49} This is supported by Moon\textsuperscript{30} who indicated that for a higher level of reflection to take place, a meaningful understanding of reflection and how different levels or types of reflection may present is essential.

The theories of reflection outlined in this review closely link with constructivist educational theory. Constructivism is based on learners constructing their emerging knowledge from the foundation of what they already know.\textsuperscript{50} Learners are able to recognise the parallels and conflicts to their existing understandings, knowledge, values and beliefs that arise with presentation of new knowledge. Therefore, active experiences, compared to passive, are critical to a constructivist educational approach to learning whereby the teacher facilitates learning rather than merely transmitting knowledge.\textsuperscript{50} As this study provides more in-depth knowledge of how and why undergraduate physiotherapy students use reflection in different learning contexts, it is anticipated that the findings, combined with theories and models of reflection and relevant research will inform the development of active constructionist educational strategies to foster and facilitate the use of reflection in learning and practice.

The use of reflection in undergraduate health professions’ students

A large number of studies address reflection in health professions students within the higher education sector. These have predominantly been with nursing and medical students.\textsuperscript{1,2,51-61} As reflection involves cognitive,\textsuperscript{1} psychomotor and affective learning domains;\textsuperscript{62,63} research studying how it is used as well as its effectiveness and associations to learning processes\textsuperscript{64} and outcomes is complex.
This review aims to present relevant literature with respect to reflection in health professions students. There is an attempt to focus on studies that include physiotherapy students, where possible, to illustrate the current research for this topic in physiotherapy training and identify gaps that this study will aim to address. In order to place reflection in the context of learning, this review looks at studies that explore the links between reflection and academic outcomes, clinical competency and learning approaches as well as participants’ perceptions of reflection and how it impacts learning and practice. Then, to link with the research question of this study; how and why undergraduate physiotherapy students use reflection in learning and practice, this review presents studies where researchers aimed to develop a system of recognising different depths, or “vertical dimensions" of reflection within written reflective activity tasks, as well as studies exploring themes of learning events or triggers in which health professions students reflect. Lastly, to address the research question that seeks to find differences or commonalities in student populations’ use of reflection, this review presents studies that compare the use of reflection across different levels of learning and demographic characteristics in health professions students.

*Reflection and learning in health professions education*

In order to understand the impact of reflection on learning, research has investigated possible correlations or associations with academic outcomes, clinical competencies and/or study and learning approaches. Studies exploring these associations with reflective thinking may have used a quantitative methodological approach, using and developing questionnaires and survey instruments. Based on the Reflection-in-Learning Scale (RLS) developed by Sobral, Sobral found when studying three consecutive cohorts of Year 2 medical students (n=200), those students who gained above average reflection scores were more likely to have higher Grade Point Averages (GPA’s). Sobral also followed up with a longitudinal study to
identify how the RLS scores from first semester, Year 2 correlated with second semester, Year 3 GPA’s finding a significant, yet weak, correlation. The RLS questionnaire used to quantify level of reflective thinking displayed good internal consistency (Cronbach’s alpha = 0.84 to 0.86) in Sobral’s studies.\textsuperscript{1,2} The large sample size and longitudinal research methodology further strengthen Sobral’s findings.

Research by Devi et al.\textsuperscript{51} also showed a weak correlation between written exam performance and RLS scores in 153 Year 2 medical students. This study showed that students who failed their written examination (<50% marks) had significantly lower RLS scores than students who achieved highly. (≥65%).\textsuperscript{51(p272)} While this study adds to research in this area, the generalisability of this study is limited as the nature, content and context of the written examinations may have influenced the results.

In further research, Phan\textsuperscript{66} used the Reflective Thinking Questionnaire (RTQ) developed by Kember et al.\textsuperscript{3} in conjunction with other validated questionnaires to discover positive correlations between higher levels of reflective thinking, effective study processes, deep learning and academic achievement in educational psychology students (n=254). Phan\textsuperscript{73} followed with a longitudinal study comparing reflective thinking and learning in the same educational psychology course (n=347) and found that “reflection and critical thinking encourage(s) the cultivation of meaningful learning”\textsuperscript{73(p308)} where students diagnose their own learning needs and generate new knowledge. From this study, Phan recommended longitudinal studies that include both quantitative and qualitative data collection to strengthen the current research evidence in reflection and learning outcomes. Although the current study will not be longitudinal, due to time and scope constraints, this study used quantitative and qualitative data in a cross-sectional design providing a clear justification for the research.
Grant et al.\textsuperscript{67} used a mixed method approach to compare medical schools with a traditional lecture-based approach and a Problem-Based Learning (PBL) approach. The findings of the study showed that students exposed to a PBL environment had significantly higher RLS scores, had a deeper learning approach and were more self-directed. Students exposed to a more didactic approach tended to be extrinsically motivated, surface learners with lower RLS scores. One significant limitation of this study was that qualitative and quantitative data were collected from two different PBL medical schools with one participating in the qualitative element and the other in the quantitative element. This impacts the reliability of the comparisons made between the PBL schools and the traditional learning school. Despite this, the findings do point to an active, immersive teaching approach that stimulates learning and inquiry facilitating the development of reflective thinking.

Other research has also explored the association between reflective writing capability and different modes of assessment. Interestingly, Tsingos-Lucas et al.\textsuperscript{28} found that stronger reflective writing skills were a predictor of success in written and oral examinations when they studied 264 second year pharmacy students in one unit of study at a single university. The generalisability of these results is impacted due to the specific educational setting but there are certainly parallels with learning environments of other health professions. The study concluded that reflective writing activities should be embedded throughout the curriculum to allow time to foster reflective skills that enhance critical thinking and problem solving skills.

Looking beyond qualitative and quantitative research, Tsingos et al.\textsuperscript{64} undertook an extensive review of literature to clarify the differences in learning approach and learning style and the role of reflection in these constructs. From this review the authors suggested that embedding reflection into educational activities in pharmacy training has
the ability to foster deeper, more self-regulated and sustainable approaches to learning. They also stated that while different learning styles of students may be considered fixed, there is an adaptive element to this construct that is influenced by the learning environment, most notably between the classroom and clinical environment.64

While the current study does not aim to quantify the outcomes of reflective thinking, from the research reviewed above it may be surmised that fostering reflective thinking in health professions students has the capability to improve academic outcomes and facilitate deeper, lifelong learning approaches, aiding the transition from theory to practice.

**Participant perceptions of reflection in health professions education**

Some qualitative studies included in this review explored participants’ perceptions of reflection and how this impacted their learning and practice.32,74-76 Roche and Coote32 investigated undergraduate physiotherapy students’ perceptions of a newly introduced reflective practice module. The authors used case studies as the basis of discussion for the development of reflective practice skills. Focus groups were conducted before and after the reflective practice module with a sample of Year 3 students (n=10). A third focus group was conducted with a sample of Year 4 students (n=10) during the clinical placement program that followed the reflective practice module. Although the results from this study would have been strengthened by a longitudinal study following the sample of Year 3 students into Year 4, there are certainly reliable insights that can be gained from this research. The researchers found that students used reflection to highlight and link evidence-based theory to practice and that reflection enhanced client focussed care, autonomy and personal satisfaction with a self-reported higher level of reflective ability post module.
Constantinou and Kuys\textsuperscript{74} discovered via questionnaire that undergraduate physiotherapy students (n=131) on their first clinical placement perceived using guided reflective journals assisted them to learn from clinical experiences and agreed they would be useful in professional practice. In another study, Glaze\textsuperscript{76} collected qualitative data via interviews and written reflections to determine how Advanced Nurse Practitioner (ANP) students (n=14) perceived the use of reflection in practice. The ANP students had undergone a pre-degree reflection module, including a reflection component to their clinical placement within the Master of Science degree they were completing. The findings showed the ANP students perceived a personal and professional transformation through reflection and developed new insight into how their beliefs and values may impact their decision making processes and actions in the clinical setting. There were several examples of students acknowledging others’ perspectives, their own values, beliefs and assumptions and how this challenged them to adopt new perspectives impacting future clinical practice, a clear indicator of how reflection can lead to transformative learning.\textsuperscript{9}

The studies in this section are limited in their generalisability as they link specifically to a single health professions course, undertaking a single unit of study. Despite this, it is, clear from these studies that reflective activities are a valuable learning tool that encourages students to analyse and articulate their own thought processes, including learning needs, in order to grow and/or successfully make changes to their professional practice, whether it is in academic or clinical learning environments. However, research into reflection in physiotherapy students is mainly limited to the clinical learning setting which the current study aims to address.
How and why health professions students use reflection

Depth of reflection

Written reflections have been used as a learning tool across health professions education for several years. However, exploring written reflections to assess the depth and outcomes of reflection achieved by students is an ongoing research challenge. The following studies present some attempts to reliably assess the level of reflection or, as described earlier in this chapter, the “vertical dimension”\(^\text{(p597)}\) of reflection.

Wong et al.\(^77\) coded post-registration nursing students’ (n=45) written reflections based on the models of Boud et al. and Mezirow and found through a two-fold coding system, by five separate coders with follow up interviews, that written reflections were reliably categorised into non-reflectors, reflectors and critical reflectors. However, when attempting to further refine these written reflections into more complex categories, the inter-rater reliability was reduced due to the non-linear nature of reflection. Williams and Wessel\(^78\) conducted a qualitative study investigating reflective journals of physiotherapy students (n=48) and described five levels of reflection from “describes learning” through to “indicates future behaviours.”\(^78\(\text{(p21)}\)\) In another study, Carr and Carmody\(^79\) developed a schema to assess two cohorts of Year 5 medical students’ (n=145) reflective writing during women’s health clinical learning experiences. Their four reflective writing levels were “listing”, “describing”, “applying” and “integrating”.\(^79\(\text{(p772)}\)\) For the preceding two studies, the levels described appear to focus more on content and process reflection\(^9\) leading to actions and impact on future clinical practice. Kember et al.\(^80\) also developed a reflective writing schema which was based on the RTQ\(^3\) extending further to include premise reflection.\(^9\) This schema was trialled on a small sample of radiography students (n=4) in the clinical learning environment with four independent assessors having good agreement over how to assess these papers.
within the marking schema. The authors suggested that this schema may also be used for course evaluation and research in reflection. Kember et al.\textsuperscript{80} also recommended that written reflections should be assessed and classified at the highest level of reflection evident within the whole written reflection. The small sample of participants in this study, however, limits the generalisation and reliability of the results and recommendations.

It is important to reliably assess reflection in education as this not only provides useful feedback to learners but also may provide structure to the development of reflective thinking.

**Themes of reflection**

Research that has analysed written reflection has also identified themes and examples of the types of trigger events that prompt reflection. Larin et al.\textsuperscript{81} explored themes in clinical practice reflective writing of baccalaureate physiotherapy students (n=21) in the United Arab Emirates (UAE) and compared these with a similar study by Williams et al.\textsuperscript{82} in PBL physiotherapy students in Canada (n=56). They found that across these two programs, similar themes emerged which included “professional behaviour”, “awareness of learning”, “self-development and shift to a patient orientation”, and “identification and analysis of ethical issues”.\textsuperscript{81(p4)} Williams and Wessel\textsuperscript{78} studied 48 physiotherapy students and identified themes and triggers of student learning events within written reflections. The main themes identified related not only to patient care and the students’ role as a practitioner but also learning and coping strategies within the PBL environment.

Wessel and Larin\textsuperscript{33} extended their prior research into a longitudinal study to explore change in reflection over time in UAE physiotherapy students. From the students’ first to third clinical placement, additional themes emerged which included “scope of
practice" with students displaying more confidence and focus on the client after engaging in written reflections. A limitation of these studies was a dominance of female students with 85.7% of participants in the UAE study and 82.1% in the Canadian study being female. Gender biases in reflective thinking may have impacted these results and reduced the comparisons to Australian populations. The gender proportions in Australia are 67.9% female and 37.1% male. Another limitation is the reliance on data from retrospective, written reflective writing. However, these linked studies over a number of cohorts and educational settings show strong evidence that the themes of written reflections are based on important clinical, ethical and professional constructs which are essential for the development of autonomous, self-aware and self-directed practitioners.

**Reflection across different levels of learning and demographics in health professions students**

There are limited studies on reflection in learning and practice of health professions students at different levels of learning. In physiotherapy education, most studies exploring reflection were solely linked to students at the clinical level of learning. Of the studies that explored reflection across different levels of learning in physiotherapy students, a study by Lindquist et al. used a longitudinal research design, interviewing students (n=21) over the first five semesters of their course in two different universities. The number of participants in this study is very good given the qualitative design conducted over a number of semesters and collection points, strengthening the findings and conclusions. Both courses focused on developing reflective thinking from the start of the curriculum. The results found that the students began their course reflecting alone or with peers and teachers. In this early stage of the course, the focus of physiotherapy student reflection was on learning skills and motivations as well as their
psychomotor learning through practical skill acquisition. As they progressed through the course the focus of reflection shifted to their ability to be effective in their care through skills and knowledge and then progressed to more patient-centred and scope of practice challenges when exposed to clinical learning environments. Interestingly, their study found that the pathway of reflection began at cognitive and psychomotor domains of learning and progressed to include affective domains of learning later in the course.

The following three studies used participants who represent different stages in learning and practice in physiotherapy but they did not analyse the differences between students in the PC and C levels of learning as is the focus of the present study. Clouder conducted a qualitative study exploring the patterns and modes of reflection used by C level physiotherapy students and practitioners. The study drew on a number of qualitative data collection strategies, including focus groups and individual interviews, which were not consistent across all groups. Despite this, there were some interesting insights into the timing, depth and themes of reflection as well as the perception of the value of reflective practice. One interesting insight, regarding timing of reflection, was that in the relatively slower-paced clinical specialty of neurology, the use of reflection-in-action was more prominent and the authors concluded that potentially individuals who had a bias toward reflective thinking may be more likely to be drawn to this clinical area. In contrast, the faster-paced, appointment driven musculoskeletal clinical specialty there was a dominance of reflection-in-preparation prior to the patient encounter and reflection-on-action when documenting the interaction. Smith and Trede also studied the use of reflective practice during the transition of physiotherapy students from university level to novice graduate. This qualitative study analysed a combination of the clinical level students’ reflective writing in online blogs in combination with two semi-structured telephone interviews during the final clinical year.
and approximately six months after commencement of employment. All participants had completed a reflective practice unit of study where there was instruction, scaffolding and encouragement to engage in retrospective reflective writing whilst on clinical placement. One significant finding from the study was that students and novice practitioners associated reflection with “concrete daily tasks”\(^{20}\) whereby there was regular reflective thinking occurring within the workplace, with problem solving, experimentation and actions on the spot. The study recommended that these findings should inform educational strategy for teaching reflective practice whereby there is less emphasis on in-depth retrospective reflective writing and more emphasis on day to day, workplace oriented reflective practice. Another study by Wessel and Larin\(^{33}\) discussed earlier tracked the change in themes of reflection between the first and third clinical placement, a longitudinal study but again within the clinical level of learning.

Other studies that compared physiotherapy students at different levels of learning focused on student perceptions of reflective practice modules,\(^{32}\) and their perception of whether written reflections should be assessed\(^{5}\) rather than the differences in how and why they use reflection in their studies. There were no studies found that compared gender or previous level of education in physiotherapy students with regard to their use of reflection. This shows that the current study addresses a gap in the literature with respect to research into development of reflective thinking throughout the physiotherapy course.

**Theoretical lens: Kolb’s cycle of experiential learning\(^{4}\)**

In order to report and explain the themes that emerged from the qualitative data in this study, the researcher used the theoretical lens of Kolb’s cycle of experiential learning\(^{4}\) as a framework. David Kolb developed his experiential learning theory by drawing on the works of John Dewey, Kurt Lewin and Jean Piaget.\(^{4}\) These theorists created
frameworks of learning through experience that connected across all domains of learning; cognitive, psychomotor and affective, as well as all facets of development; personal, workplace and education.\(^4\)

In Kolb’s early work, he defined learning as “the process whereby knowledge is created by the transformation of experience.”\(^4\) From this assumption, he created an Experiential Learning Theory (ELT) that articulated a cycle by which experiences are grasped and transformed. (Kolb, Kolb 2009) (See Figure 1)

A brief description of the cycle follows:

- **Concrete Experience (CE):** this is the central stage for experiential learning.\(^{90}\) This is the experience that is designed, facilitated and/or chanced upon from which an individual can potentially learn. At this point the individual must attend to what is happening as well as their emotions and feelings within that experience.

- **Reflective Observation (RO):** this is the initial stage of transforming the experience by exploring and examining the experience from, ideally, multiple perspectives. The focus here is to articulate what has been experienced from a more emotional perspective, the senses and feelings,\(^{22}\) the discomfort or surprises,\(^{7}\) to understand more about the “why and how”\(^{91}(p102)\) of the experience.

- **Abstract Conceptualisation (AC):** at this stage, the learner uses knowledge, theory and prior experience to further understand, explore and make sense of the CE and RO stages in the cycle.

- **Active Experimentation (AE):** at this stage, the learner tests and acts upon new understandings, theories, perspectives and strategies that have been evoked from the RO and AC stages. This then leads to further CE’s and the spiral of learning from experience continues\(^{90}\).
There are, as there should be in rigorous peer review, critics of Kolb’s ELT. Some critics argue that the cycle is simplistic,\(^9^2\) “a minimalist interpretation of the complex operations of the brain,”\(^2^5\)(p43) and merely a tool for beginners that may “encourage a relatively superficial form of reflection.”\(^3^0\)(p194) Another critic argues that the bi-polar dimensions that Kolb describes whereby CE and AC are stages of “grasping”\(^4\) the experience and RO and AE are stages of “transforming”\(^4\) the experience are flawed and these assumptions have then underpinned further learning theories.\(^9^3\) While these critics have merit in their interpretations, this study has predominantly used this cycle to provide structure to reporting of findings, discussions and recommendations.

There are many critical elements whereby learning from experience occurs and it is only through critical reflection that experience can be transformed by the learner and, also, by which the learner can transform future experiences.\(^4\) Kolb’s cycle of experiential learning\(^4\) provides one structure whereby critical reflection may be attained.
through clear, active steps with the experience central to the process. This premise was
the genesis of the link between this study and Kolb’s cycle of experiential learning.4

**Conclusion of Literature Review**

This literature review has provided extensive theoretical and research perspectives of
the use of reflection in health professions education with a focus on undergraduate
physiotherapy student education. From this review, it is evident that developing the use
of reflection in learners is important and that more in-depth knowledge is needed to
discover how and why undergraduate physiotherapy students at different levels of
learning use reflection in their learning and practice during their course. The researcher
has designed the current research study to add to the body of knowledge in this domain.
In the following chapter, the methodology used in the mixed-method research design
will be explained and justified based on sound research practices and theories.
CHAPTER THREE: METHODOLOGY

Introduction

The following chapter will present and justify all methodological processes adhered to in this study. The chapter begins by discussing the research design and its rationale, followed by presentation of the quantitative questionnaires used in this study. The participant sample and setting will then be outlined to define the context of this study. Next, the data collection procedure will be presented, including the management of data and ethical considerations. Lastly, the quantitative and qualitative data analysis processes will be outlined to provide context and linkage to the results in Chapter Four.

Research design

This study used a cross-sectional, exploratory, mixed method research design by combining both quantitative and qualitative research approaches to data collection and analysis. The quantitative data was collected via two validated questionnaires and provided the initial point of analysis of participants’ use of reflection in learning and practice. A cross-section of participants were selected for interview (n=12) based on the type and levels of reflection they displayed in their questionnaire responses as well as their demographics. The questionnaire items formed the basis for the interviews to gather qualitative data with examples of how the participants used reflection during their course.

Figure 2 represents the timing and sequence of the data collection as well as the emphasis of the data in the final interpretation. The quantitative data (questionnaires and demographics) were collected and analysed first, followed by collection of qualitative data (individual interviews). Both the quantitative and qualitative data were
integrated for final interpretation; however, the qualitative data provided the dominant data source for this study.

![Diagram](image)

*Figure 2: Diagrammatic representation of the timing and sequence of research methodology*

**Rationale for use of mixed method**

The rationale for using a mixed method research design was multifactorial. Firstly, mixed method research combines two different research approaches that have their own strengths and weaknesses to ideally lessen the effect of their weaknesses.\(^95\) This research design was therefore chosen to strengthen the final results with complementary approaches. Morse and Cheek\(^96\) indicate that there should be “dynamic reflexivity”\(^96(p3)\) between each research method within the study to “enable(s) the research design to respond to and be moulded by the questions underpinning the research…”\(^96(p3)\) This study therefore took a pragmatic\(^95,97\) and dynamic approach to data collection and analysis. Secondly, this approach was chosen to ensure both breadth and depth of understanding by incorporating “diverse viewpoints”\(^98(p5)\) thus using the strategy of triangulating the data to further strengthen the study.\(^99,100\) Triangulation is a method of improving the credibility of the researcher’s interpretations by gathering data from three or more sources and methods\(^99\) which this study achieved by utilising two questionnaires and interview data.
Questionnaires

In order to gather quantitative data on how undergraduate physiotherapy students use reflection in their learning and practice, the researcher conducted a detailed literature review focusing on reflection in undergraduate health professions education. The Reflection-in-Learning Scale (RLS) developed by Sobral$^{1,2}$ and the Reflective Thinking Questionnaire (RTQ) developed by Kember et al.$^3$ were initially chosen by the researcher, as the items within each questionnaire and the theory underpinning the development of these instruments aligned with the aims and purpose of this study. Additionally, both questionnaires were developed for health professions populations similar to those included in the current study.

**Reflection-in-Learning Scale$^{1,2}$**

The RLS$^{1,2}$ was developed to measure the use of reflection by undergraduate medical students while they were learning. It has since been used and validated in studies involving both medical$^6$$^7$ and education students.$^{101}$ The items in this scale focus primarily on cognitive learning within the course of study, with respect to content and process reflection.$^9$ The RLS$^{1,2}$ is a 14-item questionnaire that uses as 7 point Likert scale ranging from never = 1 to always = 7. The scale measure is then reported as a total score; which can range from 14 to 98. A higher score indicates that the student is self-reporting higher engagement in the reflective behaviours in the scale.$^{61}$ Permission to use the questionnaire was obtained from the author.

The RLS$^{1,2}$ displayed good internal consistency in the studies reported by Sobral$^{1,2}$ (Cronbach’s alpha = 0.84 to 0.86), Grant et al.$^6$$^7$ (Cronbach’s alpha = 0.88), with a modified version used by Kalk et al.$^{101}$ (Cronbach’s alpha = 0.84). Acceptable Cronbach’s alpha scores are generally reported as being between 0.70 and 0.95.$^{101,102}$
The RLS\textsuperscript{1,2} was chosen to collect quantitative data regarding how the students use reflection in their learning. This was of interest to the researcher, not only as a baseline measure of how the students may be engaging in reflection, but also to potentially inform strategies for enhancing reflection in all areas of academic and clinical learning in physiotherapy education.

As this questionnaire had been developed for overseas undergraduate medical students, the wording was modified (with permission) to reflect the linguistic differences (eg. using the term ‘units’ instead of ‘courses’) as well as being specific to the participant population (using ‘physiotherapy course’ instead of ‘medical program’). Both the original and modified questionnaires are provided in Appendices A and B.

**Reflective Thinking Questionnaire**

The RTQ\textsuperscript{3} was chosen to collect quantitative data regarding the participants’ stages of reflective thinking. Kember et al.’s RTQ\textsuperscript{3} was developed for undergraduate health professional students in Hong Kong and has since been used with populations of nursing,\textsuperscript{69,103} occupational and physical therapy,\textsuperscript{70} pharmacy,\textsuperscript{104} educational psychology,\textsuperscript{65,66,72} mathematics,\textsuperscript{65} arts,\textsuperscript{65,105} science,\textsuperscript{72,105} engineering, information technology and applied science,\textsuperscript{106} and education students,\textsuperscript{101,105} as well as practising physicians.\textsuperscript{107}

Kember et al.\textsuperscript{3} identified four ‘scales’ of reflective thinking along a continuum from ‘Habitual Action’ and ‘Understanding’ (both non-reflective thinking stages) to ‘Reflection’ and ‘Critical Reflection’ (reflective thinking stages). Kember and colleagues\textsuperscript{3} predominantly cited the work of Mezirow and Dewey in the development of these four scales. It was proposed that students employ each stage of reflective or non-reflective thinking in their course to varying amounts and in different
circumstances. As a summary, the four scales in the RTQ are described with item examples below.

**Habitual Action:** Acting without having to think about the reasons why or how. This is mostly related to actions or activities that have been previously learnt or have been repeated frequently such that they can be “performed automatically with little conscious thought.” The questions in this scale represent non-reflective thinking. For example, Question 1: “When I am working on some activities, I can do them without thinking about what I am doing.”

**Understanding:** Students’ knowledge and skills are appraised, but not related to other experiences or learning. This scale is designed to relate to pure cognitive processes and align with Bloom’s taxonomy “Comprehension” level. The questions in this scale also represent non-reflective thinking. For example, Question 2: “This course requires us to understand concepts taught by the lecturer.”

**Reflection:** Students’ experiences or learning activities are analysed and compared to previous knowledge, experiences and understandings resulting in new understandings, processes or perspectives. The questions in this scale focus mostly on content and process reflection. For example, Question 7: “I like to think over what I have been doing and consider alternative ways of doing it.”

**Critical Reflection:** Critical reflection is a more in-depth and potentially transformational level of reflection. It is where the student recognises challenges to their preconceived ideas, beliefs and values involving more affective domains of learning to adopt new perspectives. These questions therefore focus more on premise reflection, appraising and challenging one’s roles, assumptions, beliefs and potentially making a decision to change. For example, Question 8: “This course has challenged some of my firmly held ideas.”
This questionnaire uses a 5 point Likert scale. Likert responses range from A: definitely agree (assigned a score of 5), C: definite answer not possible (3) to E: definitely disagree (1). In this 16-item questionnaire, there are four questions that relate to each of the four scales, with each scale generating a possible score of 4 to 20. Questions 1, 5, 9 and 13 represent the Habitual Action scale, questions 2, 6, 10 and 14 represent the Understanding scale, questions 3, 7, 11 and 15 represent the Reflection scale, and questions 4, 8, 12 and 16 represent the Critical Reflection scale. The scales were developed to be calculated and analysed separately and not to generate an overall composite score for the RTQ. Higher scores for each scale indicate that the student is self-reporting a higher level of engagement in the respective stages of reflective thinking. Permission to use the questionnaire was obtained from the authors. Copyright details were also added to the questionnaire documents as detailed in Kember, et al.  

Using the RTQ allowed the potential analysis of self-reported use of premise reflection (Critical Reflection scale) as well as content and process reflection (Reflection scale) to complement the RLS. It is important to note that the developers of the RTQ, when designing the Reflection and Critical Reflection scales, sought to remove emotional or affective domains from the items within these scales.

Along with the Reflection and Critical Reflection scales, the Understanding and Habitual Action scales have also been linked to depth of learning approach. Leung and Kember used the RTQ and a Revised Biggs Study Processes Questionnaire to study 402 undergraduate health sciences students and found that the Habitual Action scale was linked to students who used a surface approach to their learning whereas the Understanding, Reflection and Critical Reflection scales were linked to a deep approach to learning. This was of interest to the researcher as it
illustrated the complexity of the learning strategies used by students and created links to the qualitative data for integration and interpretation.

The internal consistency (Cronbach’s alpha) scores for the four scales in previous studies have generally been on the lower end of acceptable levels. In Kember et al.’s study, Cronbach alpha scores ranged from 0.62 – 0.76. Further, in a study of nursing students (n=538), Leung and Kember reported Cronbach alpha scores between 0.58 – 0.74 arguing that with the small number of items in each scale (4), the impact is generally lower internal consistency values and that “the alpha scores are modest but still acceptable.” Studies by Lethbridge et al., Phan, and Yuen Li Lim (reported Cronbach Alpha scores for the individual scales between 0.56 and 0.85, with most indicating that whilst many of these scores are lower than desired, they are considered adequate. Dunn and Musolino reported that the Cronbach’s alpha scores in their study of occupational and physical therapy students (n= 125) for Habitual Action (0.57) and Reflection (0.55) were below acceptable range.

Leung and Kember’s study compared the RTQ to the Revised Study Processes Questionnaire and, as a result, gained external validity of the RTQ. In addition, Lethbridge et al. assessed the psychometric properties of the RTQ in nursing students (n=538) within classroom and clinical practice learning environments via second-order confirmatory analysis. Results in this study supported the construct validity and the psychometric properties of this questionnaire.

The RTQ was not modified for this study. The RTQ is provided in Appendix C.

Rationale for using the chosen questionnaires

The RLS and RTQ were chosen as they seek to investigate the use and stages of reflective thinking of tertiary level students within their course of learning. This was of interest to the researcher as it would provide quantitative data from two validated
questionnaires that complement each other with respect to use of content, process and premise reflection in the sample population to assist in answering the first research question, ‘How and why do undergraduate physiotherapy students use reflection in learning and practice?’

The scale scores of the RLS\textsuperscript{1,2} and RTQ\textsuperscript{3} were also used to statistically analyse if there were any significant differences between the cohorts (pre-clinical and clinical level students), genders, current course of enrolment groups (Bachelor of Physiotherapy and Bachelor of Physiotherapy/Bachelor of Exercise and Sport Science – double degree) and the participants’ previous level of education prior to enrolment groups (final year of secondary school or equivalent and at least 1 year tertiary level learning), answering the second research question of this study.

The items in these questionnaires also formed the basis of questioning for the interviews so that the findings from the qualitative data could be analysed in conjunction with the quantitative data and item responses (see Appendix D – interview questions).

**Participants**

**Sample**

The participants were a convenience sample of students enrolled in a four-year undergraduate Bachelor of Physiotherapy (BPhys) degree or a five-year undergraduate Bachelor of Physiotherapy/Bachelor of Exercise and Sport Science (BPhys/BESS) degree at a Western Australian university. Participants from two cohorts of students enrolled in the undergraduate Bachelor degrees were recruited. The first cohort was pre-clinical (PC) level students (Semester 1 - Year 2 BPhys or Year 3 BPhys/BESS), meaning these students had not attended any 5-week clinical placements in their current degree. The second cohort was final year clinical (C) level students (Semester 1 - Year
4 BPhys or Year 5 BPhys/BESS) who had completed at least three 5-week clinical placements at a variety of clinical settings. The inclusion criteria were male and female students aged over 18 years and currently enrolled in the BPhys degree or the BPhys/BESS degree.

There are two graduate-entry Bachelor degrees in physiotherapy at the Western Australian university accessed in the study. Firstly, the Bachelor of Physiotherapy (BPhys) is a four year degree and secondly, the Bachelor of Physiotherapy/Bachelor of Exercise and Sport Science (BPhys/BESS) is a five year double degree. The two streams have a common first year (aside from one academic unit difference in Semester 2). The double degree (BPhys/BESS) students then separate from the single degree (BPhys) students in their second year to do academic non-clinical units with the School of Health Sciences (aside from one common academic unit) and then re-join the B/Phys students who are at year 2 level (the PC group in the study). Clinical placement exposure does not occur until the end of semester 2 in the BPhys degree Year 2 (common with BPhys/BESS double degree semester 2 - Year 3). From then on, the students complete two further years with the same level of clinical placement exposure.

The following (Figure 3) provides clarification of the two Bachelor degrees from which participants were accessed at the time of data collection.

Figure 3: Bachelor degrees in the study at time of data collection
Reflective learning context of sample

In order clearly describe the sample population for research comparison; the study participants’ exposure to educational activities that directly linked to reflective thinking is outlined below. In Year 1 and first semester Year 2 of the BPhys degree and Year 1 and first semester Year 3 of the BPhys/BESS degree (the PC stage of learning), the participants of this study were engaged in 55 hours of service learning activities. These activities included assisting with disabled children participation programmes, hydrotherapy classes, aged-care, massage for new mothers and ironman events along with volunteering as ‘patients’ for practical examinations. Linked to these service learning activities, the students completed structured written reflections on their experiences that were formative but compulsory. The students used a reporting framework based on the Situation, Task, Action, Result (STAR) technique. From second semester of Year 2 for the BPhys degree and Year 3 for the BPhys/BESS degree, when the students commenced clinical placements (the C stage of learning as described above), written reflection summative assessments were linked to each clinical placement. Again, the STAR analysis structure was used but this framework was extended to include “Evaluation” and “Strategies for the future”; “STARES" to complete the reflective thinking cycle and to communicate action for change. This written form of reflection was preceded with a one-hour lecture and a one-hour tutorial in semester 2 of Year 2. These sessions provided theoretical background as well as practical examples of how they might use reflection within their clinical learning experiences.

Aside from the above written reflections, there were no other formative or summative assessment tasks explicitly associated with reflective thinking known to the researcher. There were several educational activities and assessment tasks, at all stages of learning, that required the sample participants to reflect and clinically reason on case studies,
theoretical concepts and practical skills. These were often in small group sessions but also within the lecture setting. Most of these experiences linked to cognitive and psychomotor domains of learning rather than affective domains.

**Setting**

Both PC and C level participants were in an on-campus learning environment at the time of recruitment and data collection. The C level participants were attending a compulsory on-campus module of learning in their final year of the undergraduate degree. The final year of this undergraduate physiotherapy degree includes 10 weeks of on-campus and self-directed learning modules and assessment as well as up to 20 weeks of clinical placement.

**Data collection procedure**

**Piloting the questionnaires**

Pre-clinical level students (n=10) from the School of Physiotherapy at the university were recruited in early semester 2, 2014 to participate in piloting of the RLS$^{1,2}$ and the RTQ.$^3$ Pilot documents were developed for both questionnaires with the written information outlining the purpose and process of the pilot. Tables were made available in the pilot documents so pilot participants could provide comments and suggestions regarding the individual questions, as well as the questionnaires as a whole (see Appendices E and F).

The pilot participants were chosen for their similarity to the projected participants in the main study. They were from a cohort of students that were not to be included in the main study. At the pilot recruitment stage, the researcher verbally communicated a brief description of the requirements of the pilot and assured all students that participation was voluntary. The students were also informed that their comments and responses
would remain confidential and not be included in the main study. Ten students agreed to participate. The students completed the first phase (test 1) of the pilot at the end of a class in mid-September 2014 and the second phase (retest – test 2) two weeks later (postal return).

Using the IBM Statistical Package for Social Sciences (SPSS) Version 23,\textsuperscript{112} Intraclass Coefficient Correlation (ICC) between the data collected on the two dates was used to determine the test-retest reliability of both questionnaires. In addition, to determine internal consistency across questionnaire items, Cronbach’s Alpha measures were determined for both test 1 and test 2. This was particularly important for the RLS\textsuperscript{1,2} as modifications had been made to reflect the linguistic and participant population differences.

**Accessing the participants**

The researcher is an academic staff member in the School of Physiotherapy at the Western Australian university from where the participants were recruited.

**Recruitment of study participants**

The participants were recruited by the researcher at the conclusion of a lecture scheduled for each cohort of students in semester 1 of 2015. The researcher conducted a short presentation outlining the research and the process of consent and participation. Following this presentation, a Participant Information Form (PIF) (see Appendix G) and Participant Consent Form (PCF) (see Appendix H), and a questionnaire coversheet (see Appendix I) to gather demographic information and the two questionnaires (Appendices B and C) were distributed as a pack and later collected by an administrative assistant not involved in the study.
Selection of interview participants

The participants were given the opportunity to Consent to Part A of the study (completion of demographic information and questionnaires) only or to Consent to Part A and Part B (consent to be contacted and participate in an interview with the researcher).

In the PC cohort of students, 18 students consented to be contacted and participate in the interview. In the C cohort of students, 13 students consented to be contacted and participate in the interview. Twelve interview participants were chosen (6 participants from each cohort) based on the following:

1. Consent to Part B of the study;
2. A variety of RLS\textsuperscript{1,2} scores;
3. A variety of RTQ\textsuperscript{3} results with preference for participants displaying a dominant scale;
4. A ratio of male to female participants similar to the total sample;
5. A mix of BPhys and BPhys/BESS students; and,
6. A variety of secondary school leavers and those with at least 1 year tertiary education prior to enrolment in this course of study.

Interviews

Participant interviews served, initially, as a method of triangulation of the data. Triangulation is a method of improving the credibility of the researcher’s interpretations by gathering data from three or more sources and methods.\textsuperscript{99} Interview participants were contacted to arrange a time and place suitable to them. All participants contacted for interview proceeded to participate in an individual, semi-structured interview that was recorded following additional verbal informed consent. The interviews were
conducted between 2 days and 5 weeks after completion of the questionnaires in April and May, 2015.

**Interview process**

Each interview was conducted at a time and venue convenient to the participant. The interviews were audio-recorded for analysis purposes. The twelve interviews ranged from 27 minutes to 51 minutes in duration with a mean duration of 39 minutes. The interviews commenced with the researcher providing an explanation of the aims and purpose of the interview as well as contextual information regarding the definition and use of reflection in learning. Each participant was reminded of the confidentiality of the data gathered and all participants were asked to provide a pseudonym for reporting purposes. Verbal informed consent was gained prior to further questioning (see Appendix J for the outline of interview preamble).

A semi-structured interview approach was chosen using a combination of pre-defined open-ended questions with spontaneous probing and clarifying questions. Reflective statements and summarisation were also employed to elicit further valuable discussion and elaboration of ideas. The pre-defined questions were matched to questionnaire stimulus questions to trigger the gathering of specific examples of how participants use reflection in their course.

Examples of these were:

1. Can you provide me with some examples of how you have used reflection within your course?
2. Can you provide me with examples of where you have talked with your colleagues about learning and methods of study?
3. Can you provide me with examples of where you have pondered over the meaning of things you have been studying and learning in relation to your own personal experiences?

4. Can you provide me with examples of where this course has challenged some of your firmly held ideas?

5. Can you provide me with an example of where you have considered how your own point of view on a problem may be different to another’s?

In addition, open-ended and probing questions were used to gather information on their motivations for reflection as well as outcomes or actions that occurred as a result of their reflection. The participants were also asked for their thoughts on how reflection might be enhanced or encouraged in learning and practice. The pre-defined interview questions are presented in Appendix D.

**Data management**

To comply with Section 3 of the UWA Code of Conduct for the Responsible Practice of Research\(^\text{114}\) the following steps were implemented:

1. Data (including electronic data) was recorded in a durable and appropriately referenced form;

2. Data was held for sufficient time to allow access and reference. Recommended a minimum 5 years from date publication, but up to 15 years for specific types (eg clinical studies); and,

3. Wherever possible, original data was retained in the school or research centre in which it was generated. In all cases, prior to the publication of research findings a Location of Data Form has been completed.
To maintain anonymity, privacy and confidentiality of all participants, the following measures were taken:

1. All questionnaires, demographic information and consent forms were given a unique numeric code linked to each participant;

2. A non-academic staff member coded and matched the questionnaires to participant information, keeping the list secure from the researcher;

3. Only anonymous quotes and aggregate data reported; and,

4. Participants were referred to by a pseudonym of their choosing and/or their participant number.

To comply with data storage requirements, the following measures were taken:

1. All hard copy questionnaires were locked in a filing cabinet in the researcher’s office;

2. Quantitative electronic data in an SPSS file was password protected and stored on a secure server at UWA and The University of Notre Dame Australia;

3. Digital audio-recordings were electronically stored in a secure server at UWA and The University of Notre Dame Australia and password protected;

4. Electronic transcriptions were saved in PDF format and password protected and stored on a secure server at UWA and The University of Notre Dame Australia;

5. All data, both hard and suitable electronic versions, were copied, backed up, password protected and retained for a minimum of 7 years following the completion of the research or publication (whichever is later) in a locked cabinet and/or secure UWA server and The University of Notre Dame Australia; and,

6. The location of this data was recorded and retained by the University of Western Australia and the researcher.
Ethical considerations

The researcher was an academic staff member in the School of Physiotherapy from which the participants were recruited. To satisfy ethical standards required in educational research the following steps were implemented:

1. Following the initial information presentation the researcher left the room so that students were free to decline consent to participate;
2. All students placed the consent and questionnaire package in a box at the end of the session whether they had consented or declined to participate. This created an environment where the students were free to decline to participate as they would not be identified by leaving early or not handing in the documents;
3. A non-academic member of staff collected the consent forms and completed questionnaires and code matched for interview purposes only;
4. The information sheet clearly stated that as a participant of the study, there would be no impact on their undergraduate physiotherapy course if they participated or not;
5. The researcher did not have access to individual participants’ names;
6. Neither individual responses nor the status of participants’ consent were made available to teaching staff in the School of Physiotherapy;
7. From the National statement on ethical conduct in human research 4.3.7, students were informed that “A person declining to participate in, or deciding to withdraw from, research (will) not suffer any negative consequences…” and, should they withdraw, they would have their record of participation destroyed unless otherwise agreed; and,
8. The student researcher was not involved in teaching and assessment of the
students from which the participants were recruited during the gathering of all
data.

In order to gain access to the participants, the researcher was required to apply for dual
ethics approval from both the Western Australian university from where the participants
were accessed and the University of Western Australia where the researcher was
enrolled as a Masters student.

Data analysis

This study has a cross-sectional, exploratory mixed-method research design using data
from two validated questionnaires and twelve individual semi-structured interviews. For
analysis purposes the quantitative data from the questionnaires was analysed prior, and
separately to, the qualitative data from the interviews. Finally, the data from the
questionnaires and interviews were integrated for final analysis and discussion.

Questionnaires and demographic information

Returned questionnaires and demographic information were coded and all data
transferred by the researcher to IBM Statistical Package for Social Sciences
(SPSS) Version 23\textsuperscript{112} for statistical analysis.

Quantitative data analysis – demographics

Prior to analysis the demographic data was checked for outliers and omissions in order
to identify errors of data entry or missing data. This was important to ensure the data
was a true and accurate representation of the sample in the study.\textsuperscript{116} Following this,
 frequencies of the nominal demographic data (cohort, current course, gender and
previous level of education prior to entry to this course) were calculated as well as
range, mean and standard deviations of the scale data (age in years).
The data were also split into groups on four occasions for comparisons of test groups. The test groups were cohort (PC and C level students), gender (male and female), current course (BPhys and BPhys/BESS - double degree students) and previous level of education prior to enrolment in current course (final year secondary school or equivalent and those students with at least one year tertiary level of education). From each test group, frequencies of the nominal demographic data were calculated as well as range, mean and standard deviation of the scale data.

**Quantitative data analysis – questionnaires**

The data from each questionnaire is via a Likert scale. The Reflection-in-Learning Scale (RLS)\textsuperscript{1,2} uses a 7 point Likert scale where 1 = never and 7 = always. The RLS was designed to generate a composite score from the 14 items with a possible range of 14 to 98. The Reflective Thinking Questionnaire (RTQ)\textsuperscript{3} uses a 5 point Likert scale where A = definitely agree, B = agree with reservation, C = only to be used if a definite answer is not possible, D = disagree with reservation and E = definitely disagree. Values assigned to each response for this scale were A = 5, B = 4, C = 3, D = 2, E = 1 in accordance with the developers of this questionnaire. The RTQ has 16 items which are subdivided into four separate scales; Habitual Action (HA), Understanding (U), Reflection (R) and Critical Reflection (CR) with four items per scale. Each scale generates a separate composite score with a possible range of 4 to 20. These scales were at all times analysed separately as was the intention of Kember et al.\textsuperscript{3} and reflected the theoretical underpinning of the questionnaire.\textsuperscript{103}

Prior to analysis of the quantitative data from the questionnaires, the data was checked for outliers and omissions. Missing data was identified and then verified from hard copies of the questionnaires. The responses from those participants, for the scale
impacted by the omissions, were removed to prevent skewing of composite scores. All other data from the identified participants was retained.

Descriptive statistics of the total scores in each scale for both questionnaires were calculated. As the data is generated from ordinal data from Likert scales, the median was calculated. All prior studies using these questionnaires reported mean, range and standard deviation of composite scores; therefore, these descriptive statistics were also calculated for comparative analysis.

Cronbach’s alpha scores for the 14 items in the RLS,\textsuperscript{1,2} as well as the 4 items in each of the four separate scales of the RTQ,\textsuperscript{3} were calculated to determine internal consistency of the scales.\textsuperscript{117} This was especially important for this study as there had been some modification of language in the RLS from the original questionnaire developed by Sobral.\textsuperscript{1,2} (See Appendices A & B) Additionally, Henson\textsuperscript{118} citing Gronlund and Linn stated that Cronbach’s alpha scores reflect the reliability of “the results obtained with an evaluation instrument and not the instrument itself.”\textsuperscript{118,p186} Scores obtained from other studies should not be relied upon as the basis for reliability of composite scores representing the scale consistently.\textsuperscript{118} Acceptable Cronbach’s alpha scores are generally expected to fall within a range of 0.70 to 0.95.\textsuperscript{101,102,117} It must also be noted that the Cronbach alpha scores may be lower than the aforementioned acceptable range in scales with a small number of items and/or a small number of participants.\textsuperscript{102} Therefore, in the RTQ,\textsuperscript{3} the four scales only have four items each so a lower Cronbach’s alpha score may be considered acceptable.

**Comparisons of questionnaire quantitative data between test groups**

In order to correctly analyse if there were any significant differences between the test groups for the total scores of the RLS\textsuperscript{1,2} and total scores of each of the four scales in the
RTQ \(^3\) (HA, U, R and CR), the data was categorised and tested for normality of distribution.

All data obtained from the RLS\(^{1,2}\) and RTQ\(^3\) were categorised as ordinal data as both questionnaires use a Likert scale. To test normality of the data for each test group, the Shapiro-Wilk test was run and histograms were created using SPSS.\(^{112}\) The Shapiro-Wilk test is the most reliable test of normality for the data obtained in this study as it is sensitive for sample sizes between 20 and 2000.\(^{119}\) For the Shapiro-Wilk test to indicate that the data is parametric, or has a normal distribution, the p-value is required to be greater than 0.05.\(^{119}\) Histograms provided visual representation of the quantitative data to assess similarity of distribution between the test groups.

From the Shapiro-Wilk test results, the choice of test to find significant differences between the test groups was determined. For scales with parametric data, the 2 sample t-test was applied. For scales with non-parametric data the Mann-Whitney U test was applied.\(^{120}\) Histograms from each grouping were checked for similarity of distribution between test groups. Non similarity indicates the most appropriate comparison for the Mann-Whitney U test is to use the mean ranks of each group as opposed to the median scores.\(^{121}\)

**Comparison of data analysis to previous studies**

All studies using the RLS\(^{1,2,56,61,70}\) and the RTQ\(^{3,65,66,70,72,73,103,106}\) reported mean, range and standard deviation descriptive statistics when analysing the composite scores of the scales. In addition to this, all studies that were of similar research design, being cross-sectional comparing cohorts of students also applied t-tests to calculate significant differences. Frost\(^{122}\) argues that in Likert scale datasets, there is limited difference in the ‘statistical power’ between the Mann-Whitney U and t-tests and suggests that both tests could be applied to confirm findings of significant difference. Therefore, both 2 sample...
t-tests and Mann-Whitney U tests using mean ranks were applied for all appropriate comparisons of test groups.

**Interview sample demographic and quantitative data analysis**

In order to illustrate the interview sample, with respect to demographic and questionnaire data, descriptive statistical tests were conducted. Frequencies of the nominal demographic data (cohort, gender, current course and previous level of education prior to entry to this course) as well as range, mean and standard deviations of the scale demographic data (age in years) were calculated. Additionally, measures of central tendency which included range, median, mean and standard deviation were found for each questionnaire for the interview participants for each cohort.

**Interview data**

The interview data was thoroughly analysed over a period of several months using thematic analysis. Braun and Clarke\(^{123}\) developed and defined a flexible structure to the process of thematic analysis as a way to strengthen and define what they believe to be the essence of all qualitative research. The thematic analysis process has six phases:

1. Familiarising self with the data
2. Generating initial codes
3. Searching for themes
4. Revising themes
5. Defining and naming themes
6. Producing the report (adapted from Braun and Clarke,\(^{123}(p87)\))

The qualitative data analysis for this study was conducted using these six phases.
Phase One: Familiarising self with the data

The initial phase of thematic analysis began when transcribing the interview data. The researcher personally transcribed all twelve interviews verbatim which allowed for initial immersion in, and primary analysis of, the data. Braun and Clarke\textsuperscript{123} cite Lapadat and Lindsay stating that at the stage of transcription, there is some level of interpretation occurring “rather than simply a mechanical act of putting spoken words on paper.”\textsuperscript{123(p88)} The transcripts were then read and re-read to gain further insight and deeper understanding of what the interview data was saying.

Phase Two: Generating initial codes

In this phase, initially one transcript from a clinical level student was randomly selected. The researcher and research supervisor independently coded this transcript and then met to compare and discuss the initial codes that were generated. This served to clarify the coding process and foster confidence in the early researcher.

The initial coding of all twelve transcripts was inductive and open.\textsuperscript{97,99,123} Phrases and clauses within the data were firstly coded based on their semantic content, highlighting the meaning the words on the page which were taken at face value.\textsuperscript{123} Following the review of each transcript, notes and reflections were made by the researcher on the transcripts and backed up in electronic documents. This, in turn, led to repeated review of the data in a “recursive process.”\textsuperscript{123(p88)} The subsequent multiple reviews were driven firstly by; the codes and themes that were emerging from the data, secondly; new insights and questions that were generated as a result of this analysis and, thirdly; by the researcher’s theoretical knowledge and interest in the area. This then informed and organised the generation of codes from a theoretical perspective.\textsuperscript{123} Through this cyclical, repetitive, exploratory analysis process over ninety codes were identified.
Phase Three: Searching for themes

Braun and Clark\textsuperscript{123} suggest that the researcher must make decisions and judgements to determine themes from a variety of perspectives. The researcher should look for repetition of ideas and responses as well as recognise important points in the data that link to the research question(s). Following the generation of the codes, the frequency of each code in the interview data was quantified. This served to launch the process of searching for themes. The codes were then analysed, interpreted and sorted into potential themes and subthemes by seeking relationships between them. Mertens names this step as “axial coding.”\textsuperscript{99(p424)} Again, this was a cyclical process whereby each repetition was informed by learning from the previous cycle. This process was completed independently by the researcher with regular consultation with the research supervisor to further validate and strengthen the findings.

Phase Four: Reviewing themes

The main themes that had been found by code analysis and collation were then reviewed and checked against firstly, the “coded extracts,”\textsuperscript{123(p91)} the highlighted chunks of data associated with each code, and secondly, the overall interview data or “data set,”\textsuperscript{123(p91)} to ensure that they were representative of the identified theme. This initiated the refinement and organisation of the main themes.\textsuperscript{123}

Phase Five: Defining and naming themes

Once the main themes were created, ongoing analysis and discussion between researcher and research supervisor occurred to tease out subthemes. This generated a defined framework for reporting findings that answered the primary research question as well as further questions that emerged from the analysis process. Mertens names this stage as “selective coding.”\textsuperscript{99(p424)} The process of naming the themes and subthemes was
an iterative process that occurred across this phase and into the following phase of producing the report.

**Phase Six: Producing the report**

Throughout this phase, ongoing refinement and analysis of themes, subthemes occurred. Selected quotes or extract examples from the data were used to effectively illustrate each theme and subtheme and provide evidence for answering the research questions. Writing the results section of this thesis, there was need for presentation of these extracts with some level of analysis to create a clear story of what the data represented in this study. In order to report and explain the themes that emerged from the data, Kolb’s cycle of experiential learning model\(^4\) was overlayed. This evolved from the report writing process as a way to clearly link with the premise that, within higher education, using a constructivist approach, reflective thinking is essential to learn from experience. The production of the thesis discussion, recommendations, limitations and conclusions further linked the data to the research questions and literature in a scholarly report.\(^{123}\)

**Conclusion of Methodology Chapter**

This study used both quantitative and qualitative research methodologies to explore how and why undergraduate physiotherapy students at a single Western Australian university use reflection in their learning and practice. Through a rigorous methodological approach that has been informed by theory and relevant research, as described in this chapter, this study has produced quantitative and qualitative results that will be presented in the following chapter.
CHAPTER FOUR: RESULTS

Introduction

In this chapter, the results will be presented in four sections. Firstly, the results of the questionnaire pilot study will be reported. Secondly, the quantitative results of the main study which includes demographic data, and results from the questionnaires of the total sample as well as the test groups will be presented. Thirdly, the interview participant sample will be illustrated through quantitative results of their demographic and questionnaire data. Lastly, the qualitative results from the interviews conducted with twelve participants will be presented.

Questionnaire pilot results

The Reflection-in-Learning scale (RLS)\textsuperscript{1,2} Intraclass Coefficient Correlation (ICC) using single measures was 0.89 and the ICC using average measures was 0.94. This indicated an excellent level of test-retest reliability for this questionnaire pilot. Cronbach’s alpha measure for test 1 was 0.80 and 0.91 for the test 2 (retest). This indicated an acceptable level of internal consistency for this pilot.

The reliability results for the Reflective Thinking Questionnaire (RTQ),\textsuperscript{3} for each of the four scales, Habitual Action (HA), Understanding (U), Reflection (R) and Critical Reflection (CR) are shown in Table 1.

<table>
<thead>
<tr>
<th>Scale</th>
<th>ICC (single measures)</th>
<th>ICC (average measures)</th>
<th>Cronbach’s Alpha test 1</th>
<th>Cronbach’s Alpha test 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>HA</td>
<td>0.41</td>
<td>0.58</td>
<td>0.21</td>
<td>0.09</td>
</tr>
<tr>
<td>U</td>
<td>-0.04</td>
<td>-0.09</td>
<td>0.52</td>
<td>0.69</td>
</tr>
<tr>
<td>R</td>
<td>0.88</td>
<td>0.94</td>
<td>0.81</td>
<td>0.71</td>
</tr>
<tr>
<td>CR</td>
<td>0.71</td>
<td>0.83</td>
<td>0.76</td>
<td>0.87</td>
</tr>
</tbody>
</table>

\textit{Table 1: Pilot test-retest reliability and internal consistency of RTQ}\textsuperscript{3}
This analysis showed that there was strong test-retest reliability and internal consistency for the R and CR scales for this pilot. The HA scale displayed fair test-retest reliability and poor internal consistency for this pilot. The U scale displayed poor test-retest reliability and fair internal consistency for this pilot.

Comments and suggestions made by the pilot participants were used to inform document presentation and verbal instructions to the participants at the time of data collection in the main study. This assisted to improve clarity and context of completion of the questionnaires. For example, pilot participants were unsure of the context of their responses to the questionnaire items. Therefore, this information was included in the data collection presentation and a clarifying sentence was added to the top of the questionnaires: ‘Please respond to the statements below in relation to your approach to learning, practical experiences and study practices within this physiotherapy course.’

**Quantitative results**

**Introduction**

In order to present the quantitative results of the main study, the following structure will be used.

1. Internal Consistency results for each questionnaire in this study. This is presented to analyse if the composite scores calculated for each scale, and used in the analysis of this research, are representative of the individual items. This has been calculated to determine the reliability and validity of the study results.

2. The descriptive statistics, being frequencies, measures of central tendency and ranges, will be presented for the total sample demographic data and questionnaire data.
3. The four test groups’ quantitative results will be presented. This will include descriptive statistics of each test group demographic and questionnaire data as well as statistical analysis comparing each test group’s questionnaire results.

The four test groups are:

i. **Cohort**: Pre-clinical level and Clinical level students

ii. **Gender**: Male and Female

iii. **Current course**: Bachelor of Physiotherapy and Bachelor of Physiotherapy/Bachelor of Exercise and Sport Science – double degree.

iv. **Previous level of education prior to enrolment**: Final year of secondary school (or equivalent) and at least 1 year tertiary level education.

4. Comparison of results in this study to previous studies

**Internal consistency of questionnaires**

**Internal consistency for Reflection-in-Learning Scale (RLS)**\(^{1,2}\) for this study

The Cronbach’s alpha of the item scores of the RLS\(^{1,2}\) was 0.80. This result indicates that the composite score of the RLS is a reliable reflection of the individual items within the questionnaire.\(^{118}\) The internal consistency in the current research aligns with the results of between 0.70 and 0.95 reported in previous studies.\(^{1,2,70,101}\)

**Internal consistency for Reflective Thinking Questionnaire (RTQ)**\(^{3}\) for this study

The Cronbach’s alpha scores for the RTQ\(^{3}\) ranged from 0.48 to 0.67. The Habitual Action scale internal consistency (Cronbach’s alpha = 0.48) was well below the acceptable range of 0.70 – 0.95.\(^{102,117}\) This indicates that the composite scores for the Habitual Action scale have poor reliability for analysis in this study.\(^{70,118}\) The Cronbach’s alpha scores for the remaining three scales (Understanding = 0.62; Reflection = 0.64; Critical Reflection = 0.67) are similar to those found in previous
studies using this questionnaire\textsuperscript{3,66,69,70,103,106} and are considered acceptable given the small number of items in each scale.\textsuperscript{69,102}

\textit{Total sample quantitative results}

\textbf{Descriptive statistics demographic data of total sample}

From a convenience sample of undergraduate physiotherapy students at a university in Western Australia, 122 students consented to participate in the current study. This represented 83\% of the current enrolments of 148 students. The participants were recruited from two cohorts of students, those classified as pre-clinical (PC) level students and those classified as clinical (C) level students. Of the PC level student cohort of 81 students, 80 students consented to join the study which is a 99\% participation rate. Of the C level student cohort of 67 students, 42 students consented, a 63\% participation rate.

The demographic data collected from the participants was cohort, age in years, gender, current course of study and previous level of education prior to enrolment.

\textit{Descriptive statistics demographic data of total sample}

\textbf{Check for outliers and missing data}

There were no outliers or missing data.

\textbf{Cohort}

Eighty participants (65.6\%) were from the PC level cohort and 42 participants (34.4\%) from the C level cohort.

\textbf{Age}

The total sample had an age range of 18 to 42 years and a mean age of 22 years with a standard deviation of 4.1 years.
Gender

Forty participants (31.8%) were male and 82 participants (67.2%) were female. This is consistent with the latest figures reported by the Physiotherapy Board of Australia in December 2016 stating there were 32.1% male and 67.9% female registered physiotherapists.\textsuperscript{83(p6)}

Current course

Ninety four participants (77.0%) were enrolled in the Bachelor of Physiotherapy degree and 28 participants (23.0%) enrolled in the Bachelor of Physiotherapy/ Bachelor of Exercise and Sport Science double degree.

Previous level of education prior to enrolment

Eighty one participants (66.4%) had a previous highest level of education prior to enrolment of the final year at secondary school (or equivalent) while 41 participants (33.6%) had completed at least one year of tertiary education.

Table 2 presents the descriptive statistics of the demographic data for the total sample as described above.

| Table 2: Descriptive statistics of demographic data for total sample (n (% of group)) |
|---------------------------------|------------------|-----------------|
| **Cohort**                      | **Pre-clinical** | **Clinical**    |
| **Gender**                      |                  |                 |
| Male                            | 40 (31.8)        | 82 (67.2)       |
| Female                          |                  |                 |
| **Current Course**              |                  |                 |
| Bachelor of Physiotherapy       | 94 (77.0)        |                 |
| Bachelor of Physiotherapy/Bachelor of Exercise and Sport Science – double degree | | 28 (23.0) |
| **Previous level of education** |                  |                 |
| Final year at secondary school or equivalent | 81 (66.4) | |
| At least one year tertiary level education | 41 (33.6) | |

Descriptive statistics questionnaire data of total sample

For each questionnaire, a Likert Scale was used to represent responses to the items. Likert scales produce ordinal data. The correct descriptive statistic of central tendency for Likert scale data is the median, however, in this thesis; mean and standard deviation
are also reported to enable comparisons with previous studies using these questionnaires.

**Reflection-in-Learning Scale (RLS)**

This questionnaire is a 14 item questionnaire using a 7 point Likert scale. It was designed to be analysed using the composite score of items; which can range from 14 to 98.

**Check for outliers and missing RLS data**

Prior to analysis, the data set from the RLS was checked for outliers and missing data. No outliers or missing data were detected.

**Descriptive statistics for RLS data**

From the total sample (n = 122), the RLS composite scores ranged from 45 to 92. The median score was 66, with a mean score of 66 and standard deviation of 8.9. These results compare to previous studies using the 14-item RLS being Sobral’s study of undergraduate medical students (n=196) with a mean age of 19 years having a mean RLS score of 71.55 and standard deviation of 10.32. Sobral followed this later in a study of 275 second year undergraduate medical students and reported mean RLS scores of 70.91 (SD=10.33) at the start of term and 70.53 (SD=11.08) at the end of term. Chalmers et al. studied final year medical students (n=56) with an age range of 20 to 29 years and reported mean RLS scores of 60.2 (SD=13.6) at the start of the year and 62.9 (SD=12.2) at the end of the year. Grant et al. studied final year medical students from two schools in the UK with different teaching approaches and reported that the students from the school with a lecture-based teaching approach (n=154) had a mean RLS score of 58.55 and the students from a school with a problem-based learning approach (n=237) had a mean RLS score of 63.35. Therefore, in comparison to Sobral’s results, the current study participants report lower levels of
engagement in reflective behaviours and similar or higher levels than other studies presented.

**Reflective Thinking Questionnaire (RTQ)**

This questionnaire was designed to generate composite scores of the four scales separately: Habitual Action (HA), Understanding (U), Reflection (R) and Critical Reflection (CR). Using a 5 point Likert scale, with 4 items per scale, generated a possible score ranging from 4 to 20 for each scale.

*Check for outliers and missing RTQ data*

Prior to analysis, the data set from the RTQ was checked for outliers and missing data. No outliers were detected but there were two missing responses in the SPSS data spreadsheet for the RTQ. Hard copies of the questionnaires were checked and two participants had failed to complete responses for one item each in the RTQ. Participant # 2034 (PC cohort) missed Question 13 which falls in the HA scale. Participant # 2064 (PC cohort) missed Question 9 which also falls in HA scale. It was decided that all responses in the HA scale for participants # 2034 and # 2064 would be removed from the data prior to analysis as the missed item scores would skew the HA total scores. All other data for these two participants was retained as the HA scale was analysed separately to all other scales in the RTQ.

*Descriptive statistics for RTQ data*

The HA scale scores ranged from 6 to 20 with a median of 12, and the U scale scores ranged from 11 to 20 with a median of 19 (Table 3). R scale scores ranged from 9 to 20 with a median of 16, and CR scale scores ranged from 8 to 20 with a median of 15. The HA and CR scales show lower median scores than the U and R scales which aligns with the results reported in previous studies that used the 16-item with 5 point Likert scale. This is an expected outcome in health professions education as there is
limited time within the curriculum to practise a volume of tasks to the level that they become habitual and critical reflection requires more investment of time, appropriate triggers as well as skill and willingness to engage in this stage of reflective thinking. See Table 3 below for descriptive statistics of the RTQ scale scores for this study.

<table>
<thead>
<tr>
<th>Scale</th>
<th>N</th>
<th>Range</th>
<th>Median</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitual Action</td>
<td>120</td>
<td>6 – 20</td>
<td>12</td>
<td>12.6</td>
<td>2.59</td>
</tr>
<tr>
<td>Understanding</td>
<td>122</td>
<td>11 – 20</td>
<td>19</td>
<td>19.0</td>
<td>1.43</td>
</tr>
<tr>
<td>Reflection</td>
<td>122</td>
<td>9 – 20</td>
<td>16</td>
<td>16.1</td>
<td>2.23</td>
</tr>
<tr>
<td>Critical Reflection</td>
<td>122</td>
<td>8 – 20</td>
<td>15</td>
<td>14.5</td>
<td>2.72</td>
</tr>
</tbody>
</table>

Test group quantitative results

Descriptive statistics of demographic data of test groups

In order to create a picture of the make-up of each test group, descriptive statistical tests were applied to each group. When comparing the cohorts of PC and C level students, the proportions between gender, current course and previous education were similar. The range and mean for age were expected measures for this sample as the majority of students enrol in these degrees directly from secondary school. When comparing the gender groups, the proportions of PC to C level students were similar, but there were a greater proportion of female single degree students and secondary school leavers. There were also a greater proportion of single degree students and students of a younger age were more likely to be completing the double degree. Students who had completed at
least one year of postgraduate qualification prior to enrolment were also much less likely to be enrolled in the double degree. This is presented in Table 4 below.

**Table 4: Demographic descriptive statistics for each test group**

<table>
<thead>
<tr>
<th>COHORT</th>
<th>GENDER</th>
<th>CURRENT COURSE</th>
<th>PREVIOUS EDUCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>N</td>
<td>80</td>
<td>42</td>
<td>40</td>
</tr>
<tr>
<td>Age mean (SD)</td>
<td>21</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>Age range</td>
<td>18 - 42</td>
<td>18 - 42</td>
<td>18 - 42</td>
</tr>
<tr>
<td>Preclinical n (%)</td>
<td>26</td>
<td>65.0</td>
<td>54</td>
</tr>
<tr>
<td>Clinical n (%)</td>
<td>14</td>
<td>35.0</td>
<td>28</td>
</tr>
<tr>
<td>Male n (%)</td>
<td>26</td>
<td>32.5</td>
<td>14</td>
</tr>
<tr>
<td>Female n (%)</td>
<td>54</td>
<td>67.5</td>
<td>28</td>
</tr>
<tr>
<td>BPhys n (%)</td>
<td>60</td>
<td>75.0</td>
<td>34</td>
</tr>
<tr>
<td>BPhys/BEss n (%)</td>
<td>20</td>
<td>25.0</td>
<td>8</td>
</tr>
<tr>
<td>Final year Secondary School or equivalent n (%)</td>
<td>53</td>
<td>66.3</td>
<td>28</td>
</tr>
<tr>
<td>At least one year tertiary level education n (%)</td>
<td>27</td>
<td>33.7</td>
<td>14</td>
</tr>
</tbody>
</table>

Comparisons of quantitative data between test groups

**Rationale for statistical test choice in this study**

As described in Chapter Three (Methodology), the Shapiro-Wilke test and histograms were used to determine correct statistical test choices for the results in this study. For the Shapiro-Wilk test to indicate that the data is parametric, or has a normal distribution, the p-value must be greater than 0.05. Findings for normality of distribution of the data using the Shapiro-Wilk test are presented in Appendix K. Histograms provided
visual representation of the quantitative data (see Appendix L). This assessed similarity of distribution between the test groups which further impacted the choice of statistical test.

Rationale for statistical test: Reflection-in-Learning Scale (RLS)$^{1,2}$

When analysing the data from the RLS$^{1,2}$ for all test groups, the p-value from the Shapiro-Wilke tests ranged from 0.104 to 0.857 (see Appendix K). These findings indicated that the data, when comparing the test groups for the RLS, consistently had a normal distribution or was considered parametric. Therefore, a two sample t-test was applied. This is consistent with data analysis applied in other studies using the RLS.$^{1,2,61,70}$ Frost$^{122}$ argues that when comparing Likert scale datasets, there is limited difference in the ‘statistical power’ between the Mann-Whitney U and the t-test. He suggests that both tests could be applied to confirm findings of significant difference. Therefore, both were applied to the data in the current study for primary and confirmatory analysis. In order to choose the correct Mann-Whitney U test, the histograms were assessed for similarity of shape (see Appendix L). No test groups had a similar shape of distribution and therefore, the Mann-Whitney U test using mean ranks was applied.

Rationale for statistical test: Reflective Thinking Questionnaire (RTQ)$^{3}$

When applying the Shapiro-Wilk test to the data of the RTQ$^{3}$ the distributions for the four scales (HA, U, R and CR) were inconsistent (see Appendix K). The U scale was consistently non-parametric with a p-value less than 0.001 for all test groups. A possible reason for this was that there was a ceiling effect being demonstrated in this scale. The ceiling effect in the U scale data was also in the findings of a study by Dunn and Musolino.$^{70}$ They indicated that both the U and R scales in their study “lacked adequate distribution of responses across the items.”$^{70(p134)}$ Additionally, in this study, the R scale
data was nonparametric for the clinical level cohort, female gender, Bachelor of Physiotherapy course test group and final year of secondary school prior to enrolment test group with p-values ranging from 0.008 to 0.042.

As the RTQ data from this study had normality distributions that were inconsistent between each of the four scales, all data was classified as non-parametric. Therefore, the appropriate statistical test to compare the groups was the Mann-Whitney U test. As the histograms from each grouping did not display similarity of distribution between test groups (see Appendix L), the most appropriate comparison was to use the mean ranks of each group as opposed to the median scores.¹²¹ This statistical analysis varies from that used in previous studies for the RTQ,³,⁶,⁵,⁶,⁹,⁷⁰,⁷²,¹⁰,³,¹⁰,⁶ who reported mean scores of the scales and applied t-tests. It is unclear in these papers if normality tests were applied to the data sets.

**Statistical comparison of test groups**

Median scores are the most appropriate measure of central tendency for ordinal data of Likert scales. Mean and standard deviation are also reported in order to compare these results to previous studies using the questionnaires. When comparing all test groups, the level of significance was set at a p-value of less than 0.05 when applying both two sample t-tests and Mann-Whitney U tests.

**Comparison of cohort test groups**

*Cohort: Reflection-in-Learning Scale (RLS)¹²*

Possible composite scores for the RLS¹² range from 14 to 98. The PC cohort had a median score of 66, a mean of 66.3 and standard deviation of 9.64. This compared to the C cohort’s median of 65.5, mean of 65.3 and standard deviation of 7.42. (See Table 5)
When comparing the composite scores of the RLS of the PC and C level cohorts, firstly a two sample t-test was used as the distributions were deemed parametric. The Levene test = 0.072, therefore, equal variances were assumed so the t-score = 0.624 with p = 0.534. Therefore, there was no significant difference in the RLS composite scores between the PC and C cohorts. The Mann-Whitney U test using mean ranks was also applied with a resulting p-value of 0.724. This confirms that there was no significant difference in the RLS composite scores between the PC and C cohorts.

Cohort: Reflective Thinking Questionnaire (RTQ)

The following table (Table 6) presents the descriptive statistics of each scale in the RTQ for each cohort of students (PC and C). The possible scores for each scale range from 4 to 20.

<table>
<thead>
<tr>
<th>Cohort Group</th>
<th>Habitual Action</th>
<th>Understanding</th>
<th>Reflection</th>
<th>Critical Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Med</td>
<td>Mean (SD)</td>
<td>N</td>
</tr>
<tr>
<td>PC</td>
<td>78</td>
<td>13</td>
<td>12.8 (2.32)</td>
<td>80</td>
</tr>
<tr>
<td>C</td>
<td>42</td>
<td>12</td>
<td>12.3 (3.04)</td>
<td>42</td>
</tr>
</tbody>
</table>

When comparing the composite scores of each scale, Habitual Action, Understanding, Reflection and Critical Reflection in the RTQ between the PC and C cohorts, the Mann-Whitney U test using mean ranks was applied. The Understanding scale score for PC students was significantly higher than the C students (p<0.001). All other scales in the
RTQ showed no significant difference between the cohorts (HA: p = 0.246; R: p = 0.970, CR: p = 0.337).

Comparison of gender test groups

**Gender: Reflection-in-Learning Scale (RLS)**

Male students had a median score of 64, a mean of 64.2 and standard deviation of 8.97. This compared to the female students’ median of 66, mean of 66.8 and standard deviation of 8.83. (See Table 7)

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Median</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>40</td>
<td>64</td>
<td>64.2 (8.97)</td>
</tr>
<tr>
<td>Female</td>
<td>82</td>
<td>66</td>
<td>66.8 (8.83)</td>
</tr>
</tbody>
</table>

Comparing the composite scores of the RLS of the genders, a two sample t-test was used. The Levene test = 0.630, therefore, equal variances were assumed so the t score = -1.507 with p = 0.134. The Mann-Whitney U test using mean ranks was also applied with a resulting p-value of 0.240. Therefore, there was no significant difference in the RLS composite scores between the gender groups.

**Gender: Reflective Thinking Questionnaire (RTQ)**

The following table (Table 8) presents the descriptive statistics of each scale in the RTQ for each gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Habitual Action</th>
<th>Understanding</th>
<th>Reflection</th>
<th>Critical Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Med (SD)</td>
<td>N</td>
<td>Med (SD)</td>
</tr>
<tr>
<td>Male</td>
<td>38</td>
<td>13 (2.65)</td>
<td>40</td>
<td>19 (1.62)</td>
</tr>
<tr>
<td>Female</td>
<td>82</td>
<td>12 (2.54)</td>
<td>82</td>
<td>20 (1.32)</td>
</tr>
</tbody>
</table>
When comparing the composite scores of each scale in the RTQ between the genders, Mann-Whitney U tests using mean ranks were applied. The female Understanding scale scores were significantly higher than male Understanding scale scores (p = 0.023). All other scales in the RTQ showed no significant difference between the genders (HA: p = 0.180; R: p = 0.352, CR: p = 0.415).

Comparison of current course test groups

Current course: Reflection-in-Learning Scale (RLS)$^{1,2}$

Students enrolled in the Bachelor of Physiotherapy (BPhys) degree had a median score of 66, a mean of 66.3 and standard deviation of 8.73. This compared to the Bachelor of Physiotherapy/Bachelor of Exercise and Sport Science (BPhys/BESS) double degree students who had a median score of 65, mean of 64.7 and standard deviation of 9.61.

(See Table 9)

<table>
<thead>
<tr>
<th>Current Course</th>
<th>N</th>
<th>Median</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPhys*</td>
<td>94</td>
<td>66</td>
<td>66.3</td>
<td>8.73</td>
</tr>
<tr>
<td>BPhys/BESS **</td>
<td>28</td>
<td>65</td>
<td>64.7</td>
<td>9.61</td>
</tr>
</tbody>
</table>

* BPhys (Bachelor of Physiotherapy) **BPhys/BESS (Bachelor of Physiotherapy/Bachelor of Exercise and Sport Science – double degree)

Comparing the composite scores of the RLS of the BPhys students and the BPhys/BESS students, a two sample t-test was used. The Levene test = 0.376, therefore, equal variances were assumed so the t score = 0.840 with p = 0.403. The Mann-Whitney U test using mean ranks was also applied with a resulting p-value of 0.505. Therefore, there was no significant difference in the RLS composite score between the current course test groups.
Current course: Reflective Thinking Questionnaire (RTQ)³

The following table (Table 10) presents the descriptive statistics of each scale in the RTQ³ for each the current course test groups.

### Table 10: Descriptive statistics of RTQ³ comparing current course test groups

<table>
<thead>
<tr>
<th>Current Course</th>
<th>Habitual Action</th>
<th>Understanding</th>
<th>Reflection</th>
<th>Critical Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Med</td>
<td>Mean (SD)</td>
<td>N</td>
</tr>
<tr>
<td>BPhys*</td>
<td>92</td>
<td>13</td>
<td>12.8 (2.69)</td>
<td>94</td>
</tr>
<tr>
<td>BPhys/BEss**</td>
<td>28</td>
<td>12</td>
<td>12.0 (2.20)</td>
<td>28</td>
</tr>
</tbody>
</table>

* BPhys (Bachelor of Physiotherapy) **BPhys/BEss (Bachelor of Physiotherapy/Bachelor of Exercise and Sport Science – double degree)

When comparing the composite scores of each scale in the RTQ between the current course test groups, Mann Whitney U tests using mean ranks were applied. All scales showed no significant difference between the current course groups (HA: p = 0.190; U: p = 0.382; R: p = 0.582; CR: p = 0.946).

### Comparison of previous education test groups

**Previous education: Reflection-in-Learning Scale (RLS)¹,²**

Students who had a previous level of education prior to enrolment of final year of secondary school (or equivalent) had a median score of 64, a mean of 64.7 and standard deviation of 8.97. This compared to students who had at least one year of tertiary level education prior to enrolment who had a median score of 68, mean of 68.5 and standard deviation of 8.38. (See Table 11).

### Table 11: Descriptive statistics of RLS¹,² comparing previous education test groups

<table>
<thead>
<tr>
<th>Previous ed.</th>
<th>N</th>
<th>Median</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final year secondary school</td>
<td>81</td>
<td>64</td>
<td>64.7</td>
<td>8.97</td>
</tr>
<tr>
<td>At least 1 year tertiary level education</td>
<td>41</td>
<td>68</td>
<td>68.5</td>
<td>8.38</td>
</tr>
</tbody>
</table>
Comparing the composite scores of the RLS of the previous education test groups, a two sample t-test was used. The Levene test = 0.810 therefore, equal variances were assumed so the t score = -2.242 with p = 0.027. The Mann-Whitney U test using mean ranks was also applied with a resulting p-value of 0.017. Therefore, RLS composite scores of the students who had at least one year tertiary level education prior to enrolment were significantly greater than the RLS scores of students whose previous level of education prior to enrolment was final year of secondary school or the equivalent.

**Previous education: Reflective Thinking Questionnaire (RTQ)**

The following table (Table 12) presents the descriptive statistics of each scale in the RTQ for the previous education test groups.

<table>
<thead>
<tr>
<th>Previous ed.</th>
<th>Habitual Action</th>
<th>Understanding</th>
<th>Reflection</th>
<th>Critical Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Med</td>
<td>Mean (SD)</td>
<td>N</td>
</tr>
<tr>
<td>Final year secondary school</td>
<td>79</td>
<td>12</td>
<td>12.6 (2.51)</td>
<td>81</td>
</tr>
<tr>
<td>At least 1 year tertiary level education</td>
<td>41</td>
<td>13</td>
<td>12.8 (2.77)</td>
<td>41</td>
</tr>
</tbody>
</table>

When comparing the composite scores of each scale in the RTQ between the previous education test groups, Mann-Whitney U tests using mean ranks were applied. All scales in the RTQ showed no significant difference between the previous education test groups (HA: p = 0.780; U: p = -0.610; R: p = 0.152; CR: p = 0.141).

**Interview sample demographic and quantitative results**

Twelve participants were selected for interview from 31 students who consented to be contacted for Part B of the study. This sample of participants represented students from
both PC (n=6) and C (n=6) cohorts. Interview participants were selected in order to represent a number of factors related to the demographic and quantitative results collected from their questionnaires.

**Descriptive statistics demographic data of interview sample**

The descriptive statistics of the demographic data from each cohort of interview participants is presented below. When comparing the PC and C cohort interview groups with the total study PC and C cohort groups, it can be seen that there were some differences in the descriptive statistic results. These differences were due to the small sample size of those who consented to be contacted for interview.

**Age**

The PC level interview participants had an age range of 18 to 22 years with a mean age of 19.5. The mean age of the interview sample of PC students was 1.5 years less than the total sample of PC students. The C level interview participants had an age range of 21 to 34 years with a mean age of 27. The mean age of the interview sample of C students was 3 years greater than the total sample of C students.

**Gender**

There were 2 males and 4 females in each of the PC and C interview participant groups. This reflected the total sample where there were approximately 1/3 males and 2/3 females.

**Current course**

The PC interview sample had 3 participants currently enrolled in the Bachelor of Physiotherapy (BPhys) degree and 3 participants currently enrolled in the Bachelor of Physiotherapy/Bachelor of Exercise and Sport Science (BPhys/BESS) double degree. In the total PC sample there were 75% BPhys and 25% BPhys/BESS students. The C
interview sample had 5 BPhys students and 1 BPhys/BESS student. This closely reflected the total C student sample of 81% BPhys and 19% BPhys/BESS students.

**Previous level of education prior to enrolment**

The PC interview sample had 5 participants who had a previous level of education prior to enrolment of final year of secondary school (or equivalent) and 1 participant who had at least one year of tertiary learning. The C interview sample had 2 participants who had a previous level of education of final year of secondary school (or equivalent) and 4 participants who had at least one year of tertiary learning. The total sample of PC and C participant groups both had approximately two thirds final year of secondary school (equivalent) and one third with at least one year tertiary learning.

**Descriptive statistics questionnaire data of interview sample**

When calculating the measures of central tendency for each questionnaire’s quantitative data, the median score is the correct statistic for ordinal data in Likert scales. Throughout the results, the mean and standard deviation have also been presented as these statistical results are reported in all studies that have previously used these questionnaires.

**Interview sample: Reflection-in-Learning Scale (RLS)**

For the RLS, the PC interview participants had composite scores that ranged from 57 to 84. The median score was 73.5, with a mean of 71 and standard deviation of 11.0.

The C interview participants had composite RLS scores that ranged from 65 to 77. The median score was 71, with a mean and standard deviation of 71 and 5.1 respectively. This compares with median scores of 66 and 66.5 for the PC and C total sample.

**Interview sample: Reflective Thinking Questionnaire (RTQ)**

The following table (Table 13) presents the descriptive statistics of the interview sample with respect to the RTQ. 
Table 13: Descriptive statistics of RTQ<sup>1</sup> comparing cohort interview samples

<table>
<thead>
<tr>
<th>Cohort Group</th>
<th>Habitual Action</th>
<th>Understanding</th>
<th>Reflection</th>
<th>Critical Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Med</td>
<td>Mean</td>
<td>SD</td>
<td>Med</td>
</tr>
<tr>
<td>Pre-clinical (n=6)</td>
<td>11.5</td>
<td>12</td>
<td>1.8</td>
<td>19.5</td>
</tr>
<tr>
<td>Clinical (n=6)</td>
<td>11</td>
<td>12</td>
<td>4.5</td>
<td>19</td>
</tr>
</tbody>
</table>

Overall, when comparing the interview sample results to the total sample for the RTQ, the median scores for the HA and U scales were lower for the interview sample and the R and CR scale median scores were higher.

**Qualitative results**

The qualitative results are presented using the Kolb’s cycle of experiential learning<sup>4</sup> as a guide. The students provided examples of how and why they use reflection in their course. As the qualitative data represents a snapshot in time for the six PC level and the six C level students, the steps of ‘concrete experience’, ‘reflective observation’ and ‘abstract conceptualisation’ are the focus of this report. Examples of **PLACE: where the students are reflecting** links to the ‘concrete experience’. This is followed by **TRIGGER: why the students are reflecting** which leads to ‘reflective observation’. The qualitative results describing the ‘reflective observation’ is firstly presented by; **TIME: when the students are reflecting** (links to the timing of reflection relative to the experience) and then ‘reflective observation’ leading to ‘abstract conceptualisation’ linking to **DEPTH: how the students are reflecting** (links to the depth of reflection). This reporting structure is presented in Figure 4.
In order to set the scene of how undergraduate physiotherapy students use reflection, it is important to first consider where students are reflecting. This links to the ‘concrete experience’ on Kolb’s experiential learning cycle and will be described below with supportive quotations from pre-clinical (PC) and clinical (C) level student interview transcripts.

**Pre-clinical level students**

The majority of PC students drew examples from personal experience, and study practices at university. There were very few examples of PC students reflecting within educational activities in class. An example of drawing on personal experiences to create links to current learning was demonstrated in Emma’s (PC # 2040) response to the
management of osteoarthritis which she connects with her mother’s experiences of
osteoarthritis in her knees:

“I was thinking, ‘oh, I can go home and practice on her’” and, “I’ve sort of
dealt with it a lot with going to physio with her…so it makes it more meaningful
I guess.”

For Emma, this motivated her to learn more about the condition; “well for her
it’s been such a tough journey to treat her knee and she struggles a lot so, yeah,
more personal in that I’m…very interested to learn about it more.”

Georgia (PC # 2020) also spoke of how previous experiences informed her current
learning:

“…we’re doing a lot about…person-centred care and…thinking about the
patient and what they want and making sure you really describe things to
them…gaining consent…” and reflected on how patient-centred care related to
her personal experience when attending a physiotherapy practice as a patient,
“I’ve experienced one physio that I had…dry needling and he just left the room
and left me…with needles in my back and for any other person that would be
pretty scary…I was even anxious about it and I’m a student learning about it!”

PC students also reflected on learning and study practices at university, which included
practical lab sessions and small group discussions. For example, Georgia (PC # 2020)
liked small group discussions:

“…because then you kind of get the feel for what everyone else is thinking as
well and you can kind of bounce ideas off each other and I know I would think,
like, people would say things that I would never think of…”
Sophie (PC # 2061) recounted a time where she reflected on a teacher directed learning strategy in a practical lab session:

“…some people have to get up and…show the class how they would do a certain technique or…test and as they’re doing it you’re obviously thinking to yourself, like, how would I do it better…what would I add in, what would I do…so it’s really effective because you’re not only seeing how someone else is doing it but you also think about how you can improve it.”

Many PC students reflected on the effectiveness of their study practices in order to make changes to future study practice. For example Andrew (PC # 2017) described a time when he tried different learning styles:

“…trying to remember everything on the lecture slides, ah, it was too much content, didn’t understand it. It needed to be condensed and…I needed to look at YouTube videos explaining…specific processes and things like that…” and when probed to discuss this further, “I learnt, ok, that was a bad way of doing it, this is a better way of doing it…”

For John, it was assessment tasks that prompted reflection, particularly after a test or exam:

“So when I finish exams I always think about what answer I got for what questions and if there’s something I wasn’t sure on I’ll...jump on-line and...if I’m confused about two answers, which one was right and then I can...judge on whether I think I got close…” (John PC # 2004)

**Clinical level students**

Not surprisingly, the C level students predominantly reflected on experiences from clinical placements. Many of these examples centred on a variety of client presentations
as well as relations with staff and clinical educators (‘supervisors’). When asked for examples of using reflection within the course, Mark (C # 4052) stated:

“So pretty much after every session with a patient, I’d come out and just automatically look back on the session itself, how long I thought the session went...if there was...anything I was missing from the session or...if there’s something in the treatment session I could have done better...”

Mia (C # 4041) responded:

“I guess we use reflection every time we treat a patient...so especially in fourth year, learning...a lot on prac’ (clinical placement), we have to reflect every day...each time you see the patient and try to focus on to improve on your next performance for next time.”

Interestingly, the C students frequently compared their experiences in clinical practice to their learning at university. Carissa (C # 4054) recounted:

“...especially when I was doing my practical (clinical placement) for my cardio, I often reflect back on what I’ve learned...what the lecturers taught us and how it differed from classroom as well as the actual hospital setting... for example... just auscultation itself is so different in the classroom base as opposed to hospital...”

This reflective experience assisted Roger (C # 4027) in linking theory to practice:

“... you sort of learn application in practice when you go out on prac’ (clinical placement)...and sometimes it’s like a different thing because in theory you say one thing but in practice it’s completely different...”
C students also indicated how their practical and theoretical learning at university assisted them in clinical practice. For example, when Mark (C # 4052) revealed:

“So my last placement was cardio...in the acute ward...so one of the techniques was suction...we were taught that in the practical setting (practical lab session)...the learning experience through uni...helped guide me through that experience...”

and Vanessa (C # 4003) stated:

“...just about every unit that I’ve ever done (at university) I draw upon in the clinical setting... all the tiny details... gets integrated every day... an exact example...talking to them (a client with lung disease) about the pathophysiology and what’s happening inside their lungs...I sat down and took the time to talk to him about that which I learnt in other units, also integrating the language and the communication skills...so that I could talk to him on his level that he could understand...”

Similar to the PC students, a number of C students reflected on their experiences within university learning, study practices and assessments. For example, Margaret (C # 4050) discussed a time where she actively adjusted her feelings toward her university learning experience:

“So we had a lab at uni’ that was structured in a way that did not really suit my learning style at all...I found myself getting so frustrated so that I just switched off...later I’m thinking back it was, ‘that was a whole waste of 2 hours,’ so at the time it was like, ‘I just don’t want to do it’ but afterwards you think back and you’re like, ‘I probably just should have gone along with it.’”
Roger (C # 4027) reflected on his actions to see if he could improve in assessment tasks, for example:

“...after your OSCA’s (practical examinations) every time, you reflect back, as soon as you walk out...I go through the whole process again in my head, or talk to someone about it.”

Therefore, the qualitative data indicates that for PC students, where the students are reflecting; are predominantly during study time, at times drawing on previous personal experience. There are very few examples of both PC and C students being guided through reflection within in-class educational activities, while C students tended to mainly reflect within clinical experiences. These results will be more thoroughly discussed in Chapter Five.

**TRIGGER: Why the students are reflecting**

Thematic analysis identified four subthemes that triggered and motivated students to reflect:

1. Extrinsic motivation
2. Intrinsic motivation
3. Conflict and challenge
4. Patient-centred motivation

Each of these themes will be described using supportive quotes from both the PC and C student responses.

"I do it pretty much after every test": Extrinsic motivation

Students provided many examples of extrinsic triggers that motivated them to reflect on their learning, study practices and performances. These included reflecting in order to excel in assessed work as well as after receiving summative feedback and grades for assessments. The physiotherapy course has a variety of assessments and Margaret (C #
revealed that frequent practical skill assessment at university and on clinical placement motivated her to reflect:

“I think it’s impossible to do a degree like physio without reflecting...being under scrutiny all the time on placements and prac’ exams and things like that you just get used to reflecting on the spot...”

There were a number of examples where students reflected on their performances in assessed work. The trigger of reflection was clearly linked to excelling and achievement:

“I think reflection’s the key to excelling and learning. If they don’t want to learn or excel then you won’t reflect...” (Roger C # 4027)

“...I’m a very, very academic person, so marks matter to me...so even if I get a (High Distinction – highest grade of achievement) I will still go to the lecturers, ‘What else is there for me to improve, what can I do better?’” (Carissa C # 4054)

Georgia (PC # 2020) was prompted to constructively self-assess her weaknesses in order to achieve good results in assessments:

“...assignments are...my weak point so...(I) kind of mark myself based on what I think I would get on the rubric...when I get it back, going through it again and seeing what I actually got and comparing it to what I thought I would get” and as a result of that process: “I feel like my assignments and...how I plan things out has gotten better as a result of that...I seem like to increase my mark each time which is good...”
Vanessa’s (C # 4003) initial example of using reflection within the course was linked to her study processes in order to achieve good marks for assessments:

“I think a good example is how I...study for exams or write essays. So I find for one year I’ll have a really good process and I will get a good result back for that particular assignment or exam and then I find I’ll keep doing that but I also need to refine it as I go...”

Students from both cohorts were often triggered to reflect on completion of assessments:

“I do it pretty much after every test I get...I always sit back and think about...how I answered things and what I struggled on and...what I was happy that I did right and I also I try and...count out how many marks...I think I would have got...” (Georgia PC # 2020)

“...so after every exam, especially when the marks are released...I will sort of reflect what I’ve done with the marks that I’ve got.” (Carissa C # 4054)

Eliza was also more likely to act on the feedback provided during semester if there was a link to the end of semester exam indicating an extrinsic motivation to reflect:

“I would especially if there is...an end of semester exam I would work on those areas more because I can learn from what I didn’t know from the last one and what I need to work on specifically.” (Eliza PC # 2024)

Sophie (PC # 2040) received feedback on professional conduct after a practical examination and was prompted to reflect and plan strategies for the future:

“I think my explanation wasn’t right...I forgot to ask for consent...so that had been a massive learning curve and make sure that I’m confident and explaining
everything right and make sure that I get all the important points across to patients…”

Students reflecting on their recent examinations were also likely to compare themselves to a peer:

“…after examination periods…when I get…feedback or results back and I compare them with some of my…other classmates and I see the marks they’ve gotten, I think of the thought processes compared to theirs and if they’ve got a better mark, what am I not thinking of that they are, or if they’re getting a slightly worse mark, if I’m thinking certain things that they’re not.” (John PC # 2004)

“…after your OSCA’s (practical examinations) every time, you reflect back as soon as you walk out you think, for myself, I go through the whole process again in my head, or talk to someone about it…just see what they did compared to what you did…but, you know, it is a reflective process and you can reason (with) each other…and understand why you did what you did or why they did what they did…” And when probed to discover why he was prompted to do this he answered: “…just to improve next time…and to see whether you passed or not (laughs)...yeah to see if you passed or not compared to other people you want to know that did alright.” (Roger C # 4027)

Mark (C #4052) was motivated to reflect on his process of completing an assignment during a clinical placement when he received poor marks and feedback. He initially thought that he had submitted an acceptable assignment:

“…so my last assignment was my worst possible mark I’ve ever had for an assignment…I thought I’d popped down everything I needed to, had a good
example...had a pretty round answer to...what was asked of me, but on the feedback and...by comparing it to the marking rubric itself it kind of highlighted that I’d missed out on what was asked of me. If I had have had that marking rubric next to me while doing the assignment I would have...had no dramas...it made me kind of think through it further...in assignments down the track just to have that...marking schema next to you to make sure you’re hitting every key point when you’re writing it up.”

For some of the students, failure of examinations or assessments motivated them to reflect on their performance and study strategies. Mia (C # 4041) was prompted to reflect on her actions when she had failed:

“...so that was a huge learning...point for me...and obviously something’s gone wrong so...fixing that...and developing new strategies and ways to overcome whether it’s nerves or the lack of knowledge or...the actual hands on treatment that you’ve done with the patient...”

Sophie (PC # 2061) was also prompted to reflect on her study strategy for the final exams when she failed:

“I failed one of my units last year and I got offered a (supplementary exam) but I kind of looked back and...my...method of studying was shocking...it was an exam toward the end (of the exam period) so I spent a lot of time focussing on the other exams at the beginning (of the exam period) and then I had to cram for this exam...so...then I looked and I had my supplementary exam and I was like, ‘OK, I’m not going to cram’...”
All examples in the subtheme of Extrinsic Motivation relate to the student being triggered to reflect related to summative assessment, achievement within assessment and reaction to grades or results from assessment.

"I want to be a good physio": Intrinsic motivation

Interestingly, examples of students being triggered to reflect by intrinsic motivation were far less common. Intrinsic motivation triggers were linked to a desire to feel proud of themselves through developing effective relationships with their patients, becoming a good practitioner or performing well. PC level students were also triggered to reflect on the relevance of their educational activities when considering if the content aligned with their emerging professional identity.

The main motivator for other C level students was the desire to provide effective treatment outcomes for patients through improving their clinical and communication skills. The source of this motivator appeared to be more for personal clinical performance rather than for altruistic reasons. For example:

“An example I guess, rapport building with a patient. So it’s very important that you be able to assess someone, clinically reason the issue and then provide treatment and reflect on what you’ve done. But it’s also very important that you be able to build rapport with someone because without doing that you’re not able to do the rest of your intervention sessions quite so effectively…” (Vanessa C # 4003)

John (PC # 2004) was motivated to reflect on his learning and practice by his desire to be a superior practitioner in the future:

“ I’ve had the drive to do better basically and I want to make sure I understand the content because it’s something that I enjoy, doing physio, and I want to be a
Carissa (C # 4054) actively sought feedback during a clinical placement to improve herself as a practitioner:

“…my last placement I asked my supervisor,… ‘So what else can I improve that can make me a better physio?’”

Being proud of performance was important for Margaret (C # 4050) who reflected on how she played to her strength in a recent oral presentation:

“It was a very...large reflective process going on ‘cause…I really enjoy public speaking so I wanted to do myself proud and I think that when, it’s times when I do want to do it to the absolute best of my ability, that’s when I get the most critical, and I’ll spend hours and hours thinking back…”

In addition, PC students were triggered to reflect on their learning and engagement in the course when they considered whether the content aligned with their area of interest:

“…I’ve got this unit at the moment that I…think is interesting but I just couldn’t see myself working in it and I was just like, ‘Oh, I don’t really need to study for this ‘cause I just can’t see myself doing it and I was just like, ‘Well that’s a terrible attitude,’ ‘cause...at the end of the day, jobs will be, you know it’s competitive out there so you can’t afford to be…picky and you’ve got to make the best of the situations…” (Georgia PC # 2020)

“…I want to be a physio so I have to do this unit to graduate, so it is relevant in terms of getting the qualification...maybe if I wanted to do Sports physio, maybe research methods isn’t so flash and I don’t see the particular relevance of it
but…I feel that we have good lecturers so I feel it’s like their teaching it in a way that I like and (I) like them personally as well so I guess that makes it easier.” (Andrew PC # 2071)

The examples in this subtheme point to reflection being triggered by intrinsic motivations that relate purely to the students’ emerging sense of professional identity and competence.

“So we had quite a big clash”: Conflict and challenge

For some students in this study, challenging situations that prompted a cognitive discrepancy between previous and new understandings heightened reflection. These included questioning of previous understandings or assumptions, a widening scope of practice as well as challenge to clinical reasoning. There was also an affective component to this type of learning that triggered reflection. This was mainly evident in the C level students’ responses as the C students had experienced conflict with their clinical educators and others in the workplace which elicited emotional responses.

Emma (PC # 2040) was triggered to reflect on her previous assumption that her final year of secondary school would be her most challenging:

“…after Year 12 I thought, you know, it’s a silly thought but that that was probably going to be the most challenging year of my studies (laughs) and really that was just the beginning and then I didn’t really realise how much physio would build on top…with the workload and the content and it’s just it has challenged me…in terms of me as a person (pause) I guess…how I work under pressure perhaps…I can handle pressure better than I thought I could…”

A widening scope of practice for physiotherapy triggered many students to actively reflect on the health profession’s role, challenging their previous assumptions:
“…I didn’t even really understand that neuro was a component of physio before going into it so, yeah, I was just like, ‘Oh wow, this is really cool actually!’ …I understand there’s lots of different avenues to what we can do as physio’s.”

(Andrew PC # 2071)

“…I didn’t, I guess, realise the extent to which physio was involved in patient care so it’s kind of expanded that scope of practice for me, just in the amount of exposure to the bigger patient base, yeah so that’s kind of a positive for me…”

(Mark C # 4052)

Vanessa (C # 4003) took the reflection one step further by examining where her assumptions came from as she recounts how they originated from childhood:

“Originally I thought physio was going to be a case of learning about different conditions and learning how to treat that condition – and that’s the answer and you seem magical because you’re able to diagnose things and then fix it… and it’s not like that at all…it’s a lot of clinical reasoning…there’s no one right answer to anything generally…and I could never understand that as a kid when I saw physios…so I was always under the impression that physios were magical because they knew everything about everything…and it’s actually given me a bit more confidence. I think if I’d been expected to just memorise treatments and answers to things I would be nervous that I couldn’t remember it all…I feel I’m more confident now that I’m able to work through and reason and work out answers to things rather than just know things straight away…”

This widening scope was important for Carissa (C # 4054) who was not aware how autonomous the role of the Australian physiotherapist was, challenging her previous understanding:
“...I never thought that physio would be the primary care for patients...back where I come from...the physio is always the secondary one. So they listen to the doctors tell them, ‘Ok you do this to the patient and you do that to the patient,’ they don’t have their own mindset...which it’s really different from what I imagined I would be...obviously it’s a lot better for me because I’m taking charge, you know, I’m in control of what I need to do for the patient and I’ve got a voice to speak for my patient and that’s really good! ...it makes me feel more respectable...I think it’s a really good profession to be in.” (Carissa C # 4054)

In some circumstances it was the clinical learning environment and relationship with clinical educators, including what was perceived as unjust personal attacks by their clinical educator (‘supervisor’) and questioning their superior’s clinical decision making that triggered the reflection process. For example, Mia (C # 4041) reflected on how she responded to a poor relationship with her clinical educator (‘supervisor’), comparing it to how she would normally deal with conflict in the work place:

“I guess in my job that I have at (a private physiotherapy clinic) we have things called ‘clearings’. So I think I’m fairly active in ‘clearing’ things with people so...if something isn’t working, or an event or something hasn’t sat well with me...I’m pretty good at ‘clearing’ that with the other person and ...strategising what we can do next time...in my last placement...I had a not so nice supervisor, I mean we kind of butted heads a little...and I kind of regrettably let it slide a little bit...a lot of the time the supervisor would somewhat embarrass me in front of patients and...belittle me...so...if that happened again (I would) just have, obviously, a professional quiet word to them and say this is how it made me feel...and give a few suggestions of what we could do next time.”
Carissa (C # 4054) was triggered to reflect when she felt discriminated against by her clinical educator (‘supervisor’):

“...I met a supervisor which I think she’s a little bit...racist in a way, um, but I can’t really, at the time, I feel I shouldn’t really tell anyone about it because she still treats me fairly well except that, you know, she has (another student who she is treating differently)...it’s very, very obvious! I know myself very well, I’m a very hardworking student, I want to learn, I want to keep on learning...and the other student, you know, I do my (written assessment) on time, I hand it in on time and everything (unlike the other student)...In that sense it sort of makes me, I actually dislike placement...”

Following a confrontation, Vanessa (C # 4003) was surprised to learn of her clinical educator’s perspective:

“...the feedback I had been receiving from everybody else at the facility was very positive...and then on my last day she sat me down and just blew me away with, ‘You’re too much this, you’re too much that, you’ve got to know your place, you’re only a student,’ and really made it a personal attack...my first response was to burst into tears...it’s a human response to react emotionally but...if it’s not feasible at the time you need to be able to push those emotions down just so you can get out and perform in a professional manner...I asked her lots of questions about where her feedback was coming from...and I thanked her in the end of that for giving me that feedback because it’s good practice to get poor feedback...I went away and I thought about it and realised a lot of the feedback she was giving me was probably coming from her own sense of insecurity...no one’s ever perfect and that was probably really confronting for her as well.”
It is interesting to note that a few of the C students provided examples where they questioned a superior’s clinical decision making and this was a stimulus for reflection. Mia (C # 4041) discussed a time when her clinical educator challenged her clinical reasoning in front of a patient which caused tension as it contradicted what she had learnt at university:

“...(The clinical educator) explicitly told me I was doing the wrong thing...and it was something that I had learnt at uni...what I saw was best for their patient and...how they presented...so she basically just said, ‘Well I wouldn’t do that,’ and kind of walked off so it’s a bit awkward when you have a patient right there and...obviously I’m writing the notes, I’m strategising what to do with the patient, writing their patient...plan and things like that so I wasn’t prepared to do something...that I didn’t feel ok with...”

Roger (C # 4027) gave an example of his clinical educator (‘supervisor’) challenging his clinical reasoning for a treatment idea during a case study presentation and how this triggered him to reflect on his response:

“...I suggested a technique to use for that patient...and the supervisor...shut me down...saying it’s rubbish, she doesn’t use it because it looks stupid, ah, but I was ok, I didn’t say anything after that, well I did say it was effective but she kind of like shhh...shooed me away...it was purse-lipped breathing...so that night I went home...found some evidence for it, I didn’t ever confront her about it or anything...so where do you draw the line and compromise your position (with your clinical educator who is assessing you) as opposed to being an evidence-based practice clinician?”

Margaret (C # 4050) was triggered to reflect on why her clinical educator had a different perspective on management of a paediatric patient:
“...I had been taught...one way of treating this particular patient...and my
supervisor had a completely different treatment method...and I think we clashed
very much on what we felt was best for the child in terms of his personality...”

Predominantly C level students related personal negative emotional responses and
discomfort as a trigger to reflect:

“...the supervisor would somewhat embarrass me in front of patients
and...belittle me...well my stomach would always turn upside down so I’d
always have to bite my tongue I guess...(I’m) probably a little bit of a fiery
person so I was often just taking a deep breath and...taking it all in...” (Mia C #
4041)

“...a lot of things were done that made you feel uncomfortable...” (Mia C #
4041))

“...my first response was to burst into tears...” (Vanessa C # 4003)

“...what if I go in there and make a complete idiot of myself?” (Vanessa C #
4003)

“...it really kind of threw me...I wasn’t completely comfortable with that...”
(Mark C # 4052)

“...that was very, very difficult and at the time found myself getting so
frustrated...” (Margaret C # 4050)

There were no examples of students questioning their university lecturers’ or tutors’
clinical reasoning from either cohort of students which may have been as a result of
being interviewed by the researcher who taught into the university course.
The examples in this subtheme overall point to the students acknowledging and exploring challenges to their previous assumptions as well as attending to their emotions and discomfort which is an important component for affective and deeper learning. The examples within this subtheme were predominantly expressed by the C students.

"You have to do what’s best for the patient”: Patient-centred motivation

Predominantly C level students were triggered to reflect on issues that arose within the clinical setting with respect to their patients’ care and rights. These included playing advocate for patients as well as considering current and future patients’ perspectives. In these examples, altruism is the stimulus for reflection.

C students were triggered to reflect on patient management decisions when they perceived decisions made by clinical educators and/or medical team were not in the best interest of the patient. The C students were triggered to explore and challenge these decisions based on their perceived role as advocate for their patients rather than for their own personal satisfaction.

Mark (C # 4052) related a time where he reflected on his clinical educator’s (‘supervisor’s’) decision not to address all his patient’s problems adequately which he felt was inadequate care for that patient:

“So the patient came in with a small bowel obstruction…which had…resolved conservatively after a few days…the patient had sciatic pain…that was…holding up our discharge planning…so my treatment was to help get that resolved for the patient…whereas my supervisor was (saying) that wasn’t our issue because it was a surgical ward and it wasn’t a ‘cardio’ issue…I kind of just said, ‘Look it is our issue because it’s a physio related issue and we can help with it.’ So I got a treatment directed at that and had her discharged within a few days…"
thought just because you’re in a surgical ward doesn’t mean that you don’t, you know it’s not outside our scope of practice...”

Vanessa (C # 4003) was triggered to reflect on a patient’s right to refuse treatment during her recent clinical placement:

“...he was being non-compliant for just about everybody...my role was to...ambulate him. This was a guy who...was in his late eighties...came in for a septic hip so it was very painful for him to walk...and in his mind he was palliative...then he told me, ‘I just want to be comfortable, I don’t want to live any longer,’ and listed lots of reasons, he was cognitively intact despite the sepsis...this was a grey point...the doctors and my supervisor thought, ‘he’s got sepsis, it’s obviously affecting his mental faculties...we know what’s best for him, this is what the literature says...that’s our first priority.’...But if the patient doesn’t want to participate and if...he understands what you’re asking him to do, why you’re asking him to do it and he still refuses it’s not our job to bully him into continuing to do it.”

For Carissa, it was the medical team’s decision to discharge a patient when she believed it would be detrimental to that patient that triggered her to reflect on her role as an advocate for her patient:

“So in the morning during our MDT (Multi-Disciplinary Team) meeting we...agreed...that this patient is suitable for transfer to another hospital, but in the afternoon...the medical team came back and told us that...this patient is medically safe (for discharge home) when the patient still has an ICC (Intercostal catheter/chest drain) in him! So I was very taken aback, I was like, ‘No, this patient is not safe to go home! I’m not discharging him...this is not
right!'…that’s the call made by the medical team…so we can’t do anything…which is pretty sad for the patient…” (Carissa C # 4054)

For Mia (C # 4041), a situation arose whereby she felt her superiors were making decisions that were outside their scope of practice and not in the patient’s best interest

“…a patient had…a personal walking stick and his wife phoned and said…that he was using it to hit her. So we were kind of given the task to take it off him and in doing that they suggested a walking frame which he probably didn’t need…it was unsuccessful which, you know, you can kind of guess that it would be unsuccessful taking away someone’s private property…that didn’t really sit well with me, first and foremost, that the wife was calling us and asking us to do something in regards to domestic abuse which is obviously not in our scope of practice…to take away a walking aid which wasn’t appropriate for the patient…it was a bit yucky…I guess from Year 1 we’re always taught…you have to put the patient…at the front of your mind and whatever you do should be reflective of helping them as much as possible…”

Mia (C # 4041) was also triggered to reflect when investigating complex cases as she described her intrinsic desire to care and advocate for her patients:

“…placements really challenge my ideas about how patients should be treated, it’s probably a reflection on what we have learnt at uni but how some practitioners treat their patients and their families…and we did some case studies a couple of weeks ago…all of them were complex cases but a lot of things were done that made you feel uncomfortable and…it made you realise that you should probably, well you should say something because you have to do what’s best for the patient…”
Carissa (C # 4054) was triggered to reflect on the way they applied their learning to consider the patient’s quality of life and potential impact on their everyday life:

“So I often think of the long term thing, which is not taught in the lab...but to translate it to a patient’s life, daily practice, it’s a totally different thing...so I often ponder what we can actually help the patient to do if they want to apply it to their practice of their everyday life” (Carissa C # 4054)

All previous examples of the sub-theme of ‘patient-centred motivation’ were drawn from C students. Only two PC level students gave examples of being triggered to reflect on their future patients’ perspective when asked to link their own experiences to learning within the course:

“...I can see that, like, in reality someone could come in with that problem (previously experienced by Eliza) and obviously they would have no idea what was happening to them but you can help them out...you have empathy for the patient, you can understand what they’re going through...you can still understand that it impacts their physical activity and what they want to do.” (Eliza PC # 2024)

“...just in the future as a physio, would make me more sympathetic and just realising what goes on in the home and how you know it is difficult to find time and to motivate yourself and things so, to try and motivate other people more and things like that.” (Emma PC # 2040)

Clearly, from the examples in this subtheme, the C students’ experiences in clinical practice setting created multiple opportunities for them to be triggered to reflect on the patient perspective and consider their emerging professional identity and practice.
Concluding *why students are reflecting*; identifying the motivations that trigger reflective processes is important to this study as it can inform strategies that could be used to trigger this skill development in learning and practice for both PC and C students. Clearly, extrinsic motivation was the most common source of triggering reflection especially in PC students. However, we can see that C student exposure to clinical practice has provided different experiences that create opportunity for students to think and reflect on personal perspectives and values, conflict and, most importantly, the patients’ perspective. From these results, it is clear that PC students have limited exposure to triggers elicited by exposure to concrete experiences of conflict and altruism. This theme will be more thoroughly analysed and discussed in Chapter Five.

**TIME: When the students are reflecting**

The previous theme deepened our understanding of what triggers reflection and provided context to how undergraduate physiotherapy students use reflection. However, it is also important to describe when students are reflecting in relation to their experiences. Timing of reflective thinking may be prior to the experience through anticipatory reflection;¹²⁴-¹²⁶ *reflection-in-preparation*, or, as described by Schön;⁷ *reflection-in-action* (during the experience) or *reflection-on-action* (after the experience). This represents the first section of the qualitative results exploring the processes of ‘reflective observation’ and ‘abstract conceptualisation’ in Kolb’s experiential learning cycle⁴ (see below Figure 5).
"I needed to prepare for it": Reflection-in-preparation

Interestingly, the students’ reflecting-in-preparation came solely from C level students. This was linked to using rehearsal, strategising and planning ahead in order to be prepared and perform well during clinical practice and practical examinations. An example is when Vanessa (C # 4003) used rehearsal prior to clinical encounters to improve her confidence when discussing sensitive topics:

"I didn’t want to let other people’s anxiety and nerves affect me so I practised speaking to, mainly myself (laughs), but I practised speaking confidently and using words...I guess preparing and recognising that this could happen, I needed to prepare for it.”
Margaret (C # 4050) also indicated how she strategised before her performance in practical examinations:

“I found myself before I’d even...start studying would be actually, sit down, ‘What’s my process?’... ‘How am I going to do it when I walk into the reading room? What am I going to do when I get into the room before the timer starts? How am I going to, um, explain myself?’ that kind of thing.”

Roger (C # 4027) reflected on the fact that he hadn’t been exposed to a full musculoskeletal clinical assessment during university learning nor clinical practice. In order to address this knowledge gap, this example shows how Roger planning his approach to communicate his learning needs to his next clinical educator:

“I know when I get to (the facility) for a “musc” (musculoskeletal) placement I would definitely be asking...to see something like that (a full clinical assessment), even if it’s just the first patient I see asking, ‘Can you show me how you do it, the subjective, objective, everything and I’ll be good to go from there?’”

There were no examples of reflection-in-preparation in the PC level students’ responses.

"You have to think on your feet": Reflection-in-action

There were very few instances of the PC level students providing examples of using reflection-in-action. One example came from PC student Sophie (PC # 2061) as she reflected on her strategy to mitigate a lack of attentiveness in a lecture:

“...if I lose focus for a moment like in a lecture or something...when I phase out for a bit and then I come back in...I really make sure from then on...I really focus...and make sure I keep my attention...and...consciously try to remember not to...phase out.”
C level students provided more examples of reflection-in-action. For example, Margaret (C # 4050) explained a time where she was prompted to swiftly reflect when an altered presentation of her patient required a different strategy:

“I had a patient at my last clinical placement where...we had been doing the same treatment for the past three to four sessions...but went in that day and all of a sudden it just wasn’t working so you have to think on your feet...you have to come up with a plan then and there. So thinking what was he doing previously and to, how to modify that to fit his changed...condition.”

For Vanessa (C # 4003) it was a lack of skill in conducting a physical assessment during an outpatient encounter that triggered her to reflect within the encounter:

“I realised even though I felt confident going in to the assessment...when it came to doing the physical assessment I recognised, even while I was doing it, I was nervous and jittery, didn’t do things in a very logical sequence...it didn’t flow well...so I recognised at the time that was not the most optimal way of doing things...”

Mark (C # 4052) discussed an uncomfortable experience which he was not prepared for when confronted with assessing the lungs of a semi-conscious “large chested” lady:

“...it kind of threw me...I wasn’t completely comfortable doing that to start with so the first session I just (did a very basic assessment)...but that wasn’t really a full assessment.”

For some students, the clinical educator (‘supervisor’) prompted reflection by challenging treatment choice:
“...so the supervisor...explicitly told me I was doing the wrong thing (and gave another suggestion) ...I didn’t have much time but had a few moments to think, kind of imagined the patient doing that...(the suggestion) didn’t really reflect my clinical reasoning...on what would help the patient...in the moment it’s quite hard to reflect...” Mia (C # 4041)

“So then I looked back”: Reflection-on-action

Most examples of reflection were where students considered and analysed the event or experience after it had occurred.

“...after a whole day of placement I would remind myself to reflect back what I’ve done today. What would I do differently the next time?” (Carissa C # 4054)

PC students tended to reflect back on their study practices and how this affected their learning:

“I was doing so much study and pushing myself to the limit...and by the end of semester I was absolutely exhausted and I realised that...sometimes you need to get a good night’s sleep...and you can’t study ‘til one o’clock in the morning...” (Georgia PC # 2020)

“I ended up missing quite a few lectures...and then I realised by...the end of the semester I was going over so many lectures going, ‘What have I missed?’ ...and then I didn’t actually know what I had missed...so then I looked back on that and I thought, ‘No, that’s not the way to go.’...so this semester I have...looked back on all that, I’m getting more focussed. So I’m at all the lectures and taking notes.” (Sophie PC # 2061)

For C level students, examples of reflection-on-action were more immediate:
“...every clinical placement you walk out of a room with every patient, you automatically think about how it went, what you did, what worked, what didn’t...” (Margaret C # 4050)

Margaret also explained the detail to which she would reflect:

“...a lot of time thinking about, you know, where you were...were you standing in the right spot, were your hands in the right place? So just, kind of, thinking through the whole experience bit by bit and kind of pulling it apart and trying to change it so that you can do it right the next time...” (Margaret C # 4050)

Also, Vanessa’s previous example of reflecting-in-action (lack of skill in physical assessment) then prompted her to reflect after the experience:

“Afterwards in reflecting I realised, yeah, I know that’s an area that...I’m a little bit unskilled in and I need more practice in that area and that if I’m good at doing that particular thing my treatment will flow more easily, I’ll have the right sort of outcome measures and I’ll be able to monitor my treatments as I go on. It also makes you look like a better practitioner if you’re not fumbling around...” (Vanessa C # 4003)

We can see in this example, that reflecting after the experience, Vanessa identified her learning needs and thought about how this may impact her future professional practice.

The C students also described examples of reflecting on their experiences at the end of the day:

“...every day you’re on placement, so you’re constantly going home, checking things, making sure you’ve done them right or asking your friends or, um looking at the lecture, anything like that...” (Mia C # 4041)
Mark (C #4052) stated that his clinical educator (‘supervisor’) had prompted reflection at the end of each day and reflected that it was a very useful process.

“on my previous placement we had a review at the end of each day so I was able to go through strengths and weaknesses of what I did each day on prac’...have a chat with the supervisor...(make) a plan for moving forward from there and what the goals were for the week...that was probably the most useful thing I’ve had on placement yet.”

Concluding when the students are reflecting; the prior examples show that reflection is occurring before, during and after the event in the student in this study but that there is a dominance of reflection-on-action. These results provide some evidence of how the students are using reflection in their course. Based on reflective practice models, these findings have significant value in relation to how and when we deliver education to foster reflective thinking throughout the course which will be discussed more thoroughly in Chapters Five and Six.

**DEPTH: How the students are reflecting**

Exploring the depth of reflection evident in the qualitative data assists to further define how the undergraduate physiotherapy students are using reflection within their course. This also represents more detail on the process of ‘reflective observation’ which can lead, at times, to the important ‘abstract conceptualisation’ stage.⁴

On thematic analysis of the qualitative data, there were four subthemes identified in this major theme:

1. Not reflecting
2. Reflecting on what was happening
3. Reflecting on how it was happening
4. Reflecting on why it was happening
Interview questions asked students to provide examples of using reflection within their course. Responses revealed examples of either a lack of reflection or varying depths of reflective thinking and exploration. Within one example, a student may have described the issue or what was happening in the experience. The student also may have reflected on the thought processes and mechanisms occurring within the issue or how it was happening and, at times, reflecting more deeply on the premise of the issue or why it was happening.

"I just get on with it": Not reflecting

When students were asked to provide examples of when they actively tried to remove negative feelings about their course, some responses portrayed a lack of reflection on the reasons for these feelings:

“...At the end of the day you’ve got to get it done...you’ve got to be good at removing those feelings and just get on with it really.” (Georgia PC # 2020)

“Ah, just get on with it, like...do I want it too much? Um, I know it has to be done...I think it all comes into play somewhere in your career so I just get on with it really.” (Roger C # 4027)

“...so there’s no point thinking, ‘Oh why am I doing this?’ or ‘I don’t want to be doing this,’ because at the end of the day, like, you’ve got to know it all.” (Sophie PC # 2061)

It can be seen in the previous quotes that feelings of discomfort associated with negative feelings toward their course have been suppressed, resulting in a lack of reflection.

"We learn specific techniques": Reflecting on what was happening

In the following examples, the students’ responses were purely descriptive, indicating only what was happening within the experience without further exploration. This depth
of reflection aligns with \textit{content reflection}\(^9\) and basic ‘reflective observation.’\(^4\) and most examples came from the PC level cohort.

Interestingly, when students were asked the initial broad question of “Can you provide me with an example of where you may have used reflection within your studies?” many students described reviewing study techniques in relation to recent examinations as well as review of lecture content:

“…it’s just during exam times really…you reflect back on, when I’m thinking about reflection I’m thinking about, sort of looking back into lectures and how…things come together. For me I use a lot of diagrams, flowcharts…”

(Roger C # 4027)

“…reflection, so just every day I guess after lectures, going home, trying…to go over things and, sort of, the actual reflection, you know, you read through and then just take a moment to break it all down in your head and think what it is actually saying, reflecting and then remembering bits of what they were talking about…just trying to group it all together…” (Emma PC # 2040)

Some PC students who provided an example about how the purpose of learning in the course linked to future professional practice purely described assessment and treatment skills:

“So basically the techniques we use to assess if there is anything going on with anything in the body…so how to assess the hip and the knee for certain things…so that obviously relates to physio so that if you’re in the clinic…and you’re picking up musculoskeletal problems and neural problems as well…those methods apply to that too.” (John PC # 2004)
“...we learn specific techniques and then our lecturer relates them to diagnosing a condition so with doing that you can relate it to, ok, this athlete or whoever we are working with has had this condition, this is a suggestion of how you treat and manage it.” (Andrew PC # 2071)

Other examples that were purely descriptive were also linked to skills and knowledge:

“...well I guess with learning new skills and information in the lectures, things that I didn’t know, does influence the way I would act in a situation or think about a certain thing...for example in first aid, now I know what to do exactly, like following an acute injury you know you would ice for twenty minutes but no longer ...” (Eliza PC # 2024)

As can be seen by all previous examples, there is no recounting of thought processes or problem solving. There is no emotion or affective learning from the subject as the student does not explore the issue or experience beyond noticing what had happened.

“I’m trying to figure out how to change”: Reflecting on how it was happening

When students reflected on an experience or issue that occurred in their course, at times, they explored their own thought processes and problem solving strategies and potentially how this may have impacted their learning. This indicated a deeper level of reflection beyond description of the experience or issue and aligns with Mezirow’s process reflection. This is also a representation of ‘reflective observation’ with some students also moving toward ‘abstract conceptualisation’ if attempting to reframe the processes with their previous knowledge and theories. Students from both cohorts used this depth of reflection when exploring study and learning strategies as well as their reaction to teaching styles.
Many students drew from examples that explored personal study and learning strategies, evaluating their effectiveness:

“I’m one of those people (who tends to rote learn rather than understand the content), I’m trying to figure out how to change that…I’m trying alternative ways at the moment in lectures…but then I think I wasn’t paying enough attention. I was sort of focussing on making these notes and then not filling in the gaps…so I’ve stopped that and (tried another strategy) but that didn’t really work either…so now I’m back to stage one again…” (Emma PC # 2040)

“…I have to say my learning style is not that fantastic, not that effective, well it’s effective to a certain extent…I need to write, I need to read, I need to say it out loud…which makes it a really difficult process especially when you are in third year…when there’s so much to do…but I know I want to know exactly what’s going on so that makes it difficult…it’s not very effective in terms of time management…but it’s effective in terms of it is a long term thing, I can remember it…” (Carissa C # 4054)

“…some people have to get up and…show the class how they would do a certain technique…and as they’re doing it you’re obviously thinking to yourself…‘How would I do it better’…‘What would I add in? What would I do?’…so that’s really effective because you’re not only seeing how someone else is doing it but you also think about how you can improve it.” (Sophie PC # 2061)

Vanessa (C # 4003) explored further and reflected on how she had recognised that her personal learning style had impacted the tutor and the class:

“I found that if I don’t understand something I’ll ask lots of questions and try and work out what’s going on and most of the time that works for me because as
soon as I understand that particular concept the rest of the lesson will flow for me. And I recognised that on one occasion I did try to do that...but it was slowing down the flow of the whole tutorial...when I recognised this was happening, you can see people getting annoyed and the tutor getting a bit kind of, ‘Well we better move on now.’ I...thought, ‘Ok I need to back off’ and then...in retrospect I didn’t need to do what I did but I managed to change on the fly and not create too much of an impact on anybody else.”

Students also reflected on their thinking processes when comparing their learning and study strategies to that of a peer:

“...I’m not one to write out notes...I kind of go through the key concepts and make sure I understand it...if I don’t understand it then...I do extra research on it until I understand...because I find that if you just...write out pages and pages...of notes just off the slides you’re just copying from one bit of paper to the other and you’re not actually learning the concepts...you’re not really understanding why you’re writing those things...” (John PC # 2004)

“...she writes more and draws and it’s like kind of like a brainstorm type of thing and I tried that and I just...I need sequencing...I need order and need to understand the flow of the things and that didn’t really do it for me but it works really well for her...” (Georgia PC # 2020)

Social learning strategies were also a source of reflection on the students’ thought processes. Carissa (C # 4054) and her study partner worked together to refine and understand their study and learning technique:

“...I would say that we’re very, very similar so we read, write, and listen...and we try to get other study methods from other friends...they just sit there listening
to a class without writing anything, doesn’t work for us...they just practising the techniques without knowing how to apply it, to what conditions, it doesn’t work for us because...we find it a complete waste of time...I think the main thing about our learning method is we understand stuff not memorising stuff...understanding how it applies to a patient, not another patient...rather than...this is the technique that you do, that is the technique that you do, so it’s very different.”

Emma (PC # 2040) reflected on her thinking about shared learning strategy:

“...talking with my peers...leading up to exams and studying...definitely I find that the best way that I learn...because you pick up on things that you didn’t even realise...you just completely missed them...they start talking about it and you’re like, ‘Oh whoops, I can’t believe I forgot that!’ And I just guess learning, you know, talking it out and teaching other people as well...that really works for me...”

Students also reflected on their thought processes when exploring personal conflict with a teaching style:

“...(the lecturer) was very up to date with evidence and often gave us multiple treatment ideas or...options...it helped us to decide which we might use in our clinical practice but also, on the flip side, made it very confusing for, at assessment time when there’s one answer for...examination purposes and we’re often second guessing ourselves and...whether there is evidence, whether we could back it up that kind of thing so (that) confused me a lot...” (Mia C # 4041)

In all previous examples, the students extended their exploration of the issues and experiences beyond purely a description of the events. Students reflected on their own
thought processes and problem solving strategies and, at times, also explored others’ thought processes and perspectives to communicate more deeply.

“I haven’t got the maturity”: Reflecting on why it was happening

Fewer students explored and drew on their emotions, assumptions and values to reflect more deeply and critically on their experiences. These students showed willingness to explore beyond what was happening and how it was happening. They sought to explore why it was happening which aligns with premise reflection.\(^9\) This depth of reflection also links to ‘abstract conceptualisation’ in the experiential learning cycle.\(^4\) Most examples of this depth of reflection were responses by female C level students.

Interestingly, when the premise of an issue was explored, it most frequently concerned the C students’ desire to do what was best for the patient (altruistic reasons). When Mia (C# 4041) was challenged by the decision making of her superiors that she believed was not in the patient’s best interest she explained her reason for feeling this way:

“…I guess from Year 1 we’re always taught…that the patients are first and foremost…and whatever you should do should be reflective of helping them as much as possible…” (Mia C # 4041)

Vanessa (C # 4003) explored why she believed that communication skills and building rapport with patients was so important:

“…because we have to put our hands on someone and if someone doesn’t trust you…that sort of tactile connection is going to be really confronting for a lot of people…”

And Carissa’s premise for being so devoted to her studies and clinical practice was also linked to altruism:
“...I’m a very passionate, passionate person. So I really care for my patients which is a good thing and a bad thing because which means I put more time into it, it will take me a lot longer to treat one patient...” (Carissa C # 4054)

When students reflected on their motivation to engage and excel in their course, they often related it to their intrinsic desire to be an accomplished physiotherapist in the future:

“...Because I don’t want to be just a regular maybe graduate physio that people can find but I want to be someone that can provide a patient with a lot...they like to come to me...” (Carissa C # 4054)

John (PC # 2004) also indicated the reasons why he was more engaged in the physiotherapy course when compared to his previous course:

“...I was more a higher capability to do something...requiring higher knowledge...I sort of thought that I was kind of underdoing myself a bit...And later: “I want to be the one diagnosing and actually have the understanding of anatomy to do that...”

Mark (C # 4052) discussed why a shared learning strategy was so important to him:

“...I don’t think I would have been able to get through the course without it...it’s really important to make a connection...with a few people in the course...just the nature of physiotherapy, so you want to be a pretty rounded therapist by the time you finish so having input from a lot more...people in the group’s going to be a lot more of a help...”

Some C students reflected on their discomfort while in clinical practice and related it to their lack of personal or practical experience:
“...so my first prac’ placement...was in Women’s Health which can be a touchy subject and I don’t have any experience with babies; I don’t have much experience with pregnant mothers...people get uncomfortable talking about vaginas and haemorrhoids and things like that...” (Vanessa C # 4003)

“...it’s just my experience around kids is very minimal, it’s kind of outside my comfort zone...based on my experience level around (children) and just personality-wise...not having that background with kids...it kind of made it a lot harder to...engage...” (Mark C # 4052)

Previous understandings and assumptions being challenged were also examples of why a problem was occurring for the student. Carissa’s previous experience of a supportive learning environment at university was one reason why she felt so confronted by her clinical educator’s (‘supervisor’) attitude toward her on her first clinical placement:

“...I don’t have any negative feelings toward uni’, I have found this a great place to learn, everybody’s just so nice...which makes me...very protected from the outside world...during my second year clinical, I met a supervisor which I think she’s a little bit, a little bit racist in a way...” (Carissa C # 4054)

C students also related a challenge to their previous understanding of physiotherapy scope of practice as the reason behind how they saw themselves as a result of the course:

“...where I come from, people call physio as a masseur, not as a physiotherapist, which is really different from what I imagined I would be...” (Carissa C # 4054)
“...I hadn’t had any experience...in a hospital system at all...didn’t even know (physiotherapists) existed in the hospital setting...now I can see there’s a whole another...scope...” (Margaret C # 4050)

Some students also reflected on personal values and qualities as the premise of the issue being explored:

“...I’m a very conservative girl...this whole course has taught me to be a very daring girl in a way, from my culture...you never reveal (your) flesh to people...” (Carissa C # 4054)

“...if I find the lecturer boring, then I’ll find the unit boring. I don’t have the, um, probably the maturity (laughs) to just think, like, I’ve just got to maybe self-teach or...find a way to make it interesting... I haven’t got the maturity, yeah, I haven’t worked out how to do it...” (Emma PC # 2040)

In most of these examples, it can be seen that there is a common theme of emotions or discomfort being acknowledged and explored as well as assumptions and personal values being challenged. These experiences led the students to actively engage in deeper reflective processes that fostered their reflective thinking.

Concluding how the students are reflecting; having a clear understanding of the depth of reflection and the issues related to these varying depths further provides evidence to how undergraduate physiotherapy students use reflection in learning and practice. The depth of reflection within the data varies between each student which may be related to an intrinsic personal quality. However, exposure to clinical practice appears to provide opportunities to gain experiences that may trigger greater depths of reflection. These results will be analysed further in Chapter Five.
**Student suggestions for supporting reflection in the course**

At the conclusion of each interview, the students were asked to provide suggestions on how they could be supported and encouraged to reflect within the course. PC students’ suggestions mainly focussed on teacher guided review of exam, course content and practical skills. In contrast, C level students had a number of suggestions that were mainly linked to reflection within and in preparation for their clinical experiences. One student suggested that opportunities, modelling and guided reflection should be introduced from Year 1. Another student, having learnt more about depth of reflection during the interview, suggested that in preparation for clinical placements; educational activities that demonstrate and encourage greater depth of reflection would be beneficial. Two C students also related their personal experience with reflecting at the end of each day on placement where one example was clinical educator initiated and the other example was initiated by the student and involved debriefing with fellow students.

**Conclusion of Results Chapter**

The quantitative results showed no significant difference in self-reported use of reflection in learning between the PC and C cohorts of students. With respect to reflective thinking, the only statistically significant difference was students with prior tertiary level education had significantly higher (p=0.017) RLS\(^{1,2}\) scores than students who were secondary school leavers.

Using Kolb’s cycle of experiential learning\(^4\) as a theoretical lens, qualitative results showed how students’ ‘concrete experiences’ (*where the students are reflecting*) revealing that PC students predominantly provided examples linked to personal experience, educational activities and study practices, while C students drew on their rich and diverse clinical experiences. The trigger or motivation to engage in ‘reflective observation’ and ‘abstract conceptualisation’ (*why the students are reflecting*) included
for extrinsic reward in order to achieve in summative assessments. Less common
triggers, most evident in C students, demonstrated more intrinsic triggers, that included
professional identity, competency, altruism, patient advocacy and in reaction to conflict
or dissonance during clinical placement. The timing of ‘reflective observation’ (when
the students are reflecting) showed that PC students were more likely to reflect after the
‘concrete experience’ (reflection-on-action) or even after an accumulation of events that
had led to a negative outcome. C students had more examples of reflection-in-
preparation and reflection-in-action linked to clinical experiences although both these
mechanisms were less frequent than reflection-on-action.\(^7\) Lastly, the depth of reflection
(how the students are reflecting) showed that PC students mostly used content and
process reflection, whereas female C students were more likely to extend their
‘reflective observation’ and ‘abstract conceptualisation’ to the deeper, premise
reflection.\(^9\) This depth of reflection was more likely to be triggered by intrinsic
motivators as well as conflict. Students also suggested that more opportunities to be
guided through reflection and to understand depth of reflection would be useful to
support their development of reflective thinking.

In Chapter Five, the above results will be discussed through an educator’s lens in
relation to current literature.
CHAPTER FIVE: DISCUSSION

Introduction: Through an educator’s lens

In Chapter Four, the results explored how and why undergraduate physiotherapy students use reflection in learning and practice at different stages in their course (pre-clinical and clinical), including what/how experiences may or may not trigger and develop reflective thinking. The quantitative results also provided insight into students’ self-reported use of reflection. Learning is unique to the individual and thus is different for each individual in each cohort of students.

Kolb’s cycle of experiential learning is a framework of learning from ‘concrete experiences’ that connects across all domains of learning; cognitive, psychomotor and affective, as well as all facets of development; personal, workplace and education. These experiences in the classroom and/or in clinical environments (PLACE: where the students are reflecting) have the potential to motivate the student to reflect (TRIGGER: why the students are reflecting). The students potentially reflect at different times in relation to the experience (TIME: when the students are reflecting) and may reflect on what was happening and how it was happening (DEPTH: how the students are reflecting). If the learning experience is well-designed, there is effective facilitation and/or the student has developed a higher level of reflective thinking, they may attend to their senses and feelings associated with the experience and explore why it was happening (DEPTH: how the students are reflecting). Through this depth of ‘reflective observation,’ the transition to the next step in the cycle, ‘abstract conceptualisation’ or making sense of the experience, can lead to action or ‘active experimentation’ and so the cycle or “spiral of experiential learning" continues. Learning requires time and space and it is through pedagogical design that reflective thinking can be fostered to facilitate learning and transformative change.
The use of reflection is not an innate skill\textsuperscript{13} therefore, as educators, we need to teach and foster reflective thinking through scaffolded learning activities throughout the duration of the course.\textsuperscript{13,22,26,28-30} The common/traditional approach of retrospective written reflection tasks\textsuperscript{20,77-82,127} isolated to clinical experiences may not be the optimal way to foster reflective thinking in health professions students. It has been shown that there are clear links between reflective capacity, depth of learning approach\textsuperscript{1,2,51,61,64,67-70,72,73} and academic achievement.\textsuperscript{1,2,51,65} Therefore, through concurrent development of a deep approach to learning and deeper levels of reflection a path to professional development and the desired philosophy of life-long learning may be fostered.

It is therefore through an educator’s lens that the discussion of the results from this study will be centred. Based on the results of this study, a deeper understanding of educational and experiential learning opportunities to which this sample of physiotherapy students have been exposed to is described. The results revealed what experiences or activities triggered reflection, including the types of experiences or activities that resulted in the students engaging in deeper levels of reflection. The current mechanisms students use to engage in reflection as well as the impacts of level of learning, gender and previous educational experience have on their use of reflection will also be discussed. From this evidence, the discussion explores and recommends a series of educational strategies that may be used to encourage and foster reflective skills and capacity from the beginning of health professions student’s academic journey. Limitations to the study results with respect to this discussion are highlighted in the following Chapter Six.

In this chapter, the research results will be discussed in relation to Kolb’s cycle of experiential learning\textsuperscript{4} (described in Chapter One). The themes and quantitative results will be interweaved throughout the discussion chapter and supported by current
literature to offer key insights and deepen our understanding of how physiotherapy students use reflection. These discussion topics are presented in relation to Kolb’s cycle of experiential learning\(^4\) in Figure 6 and include:

**PLACE:** What experiences are the students exposed to and how does this impact their use of reflection? – the ‘concrete experience’\(^4\)

**TRIGGER:** What is the main motivator for reflection and what does this tell us about the current educational strategy? – the experiences or motivators driving ‘reflective observation’ and ‘abstract conceptualisation’\(^4\)

**TIME:** When are students reflecting in relation to their experiences and what does that tell us about the current educational strategy? – ‘reflective observation’\(^4\)

**DEPTH:** What is triggering deeper levels of reflection and how can that inform the development of educational strategy to foster this level of reflective thinking? – the motivators that increase the depth of ‘reflective observation’ through to ‘abstract conceptualisation’\(^4\)

*Figure 6: Discussion topics in relation to Kolb’s cycle of experiential learning \(^4\)*
PLACE: What experiences are the students exposed to and how does this impact their use of reflection?

Research shows that reflection is not innate, but rather a learned skill, therefore, it is important to understand how student learning experiences impact the development of reflective thinking. In this study, there were two groups of students, the C level cohort who had been exposed to both the academic (classroom) as well as the clinical learning environments where their professional, theoretical and practical skills were being developed and assessed. There were also students who were at an earlier stage of their course and had not been exposed to clinical learning environments, the PC level cohort. As the students were exposed to different learning environments, this impacted the types of experiences that were triggering the use of reflection. The key questions here are what depth of reflection is occurring from these experiences and how can these experiences be manipulated in order to teach and foster deeper levels of reflective thinking?

Kolb’s experiential learning theory places the authentic ‘concrete experience’ at the forefront of learning and professional development. In this study, the PC students discussed mainly study practices and personal experiences in relation to their examples of using reflection, whereas C students drew mainly on their clinical experiences as examples where they used reflection. This is clearly an expected outcome as students can only draw from what they have experienced.

The results in this study showed PC students predominantly provided examples of reflection that linked to cognitive and psychomotor learning domains; understanding content and theory, cognitively applying this to foster clinical reasoning skills as well as learning and practising assessment and treatment skills. This finding was strengthened by the quantitative results gained from the Reflective Thinking Questionnaire (RTQ)
that PC students had significantly higher ‘Understanding’ scale scores than C students. The ‘Understanding’ scale is designed to relate to pure cognitive processes, without a reflective component, and aligns with Bloom’s taxonomy “Comprehension” level.\textsuperscript{108} This was an expected result as PC students are at a time in their course where there is emphasis of learning and understanding new skills, theories and concepts without having real clinical experiences in which to apply them. These findings also link with the comparative study by Lindquist et al.\textsuperscript{31} where learning skills, motivations and psychomotor skills were the main themes of reflection of the physiotherapy students at the same level of learning (PC). In this study, it appears that the cognitive and psychomotor domains of learning are the primary focus of the educational experiences or activities at this stage of their course. Potentially, if there was concurrent emphasis on the affective learning of their experiences, deeper levels of reflection may have been more evident and forthcoming from the PC students in this study.

The PC students also provided some examples of linking their current learning to prior personal experiences. This finding is consistent with a constructivist approach to teaching and learning,\textsuperscript{50,128} whereby students bring their previous experiences, knowledge, beliefs and values to the learning experience, influencing how they interpret it and construct new understanding or perspectives.\textsuperscript{128,129} As an educator, facilitating students to actively access prior knowledge, ideas and experiences to construct new understanding is a potent teaching strategy. This teaching strategy is useful when drawing on the reflective component, especially for PC students who needed to draw on their personal experiences as they do not yet have the rich, authentic examples that occur during clinical experiences.

What is important to highlight, when interpreting the qualitative data, is that PC students did not offer many examples of ‘concrete experiences’\textsuperscript{14} that prompted
‘reflective observation’ in the classroom, nor many instances where they were guided through reflective thinking. This finding indicates limited time and space allocated to reflective thinking in the PC learning environment. However, there was mention of PC students being led by their tutor to observe and reflect on another student’s skill performance. This is an example of peer assisted learning\textsuperscript{130} that has been utilised to stimulate theory and skill acquisition; cognitive and psychomotor domains of learning.

In contrast, the C students provided rich accounts of many ‘concrete experiences’\textsuperscript{14} in the clinical setting when revealing examples of using reflection in their course. Their examples drew on all domains of learning; cognitive, psychomotor and affective, which included conflict in the workplace, altruism, challenges to scope of practice and tension in their emerging professional identity and competence. These findings are supported by Wessel and Larin\textsuperscript{33} who studied 15 female physiotherapy students’ written reflections whilst in the clinical learning environment. Similar to this study, themes that emerged from the students’ written reflections included, “Professional behaviour, Learning, Self-development…Ethical issues…Communication…and Scope of practice.”\textsuperscript{33(p119)}

C students also compared their experiences in clinical practice to their learning at university. The students discussed how their learning in the university environment prepared them to perform and learn in clinical environment but many could also identify difficult situations for which they felt they were not prepared for. These examples were frequently associated with conflict in the workplace and the challenging task of handling acutely unwell patients. Clinical experiences lead to greater depth and breadth of learning and have the potential to expose students to learn not only clinical skills and knowledge but also to develop professional and social identity.\textsuperscript{23} The majority of students in this study reflected on previous experiences and understandings to recognise commonalities and conflicts experienced during clinical practice. This was
then used as the trigger to create new understandings, drive further learning\textsuperscript{23,128} and bridge the transition from theory to real practice.\textsuperscript{17-19}

In conclusion, key to this discussion point is that ‘concrete experiences’\textsuperscript{4} during clinical practice facilitated depth of reflection and affective learning in C students. This was in contrast to the PC students suggesting a deficit in the types of experiences that students are exposed to prior to clinical practice. Using a constructivist approach, the results suggest that providing more opportunities for students to be exposed to a variety of educational ‘concrete experiences’\textsuperscript{4} with complexity that extends beyond cognitive and psychomotor domains to facilitate affective learning, draw on previous knowledge and experience and foster reflective thinking will prepare students more holistically for clinical practice.

**TRIGGER: What is the main motivator for reflection and what does this tell us about the current educational strategy?**

Understanding what motivates or triggers students to use reflection is important to enable educators to manipulate or design learning activities that will be relevant and meaningful to students. Koole et al.\textsuperscript{29} support the notion that awareness of the triggers for reflection is “important to develop effective educational strategies, interpreting assessment results and increase the understanding of the reflective process.”\textsuperscript{29(p7)} In this study, the majority of students from both PC and C cohorts reported that extrinsic motivation to achieve in assessment tasks was the driving motivator for them to reflect. This is consistent with previous literature that has found that assessment drives, or motivates, learning.\textsuperscript{26,131,132} Research shows that students perceive and give greater time, focus and importance to summative assessment tasks. However, research shows that overload of summative assessment tasks may be at the cost of students’ reflective thinking time.\textsuperscript{133} It is not surprising that students focus on extrinsic motivation given
the emphasis of outcomes based learning prevalent in all levels of education. To meet bi-national standards, the physiotherapy course has an extremely high curriculum load and students are likely to be strategic in their learning and time management for academic achievement.

This research found that the potential consequence of failing an assessment task was a potent trigger to reflect, with many students from both PC and C cohorts reflecting on their study and performance strategies at different points along their course journey. Interestingly, some students did not recognise or were reluctant to reflect on their approach to learning unless there were dire consequences such as failure. Other students were triggered to self-evaluate and diagnose their own learning needs by reflecting on their assessment performance (‘reflective observation’ and ‘abstract conceptualisation’) leading them to proactively plan and strategise for more effective completion of assessment tasks in the future (‘active experimentation’). It was found that the depth of this reflection determines if or how experiences shape future approach to learning. This poses the question; how much pain do some students need to experience to trigger the depth of reflection that results in change?

From this study, understanding that the extrinsic motivation of assessment is the main trigger for both PC and C students to use reflection could inform strategies to encourage students to develop their reflective thinking. Assigning marks to reflective tasks may influence the students’ engagement and value of developing reflective thinking. Research suggests that with the overwhelming content load of modern day health professions education, students are likely to prioritise knowledge and skills to which credit is assigned. Embedding reflective components within assessment tasks may also influence a student’s learning approach. Using assessment to drive reflective thinking is underpinned by the assertion that extrinsically motivated development and
repeated practice of reflective skills may result in the ability to “incorporate it into their hectic lives”\(^{131(p289)}\) leading to intrinsic motivation to reflect which is required in professional practice.

In contrast, other research states that using extrinsic reward to motivate students to reflect is in conflict with the development of deeper levels of reflection.\(^5,135\) Assigning marks to students’ reflective writing may drive the student to be strategic and “inauthentic”\(^{135(p457)}\) in reflection assessment tasks and that it may “promote conformism”\(^{135(p458)}\) so that the student writes for the assessor and not from true selves.\(^5\)

Learning should be viewed as a process, not as a summative outcome\(^4,91\) and by applying this premise to teaching philosophy; facilitating reflective thinking and capacity through formative, active learning experiences should be more prominent in curriculum.

Taking these two perspectives into account, as well as the study’s findings, it is therefore recommended that there is a blend of formative and summative activities to develop and foster reflective thinking.\(^26\)

**TIME: When are students reflecting in relation to their experiences and what does that tell us about current educational strategy?**

The ‘concrete experience’\(^4\) and the main trigger to reflect has been discussed, this now leads to **TIME: when the students are reflecting** in relation to the experience. Drawing from the theory of Schön,\(^7\) the students may reflect-in-action during the experience, and/or reflect-on-action after the experience. The students may also prepare, strategise and plan by reflecting prior to the experience drawing on previous knowledge, theory and experiences. This is anticipatory reflection,\(^124-126\) or reflection-in-preparation. In Kolb’s cycle of experiential learning,\(^4\) reflection-on-action after the ‘concrete
experience’ is where much of the reflective thinking is focussed. This is where ‘reflective observation’ and ‘abstract conceptualisation’ occurs.⁴ (See Figure 7).

![Figure 7: TIME: When the students are reflecting in relation to Kolb’s cycle of experiential learning](image)

In this study, the majority of examples were when students reflected after the experience, issue or event. This is consistent with Mezirow’s⁹ theory of transformational learning that states reflection is triggered by a need to solve a problem (prompted by a consequence) and therefore reflection-on-action⁷ may be the most common timing of reflection. Aronson²⁶ and Clouder¹⁸ suggest that reflection after an experience is the most common educational design employed in health professions education through retrospective written reflections. This is also in alignment with the current educational design for developing reflective thinking in the undergraduate physiotherapy courses in this where reflective activities are mainly written reflections linked to clinical experiences. There were also very limited examples provided by PC students where reflection-on-action was guided and supported in the classroom or directed as an after class activity. The results in this study and research suggests there
needs to be time and support allowed in order for the student to engage in \textit{reflection-on-action} \cite{22,26,90,136} and should be considered by educators in curriculum, \cite{22,26} pedagogical design in the pre-clinical learning environment \cite{22} and the clinical setting \cite{21,23,62,136}.

Interestingly, the C level students were more likely to reflect directly after their experiences within clinical practice. Examples ranged from directly after each clinical encounter to end of the day reflections. This may have been as a result of heightened risk and reward that clinical practice offers, whereby real and repeated clinical experiences guide their interactions and management of their clients in real time. In contrast, the PC students were more likely to reflect after an accumulation of classroom and assessment experiences, often when there were a number of events that led to an undesirable outcome. In the academic learning (PC) environment, there may be few instant or progressive feedback mechanisms that are evident in clinical learning environments. Students may only realise they have a problem with their study and learning practices when it is too late. A key element of adult learning theory is the desire to learn from experiences, to be self-directed and self-motivated. \cite{137} This relies on the student either receiving timely, useful feedback and/or being able to self-evaluate and diagnose their own learning needs and strategies through reflection. Additionally, a student may notice there is a problem, possibly have some idea about what they are doing (or not doing) that is contributing to the problem but still have no motivation to explore further or to change as was evident in mainly PC student examples highlighted in the qualitative results.

Examples of \textit{reflection-in-preparation} and \textit{reflection-in-action} were more commonly expressed by the C students as opposed to PC students. This study found that the C students’ use of \textit{reflection-in-preparation} was triggered by the need to perform confidently and competently; simultaneously using their theoretical, practical and
professional skills. C students also conveyed examples of feeling discomfort in experiences for which they were not prepared. These included issues of patient handling such as accessing sensitive areas of the body and working with acutely unwell patients. In clinical practice, there are also immediate, authentic responses and feedback from clients, co-workers and clinical educators to their actions triggering reflection-in-action. C students expressed considerable discomfort associated with challenges and conflict with their clinical educators and other clinical superiors requiring them to ‘think on their feet’. This is difficult to simulate in the classroom and therefore limited unexpected events and discomfort or tension in the PC learning environment could be the reason why there are so few examples of reflection-in-preparation and reflection-in-action provided by the PC students.

The results from this study suggest that the C students felt unprepared and challenged by the need to reflect-in-action and therefore opportunities to practise and explore this prior to clinical practice are important. More needs to be done in designing opportunities and experiences for students to develop these less commonly expressed mechanisms of reflection (reflection-in-preparation and reflection-in-action) pre-clinically in the classroom “to mirror what is happening in the workplace”18(p220) and assist the transition from theory to practice.17-19

**DEPTH: What is triggering deeper levels of reflection and how can that inform the development of educational strategy to foster this level of reflective thinking?**

The process of learning, as outlined in educational psychology, consists of three dimensions that encompass what is learned, why it is learned and how it is learned.63 Why it is learned is linked to affective domains and “involv(es) coping with feelings that arise during learning and may affect the progression of learning…”63(p735) Why it is
learned is also linked to greater depth of reflective thinking, or premise reflection. From the results in this study, there is clear focus on what is learned (content) and how it is learned (process) by students in both cohorts but why it is learned is underdeveloped in PC students and could be developed further in C level students.

The qualitative results in this study also indicated that there were times when students from both PC and C cohorts ignored triggers by suppressing negative, uncomfortable feelings toward their studies. Research shows that this may be due to a few reasons: lack of time, limited emotional capacity to attend to feelings, issues not being significant enough to warrant time to reflect or possibly due to cognitive dissonance whereby students dismiss data that conflicts with their world view to maintain equilibrium. Schön states that this may be “self-protectionism” which leads the individual to ignore or brush aside feelings of discomfort leading them to “avoid risk taking, exploration of issues at depth.”

Educational psychology theory, however, suggests that it is important for students to attend to their feelings surrounding learning as it may impact their learning process. Research also shows that higher education should be creating friction and tension in the learner’s view of themselves and their society to foster deeper levels of reflection in their learning. Reflection is often triggered by a problem or an issue that arises. Often there is a level of discomfort that is experienced to trigger the exploration of what is happening, how it is happening and for some students at a deeper level why it is happening. This deeper level of ‘reflective observation’ may lead to more effective ‘abstract conceptualisation’ and transformative ‘active experimentation.’

In this study, the qualitative data showed that students were more likely to engage in more critical depths of reflection when the following factors were involved; there was communication of conflict and/or discomfort in the experience, the student was female.
and the student was at the clinical level of learning. Age of the student did not appear to impact the depth of reflection. Interestingly, these qualitative results conflict with the quantitative results in this study. The quantitative results showed that there were no significant differences in self-reported level of use of reflection between the PC and C cohorts of students and between the genders. This result was evident in both the Reflection-in-Learning Scale (RLS)\(^1,2\) and the Reflection and Critical Reflection scales in the Reflective Thinking Questionnaire (RTQ).\(^3\) The only significant difference found in RLS scores was students who had completed at least one year of tertiary learning prior to enrolment in the physiotherapy courses had significantly higher self-reported use of reflection than students whose previous level of education prior to enrolment was the final year of secondary school. Potentially this may be linked to the mean age of the students in each of the prior learning groups where the mean age of the students with prior tertiary level learning was 25 years and the secondary school leavers was 20 years.

The reasons for these inconsistencies may be explained by the assertion that the items of both questionnaires are focused on the participants’ use of reflection in the academic learning environment and therefore less likely to draw on patient-centred issues and altruistic motivations that can be related more readily to the C student experiences. In addition, the RLS emphasises metacognitive behaviours in the questionnaire items\(^1\) and the RTQ specifically aims to remove affective learning constructs from the Reflection and Critical Reflection scales.\(^109\) This is described further in Chapter Six under Limitations and possible future research. Therefore, the evidence from both quantitative and qualitative results in this study suggests that the cognitive and metacognitive levels of reflection (content and process reflection)\(^9\) are equally developed in the PC and C cohorts and the genders.
However, the results from the qualitative data in this study revealed that participants were more likely to reflect deeply on issues that have more meaning or created conflict, tension or dissonance. The deeper reflectors also showed evidence of more intrinsic triggers to reflect such as patient advocacy, altruism and the intrinsic desire to be a competent physiotherapist. These triggers are related to the affective learning domain that had not been identified in the quantitative data sets. Students who placed value on patient-centred issues and professional identity were more likely to explore the complexities of issues and ponder why it was happening, which relates to deeper, premise reflection.⁹ In contrast, students who were more focused on extrinsic motivators, such as practical performance and academic achievement, displayed limited reflective processes, mostly discussing what was happening and possibly how it was happening, which relates to content and process reflection.⁹

In the clinical environment, conflict, in its many guises, was a common trigger for the C student to engage in deeper levels of reflection. The examples were mainly associated with challenges and conflict in the clinical, professional and personal relationships between students and their clinical educators. It was interesting to note that the C students consistently portrayed a sense of trust in the theoretical, professional and ideological concepts they had been taught at university prior to clinical placement. They gave examples of recognising that conflict between themselves and their clinical educators was often due to differing perspectives on physiotherapy management, scope of practice and ethical practice. The students perspectives were often linked to ‘what they learned at university’ and their understanding of evidence-based practice. The results in this study indicated that there were also feelings of discomfort associated with recognising that practical skills training at university did not always adequately prepare them for real clinical practice.
In addition, conflict of a personal nature between students and clinical educators included a claim of racial discrimination as well as another student not ‘knowing her place’ in the social hierarchy of the workplace. It is important to note that personal characteristics of each individual student and their relationship with their clinical educators can be difficult to predict. These results show that preparation for transition to clinical practice goes beyond theory and skills. Research on medical students has discussed preparing students to be agentic learners within clinical practice.\textsuperscript{140,141}

Agentic learners are active, adaptive and mature in their approach to learning, seeking opportunities to gain and learn from experiences.\textsuperscript{140} Richards et al.’s\textsuperscript{141} study identified five elements of medical students’ process of engaging effectively in their learning environment. These included “i) understanding how to use and extend their personal epistemology; ii) maximizing opportunities in self-directed learning environments; iii) developing a positive sense of self; iv) employing assertive communication; and v) resilience through peer collaboration.”\textsuperscript{141(p253)} These personal and learning strategies are important to negotiate the variability and inconsistency of the clinical workplace opportunities and environments. In a study by Trede and Smith\textsuperscript{24} they found that only the most assertive and confident physiotherapy C students were able to initiate dialogue based on their reflections with their educators. Development of these attributes in health professions students would increase their capability to effectively deal with and learn from the inevitable conflicts experienced in clinical practice.

The C students in this study also provided examples of reflection at a deeper level when they discussed ethically charged experiences involving their patients. The C students relayed experiences where they felt compelled to advocate for their patients as they felt their best interests were not being considered. These examples included removal of private property, early discharge from hospital and forcing patients to consent to unwanted treatment. The students expressed empathy for their patients and conflict with
their superiors. This experience is consistent with research that indicates the development of empathy for patients is more like to be developed in clinical practice.\textsuperscript{142}

Research shows that medical students who display higher levels of intrinsic motivation to learn also report using deeper learning strategies and increased use of reflection in learning.\textsuperscript{143} Students are also more likely to be autonomous and resilient in their learning when intrinsically motivated.\textsuperscript{63} It is contended in the literature that over-emphasis of extrinsic rewards in education may undermine the development of intrinsic motivation.\textsuperscript{144} Therefore, research in this area, as well as the results of this study clearly show that intrinsic triggers associated with affective learning domains that create conflict, tension or dissonance in learners lead to deeper levels of reflection and should be considered in educational design to foster reflective thinking.

**Conclusion of Discussion Chapter**

In conclusion, this study provides evidence that the development of reflective thinking is impacted by the types of experiences the students are exposed to as well as the time and space devoted to reflective skill development throughout the curriculum. While the main trigger for all students to reflect was for extrinsic reward, greater depths of reflection were evident when there were more intrinsic triggers, such as professional competency, altruism and patient advocacy, as well as conflict and dissonance. The results also suggest there is a need to develop reflective mechanisms that go beyond retrospective, \textit{reflection-on-action},\textsuperscript{7} to adequately prepare students for clinical practice.

By analysing and discussing the results of this study through an educator’s lens, the following chapter will present a series of key recommendations that will provide pedagogical strategies to teach and foster reflective thinking in undergraduate physiotherapy students.
CHAPTER SIX: RECOMMENDATIONS AND FUTURE DIRECTIONS

Autobiography in Five Short Chapters by Portia Nelson

Chapter One

I walk down the street.
There is a deep hole in the sidewalk.
I fall in. I am lost. I am helpless.
It isn’t my fault.
It takes forever to find a way out.

Chapter Two

I walk down the same street.
There is a deep hole in the sidewalk.
I still don’t see it. I fall in again.
I can’t believe I am in the same place.
It isn’t my fault.
It still takes a long time to get out.

Chapter Three

I walk down the same street.
There is a deep hole in the sidewalk.
I see it there, I still fall in.
It’s habit. It’s my fault I know where I am.
I get out immediately.

Chapter Four

I walk down the same street.
There is a deep hole in the sidewalk.
I walk around it.

Chapter Five

I walk down a different street.

This poem by Portia Nelson crystallises the cyclical journey of personal change that can only occur if individuals are willing and able to reflect beyond what is happening and how it is happening to then consider why it is happening. The pathway to transformative change through the process of critical reflection is long and sometimes painful.
Educators in higher education must provide authentic ‘concrete experiences’ that create the learning environment and opportunity to trigger ‘reflective observation’.

University courses need to allocate time and space to repeatedly scaffold opportunities to develop students’ reflective thinking throughout the course. By facilitating students to explore, conceptualise and experiment with a pathway to critical reflection; insight and self-evaluation can lead to self-regulation and a philosophy of engaging in lifelong learning which is embodied in reflective practice and ideally maintained throughout one’s professional career.

There are a number of recommendations that have evolved from this study. Firstly, that reflection in learning and practice should be given greater emphasis within the curriculum of undergraduate physiotherapy courses. Secondly, pedagogical frameworks that may be used to create potent and supported learning environments to trigger and teach reflection will be proposed – enhancing the use of ‘concrete experiences’ and guided ‘reflective observation’ and 'abstract conceptualisation'. And thirdly, more emphasis on creating educational experiences that foster reflection-in-preparation and reflection-in-action linked to ‘concrete experiences’.

**More space and time for reflection in the curriculum**

What might be limiting the development of deeper levels of reflection in undergraduate physiotherapy courses? Physiotherapy is a highly scientific profession and while the undergraduate curriculum includes attention to professional and therapeutic communication skills, as well as patient-centred models of health care, the focus still firmly remains on scientific content. The course emphasises knowing, understanding and applying complex anatomy, biological structures and functions of all body systems, biomechanics, movement science and pain. This is delivered via high contact hours
combining theoretical and practical skills and knowledge within a clinical reasoning framework.

In physiotherapy education, the cognitive and psychomotor domains of learning are highly utilised. Bolin et al.\(^4\O\) state that while the cognitive domains of Bloom’s taxonomy are widely acknowledged and embedded in educational design, the affective domains (that include elements that are associated with depth of reflection) are often ignored. Consistently challenging students to explore their emotional responses to their learning experiences is equally important and should be included to complement the current cognitive and psychomotor learning focus. There is so much emphasis and time allocated to teaching theory, practical skills and their application; cognitive and psychomotor domains of learning, that reflection and the affective learning domain are often forgotten or squeezed out of the curriculum. A key finding to this study is the need to foster deeper levels of reflection by integrating affective learning domains vertically within the curriculum.

As highlighted in this study, there were limited examples of PC students relating ‘concrete experiences’ with facilitated ‘reflective observation’ and ‘abstract conceptualisation’\(^4\). In contrast, C students used their access to multiple ‘concrete experiences’ in the clinical environment to personally reflect, analyse and make changes to their thinking, clinical reasoning and performance in practice at varying depths. Although some C students referred to written reflection assessment tasks linked to their clinical placements, only one C student in this study indicated that their clinical educator led them through end of day reflections to identify learning needs and plan for the future. The student revealed that this was the most useful reflective activity they had experienced throughout the course. This finding is supported by Sellheim\(^22\) who states that “clinical sites do not have the time to do as much teaching as they did in the
past"22(p57) and that just exposing students to clinical or workplace experiences is not enough; students also need to be guided and facilitated through the reflective process.24,146

Research suggests that educational strategies that teach and foster reflective thinking should be embedded throughout the curriculum.19,22,26-28 Learning requires an adequate time frame and consistent exposure to achieve success.90 Purely linking the development of this skill to clinical learning environments and experiences, as is evident in this study, which typically occurs later in the course, limits the benefits that students gain from these reflective skills pre-clinically. Additionally, expecting students to value, understand and apply reflective thinking in the clinical learning environment without prior significant exposure, instruction, feedback and modelling would certainly ill-prepare them to use these skills in the highly stressful environment of clinical practice. Therefore, an approach of scaffolding the development of reflective thinking throughout the curriculum is recommended.

In summary, the key recommendations in relation to these findings are firstly, to ensure affective domains of learning are included alongside cognitive and psychomotor learning with respect to developing reflective thinking. And secondly, to create and use authentic ‘concrete experiences’4 in the classroom and clinical practice where students are scaffolded, facilitated and supported in their reflective learning throughout the curriculum. Emphasising this pedagogical strategy creates time and space to teach, foster and develop reflective thinking. How this may be achieved will be discussed further in the following section; Pedagogical frameworks for educators to trigger and teach reflection.
Pedagogical frameworks for educators to trigger and teach reflection

The results of this study clearly demonstrated there were limited educational activities for the PC students where there were ‘concrete experiences’ that triggered guided ‘reflective observation.’ These results link with the study by Sellheim who researched a sample of 17 physical therapy educators at three universities in the USA to investigate their educational strategies using Kolb’s experiential learning theory as a framework. Sellheim found that the educators’ main pedagogy was teacher-centred via the transmission of knowledge (linked to ‘abstract conceptualisation’) and skill learning and practice (linked to ‘active experimentation’) with the important steps of ‘concrete experience’ and ‘reflective observation’ in the experiential cycle bypassed in order to ensure the content and skills in an overloaded curriculum were addressed in the classroom.

Furthermore, a study by Hauer et al. explored the learning styles of allied health students using Kolb’s Learning Style Inventory and found that physical therapy students were most likely to have a tendency toward the ‘active experimentation’ style of learning and least likely to engage in ‘reflective observation.’ Understanding learning styles of students is important when designing educational activities and curriculum and this shows that the development of reflective thinking in physiotherapy education needs an active approach to overcome potential learning style bias. Sellheim cited McCarthy, Kolb, Svinicki and Dixon who argued “that real growth and learning are based not only on receiving and doing, but also sensing, feeling, and reflecting.” Students need to be “adaptive” in their learning style to cope with the variety of learning environments in health professions education and therefore it is important for all learning styles to be included and developed. Neglecting this educational strategy in
the pre-clinical learning environment may lead to students not being adequately prepared for clinical practice.22

In contrast to the PC learning environment, the C learning environment is often full of diverse ‘concrete experiences’ via patient interactions and workplace challenges.22 There are also many ‘active experimentation’ opportunities where students are given freedom to plan and perform their own interventions.22 Clinical practice, when guided and supported by clinical educators that respect and understand the experiential learning cycle, is ripe for development of reflective thinking and deeper learning experiences.

The ‘concrete experience’4

The results from this study suggest that there were limited opportunities for students to be guided through reflective thinking linked to ‘concrete experiences.’ Potentially using Kolb’s cycle of experiential learning as a framework of educational design4,90 will assist educators to embed reflection into educational activities and scaffold these vertically into health professions curriculum.19,22,26-28 Therefore, a well-designed ‘concrete experience’ is the first challenge for the educator. Research shows that the ‘concrete experience’ should facilitate learner involvement by ensuring the experience is meaningful91 and authentic.4 Consistent with other research, the results of this study found there was limited development of reflective thinking at the PC level of learning in preparation for clinical learning environments and this suggests that there should be a scaffolded approach to fostering reflective thinking.13,22,26,29,30 This may, initially, be achieved in the PC learning environment through ‘concrete experiences’ that focus on cognitive and psychomotor domains of learning. Results from this study suggest that the limited ‘concrete experiences’ the PC students have been exposed to, do in fact, concentrate on the cognitive and psychomotor learning domains. What is lacking is the
number of opportunities where students are exposed to well-designed ‘concrete experiences’ in the classroom.

Turning to the development of more critical reflection, from the results of this study it is recommended that designing and exposing students to ‘concrete experiences’ associated with affective learning domains that create conflict, tension or dissonance in learners lead to deeper levels of reflection. Additionally, given that PC students are being prepared for the clinical learning environment, exposing them to ‘concrete experiences’ that simulate the complexities of the workplace will aid transition from theory to practice. Physiotherapists are “required to make autonomous clinical and ethical decisions based on connections and relationships with their patients, other health care team members, and health institutions…” Therefore, designing ‘concrete experiences’ that include affective learning domain and where authentic ethical, patient-centred advocacy, professional practice and relationship conflicts are present are recommended.

Supporting and facilitating ‘reflective observation’ and ‘abstract conceptualisation’

There are a number of studies that provide guidelines on teaching and assessing reflection to health professions students. Some suggest that it is important to first initially define reflection contextually for the student. From this point, depending on the learning environment and educational focus, there are many different strategies to teach and foster reflective thinking.

Using Kolb’s cycle of experiential learning, the next essential steps beyond the ‘concrete experience’, and a clear recommendation of this study, are to guide students’ ‘reflective observations’ and facilitate ‘abstract conceptualisation’. Research suggests that for the novice and emerging reflector, a structured approach with
reflective prompts and questioning is paramount. For example, using searching questions that interrogate and analyse the experience (how and why it was happening; process and premise reflection) should be employed instead of merely reviewing the experience (what was happening; content reflection) as this is not critical enough for deep reflective learning to occur.

Another consideration for supporting the use of reflection in PC and C levels is to foster a socially inclusive learning environment. Yardley et al. discusses that reflection through experiential learning, particularly in the workplace, should be linked to social learning theory. This idea supports the social inclusion of students as colleagues in the clinical environment so that they are prepared to meet the variety of challenges inherent in clinical practice. Social inclusivity should be fostered through modelling and guiding reflection on previous experiences, recognising the commonalities and conflicts that present themselves in the current experiences and assisting students to understand why the conflicts have arisen. There should also be explicit linkage of current experiences to future practice through safe and supported dialogue between student and educator in order for students to create a sense of identity that fosters lifelong learning. An essential element to this teaching philosophy is the ability and willingness for clinical educators to create an ideal learning environment by seeking to treat students as partners and not inferiors. This is supported by Musolino who cites social learning theorist Bandura by “propos(ing) that a fundamental way humans acquire skills and behaviours is by observing the behaviour of others.” The physiotherapy profession has emphasis on developing and maintaining relationships with clients, colleagues and other healthcare workers to enable best outcomes for the client and therefore creating a forum for unencumbered, open, honest communication and modelling of reflection through social inclusivity is recommended.
The results from this study possibly suggest that there may be limited emphasis on reflection at deeper levels in clinical teaching given there was only one example provided by the C students where there was guidance through reflection on the day. Central to supporting and fostering reflective thinking in clinical education is the premise that clinical educators have the skills, time and desire to facilitate this learning. A study by Trede and Smith\textsuperscript{24} found that physiotherapy C students were, at times, “openly discouraged”\textsuperscript{24}(p615) by their clinical educators to reflect. They also found that while students were mostly comfortable to initiate discussion with their clinical educators regarding treatment or technical issues they were less likely to discuss their thought processes for fear of judgement and poor assessment outcomes.\textsuperscript{24}

Therefore, again, it is essential that teaching and fostering reflection goes beyond a framework that supports purely cognitive and psychomotor domains of learning to also include affective domains. Branch and Paranjape\textsuperscript{21} suggest that clinical educators often miss teachable moments that may promote the growth of the students and “enlarge the horizons of the learners by including human and moral dimensions of care in learning encounters.”\textsuperscript{21}(p1187) In an earlier paper, Branch et al.\textsuperscript{62} recommended the inclusion of “human dimensions” in clinical teaching by “taking advantage of seminal events, role modelling and using active learning skills.”\textsuperscript{62}(p1067) These ideas link well to Kolb’s experiential learning cycle\textsuperscript{4} where the ‘seminal events’ are ‘concrete experiences’, ‘role modelling’ is a way to guide ‘reflective observation’ as well as ‘abstract conceptualisation’ and, ‘active learning skills’ link to ‘active experimentation.’\textsuperscript{4,62} This, in turn, encourages the development of autonomous health professionals.\textsuperscript{21}

As discussed previously, in this study the majority of students were triggered to reflect via extrinsic motivation which, whilst a useful strategy, does not foster the deeper reflection that results from intrinsic motivation. The student participants in this study
have summative written reflection tasks linked to clinical practice. Whilst the retrospective written reflection is a common approach to foster reflective learning, Smith and Trede recommend that reflection should be embedded in real, daily experiences with an emphasis on “social and collective opportunities for reflection.” As reflection involves many active learning steps, collaboration and discussion are recommended as potent, formative educational strategies. This can be achieved by using group work and/or educator led discussion to share ideas, concerns and emotions and is consistent with Mezirow’s theory of transformational learning where students explore, justify and reconcile their experiences through “discourse.”

Through thoughtful instructive design it is also important that there are “reflective outcomes.” This can be achieved via guided and facilitated ‘reflective observation’ and ‘abstract conceptualisation’ leading students through to the ‘active experimentation’ phase, strategising and planning, which potentially informs and impacts future ‘concrete experiences.’ And thus, the experiential learning cycle, or spiral, continues.

From the results of the current study and research in this field, a number of pedagogical recommendations have been described, including embedding formative, active reflection within both pre-clinical and clinical learning environments. It is also recommended that ‘concrete experiences’ are designed to include or highlight an affective component and where authentic ethical, patient-centred advocacy, professional practice and relationship conflicts are present in pre-clinical phase of the course to help prepare students to reflect at a deeper level during clinical practice. Creating learning environments both pre-clinically and in clinical practice that facilitates students to engage in deep discussion without fear is an important recommendation of this study.
Through consistent exposure to well-designed and supported ‘concrete experiences’ and regularly engaging in reflective thinking,\textsuperscript{20} successful transition from the classroom to clinical learning and beyond to professional practice will be achieved.\textsuperscript{17-19}

The recommendations for the pedagogical frameworks outlined above are summarised below in relation to Kolb’s cycle of experiential learning\textsuperscript{4} in Figure 8.

\textit{Figure 8: Pedagogical framework recommendations in relation to Kolb’s cycle of experiential learning}\textsuperscript{4}

More emphasis on reflection-in-preparation and reflection-in-action

The results from this study show that students predominantly use \textit{reflection-on-action}, reflecting after the ‘concrete experience’ or issue has arisen. Written reflection on experiences is also a common approach used by educators to engage and assess students in the development of reflective thinking.\textsuperscript{20,77-82,127} However, there are many benefits
that can be gained by the learner by developing and practising reflection-in-preparation and reflection-in-action which link more actively with clinical practice.20

**Reflection-in-preparation**

C students in this study gave examples of recognising that their pre-clinical learning did not always prepare them for uncomfortable patient and clinical educator experiences. Therefore, development of PC reflection-in-action activities may assist students in their transition from theory to practice. Reflection-in-preparation is useful in so many ways and links closely with constructivist theories.50 Drawing on prior experiences, knowledge and skills is useful in the PC learning environment to prepare for new learning experiences. Firstly, this can be simply by setting the scene, or “naming and framing”152(p1185) a problem, case study, scenario or simulation ‘concrete experience’4 in the classroom for students to anticipate, discuss and strategise their approach to the educational activity.

Secondly, reflection-in-preparation may also be extended to educational activities that stimulate students to explore and identify their feelings, beliefs and thoughts prior to attending clinical placements which has been shown to link closely to the affective learning domain.124-126,153,154 Research shows that students experience anxiety in anticipation of clinical placement and using self-reflection and discussion with others are helpful coping mechanisms.154 Brand et al.153 conducted a study where medical students viewed and reflected on a short film that emphasised the patient perspective in an emergency medical setting. The study found that medical students were prompted to anticipate their future role as doctors working in this clinical setting which enhanced values of patient-centred care. Through this educational intervention, there was a blending of art and science by combining humanities based pedagogies with the predominant scientific-based profession of medicine. In other studies by Brand and
a photo-elicitation technique was used whereby health professions students were shown a collection of photos and vignettes of older adults with associated reflective prompts. This guided the students to explore their attitudes toward older adults, to consider the point of view of the older adult when being cared for, as well as anticipate working with this demographic. Through the use of visual triggers (‘concrete experience’) followed by guided ‘reflective observation’ a forum for practising reflection that draws on affective learning to improve mental and emotional preparedness for the challenge of clinical practice was created.

Lastly, reflection-in-preparation is a useful mechanism in the clinical environment. Students and clinicians often take time to read client records and referrals and reflect on prior knowledge, theory, skills and experiences to guide them in their clinical encounters. Greenwood suggests that in medical practice, taking the time to “stop and think” before acting could prevent clinical errors. Students in this study used this mechanism of reflection to mentally prepare themselves for awkward or difficult clinical encounters and therefore structuring time for activities designed to explore relational and humanistic dimensions of practice prior to clinical experiences and encounters would be useful. It is recommended that practising this in the pre-clinical and clinical learning environment and aiming to draw in cognitive, psychomotor and affective domains of prior experiences would be useful to aid the transition from student to professional practice.

**Reflection-in-action**

Developing the ability to ‘think on your feet’ within clinical encounters is an essential graduate attribute for health professionals. As clinical encounters and patients are often unpredictable, there is always an element of reflection-in-action alongside communication, counselling and clinical reasoning processes. This type of reflective
thinking is important for “continuous self-monitoring that is essential to keep clinicians on course, prevent errors and maintain competence”\(^{156(p1048)}\) during clinical encounters. In addition, the health professional is prompted to judge and evaluate their own effectiveness, motivations and biases within the clinical encounter and, as a result, make adjustments and modifications to their approach. Therefore, reflection-in-action plays a role in developing the health worker from a technician to an autonomous, self-regulated professional which is a key standard of professional registering bodies.\(^{14}\)

Clinical learning environments provide many opportunities to listen and respond to patients as well as observe patient reactions to objective assessments and interventions. Going beyond what is said and observed and making judgements on patient motivation, compliance and responses is an important step in creating a trusting and effective clinical relationship. As there were limited examples of reflection-in-action within this study, and there is research that supports the development of this skill it is a recommendation of this study to create educational activities or opportunities in the classroom and the clinical learning environment where reflection-in-action is learned and practised. This can be achieved by creating activities where educators “make thinking visible”\(^{157(p2)}\) by verbalising the clinical reasoning process.\(^{157}\) Clinical reasoning activities also have the potential to combine both cognitive and affective domains of learning as both the diagnostic results and the patient-centred goals and wishes must be taken into account.\(^{157}\) Additionally, beyond the clinical reasoning process, creating a forum for verbal reflection\(^{26}\) through dialogue via educator modelling and facilitation of discussion during the learning experience is recommended to support students in “complex and uncertain situations.”\(^{136(p500)}\)

In conclusion, it is essential that the timing of reflection in relation to ‘concrete experiences’\(^{14}\) encompasses reflection-in-preparation and reflection-in-action\(^{7}\) in order to
complement the common approach of reflection-on-action in the classroom and clinical learning environments to adequately prepare students for professional practice.

The recommendations outlined above are presented below in relation to Kolb’s cycle of experiential learning in Figure 9.

**Figure 9: Recommendations for emphasis of ‘reflection-in-preparation’ and ‘reflection-in-action’ in relation to Kolb’s cycle of experiential learning**

**Limitations and possible future research**

It must be acknowledged that all research has limitations that may impact the validity and reliability, or trustworthiness, of the results. Limitations of this study will be reported alongside steps that were taken to mitigate these followed by suggestions for possible future research.
Snapshot of two cohorts of students at one university

This study had a cross-sectional, non-experimental research design illustrating a snapshot of the two cohorts of undergraduate students from one university in Western Australia which presents a number of limitations. Firstly, the cross-sectional methodological approach provided results that were not reliably representative of a longitudinal change in the use of reflection from PC to C levels of learning. Secondly, the study was exploratory and did not involve an intervention which limited the ability to determine if students had a clear understanding of the subject matter enabling them to accurately self-report their use of reflection quantitatively and qualitatively. Thirdly, the participants were a convenience sample drawn from undergraduate physiotherapy courses at a single university. It is therefore difficult to reliably translate or generalise the data and results across other undergraduate physiotherapy or health professions courses that may offer a different curriculum focus. The results do, however, contribute to the literature on reflection in physiotherapy education and the broader area of health professions education.

Possible directions for future research linked to the above limitations are firstly, to conduct a longitudinal study whereby cohorts and individuals are followed through the journey of their course from PC to C level studies and, potentially, into professional practice. This would enable direct comparisons of results of individuals and the cohort with the ability to track the development of reflective thinking with greater reliability. Secondly, a study which includes an experimental intervention to improve reflective thinking using educational strategies recommended from the results of the current research. This would further add to the understanding of reflective learning in undergraduate physiotherapy students. Thirdly, a study that includes a number of undergraduate physiotherapy courses at a variety of universities would gather further
evidence of the use of reflection across different programs of physiotherapy to
determine if results are transferrable to other populations.

Quantitative data from questionnaires linked to cognitive learning
domain

The questionnaires used in this study were designed to gather quantitative data on the
participants’ self-reported use of reflection in their course. The RLS\textsuperscript{1,2} emphasises
cognitive and metacognitive behaviours in the questionnaire items and the RTQ\textsuperscript{3} aimed
to deliberately remove affective learning constructs from the Reflection and Critical
Reflection scales.\textsuperscript{109} Based on the results in this study, it appears that these
questionnaires are more appropriate for the academic learning environment (PC
students) than for the clinical learning environment (C students). While the results from
these questionnaires were still important and valuable to gain insight into the use of
reflection in the sample population, the lack of sensitivity to affective learning
constructs associated with deeper levels of reflection limited the ability to link the
quantitative to the qualitative results in this study. Possible directions for future research
in relation to this limitation could be to develop and test a questionnaire that includes
the affective learning domain that may be linked more readily to deeper levels of
reflection and the intrinsic triggers of reflection associated with clinical experiences.

Self-reporting questionnaires and Likert scales

Self-reporting questionnaires have a number of limitations that can bias responses and
results. In this study, the main self-reporting issues centred on firstly, the participants’
understanding of the language and meaning of the questionnaire.\textsuperscript{158} The researcher
addressed this issue by providing a short presentation prior to data collection that
defined and explained the questionnaires to enable student participants to respond
within the intended context. This adaptation was generated from the feedback from the
pilot participants. Additionally, to address this issue, the terminology used in the RLS\(^1,2\) was modified (with permission from the author) to reflect the linguistic differences in Australia. The other self-reporting issue in this study was that participants may have been inclined to respond in a way that appeared more “socially desirable”\(^{158(p50)}\) or in a way that was pleasing to the researcher. The researcher attempted to minimise this bias by ensuring confidentiality and anonymity measures were clear to all participants and the researcher leaving the venue while participants completed the questionnaires as discussed in Chapter Three (Methodology).

With respect to questionnaires using Likert scales, throughout literature, there are inconsistencies in how data sets are statistically analysed when using these scales. Many previous studies using the questionnaires utilised in this study\(^1-3,5,6,61,65,66,70,72,73,103,106\) analysed the Likert data in a way that suggested it was scale data, rather than ordinal data and often used analyses that assumed the data set distributions were parametric without communicating how or if this was tested. In the current study, the researcher investigated statistical theory and consulted with supervisors and statisticians to ensure that the quantitative data was categorised and analysed correctly so that the most appropriate statistical tests were applied.

**Qualitative research potential bias**

Inherent in all qualitative research is the role of the researcher as the inquirer. Analysis and interpretation of qualitative data has the potential to be biased toward the perspective and beliefs of the researcher. Ensuring trustworthiness in the reported qualitative data results serve to lessen the potential for researcher bias and improve the rigour of the study.\(^{159}\)

The methodological approaches of qualitative data collection, analysis and interpretation outlined in the methodology chapter suggest that there was clear intent
and processes to ensure the trustworthiness of the current study. Taylor et al. cite Sandelowski who generated four categories that can be used to determine rigour in qualitative research. Firstly, “credibility…participants and readers of the research recognise the lived experiences described in the research as similar to their own…” Credibility was achieved in this study through member checking whereby interview participants read the transcribed interview and were invited to provide feedback. In addition there was ongoing review and feedback from a number of research supervisors. Secondly, “fittingness…the extent to which a project’s findings fit into other contexts outside the study setting…” Fittingness is unknown to the researcher at this point but through clear representation of the methodology, readers will be able to ascertain if this study has characteristics that could be applied in their own context. Thirdly, “auditability…the decision trail…can be scrutinised by other researchers…” Auditability in this study is possible due to the extensive documentation and recording of all data, processes, analysis, decision trails and research supervisor meetings undertaken by the researcher. Lastly, “confirmability…when credibility, auditability and fittingness can be demonstrated…” and there is participant agreement that the conclusions from their data is appropriate and minimises researcher bias. Confirmability was achieved through colleague and research supervisor review alongside participant member checking.

Other methodological processes undertaken to diminish researcher bias in this study included firstly, the use of selected RLS\textsuperscript{1,2} and RTQ\textsuperscript{3} prompts as basis for interview questions when collecting qualitative data. This served to reduce the bias of the researcher by relating the qualitative data questioning structure to the quantitative data collection instruments. Secondly, the researcher engaged in regular debriefing and discussion with research supervisors providing a number of theoretical perspectives of data analysis and interpretation.\textsuperscript{159} Thirdly, independent coding and cross checking
between researcher and research supervisor in generating initial code phase provided a number of researcher and theoretical perspectives of data analysis and interpretation. Finally, cyclical, open, inductive and reflexive qualitative data analysis processes were used. This methodological approach served to place the data at the forefront of the analysis, rather than being influenced by preconceived biases of the researcher.

**Interview participant bias**

Another limitation in qualitative research can be participant bias. Students who consented to participate in the qualitative data collection phase via individual interviews may have presented with pre-existing positive or negative views of the use of reflection in learning and practice. Additionally, the student’s most recent learning experiences will be at the forefront of their mind when recounting examples during the interview process. These factors may have resulted in qualitative data bias. The researcher sought to minimise these issues by choosing participants who represented a spread of composite scores (based on questionnaires responses) and attempted to relate the interview questions to the whole course, not just the most recent experiences.

It is important to note that the interviewer was an academic staff member in the undergraduate physiotherapy courses from which the participants were accessed. This may have encouraged participants to answer in a way that was pleasing to the interviewer, further biasing the qualitative results. The interviewer sought to minimise this bias by removing themselves from teaching and assessment of the participants during the data collection phase of the study (as discussed in ethical considerations in Chapter Three).

There was also some disparity in some of the demographic statistics between the interview sample and the total sample. The mean age of the PC interview participants was lower than the mean age of the PC total cohort and the mean age of the C interview
participants was higher than that of the total C cohort. There was also a higher proportion of C interview students who had tertiary level prior education than in the total C cohort. Both of these discrepancies may have had some impact on the interview data being representative of the total sample.

Despite the above reported limitations, the methodological approaches were sound and well supported by theory and research practices of integrity befitting of Masters Research.

**Concluding statements**

This study has provided a valuable insight into how and why undergraduate students use reflection in the classroom and clinical learning environments. Although, from the quantitative results of the RLS\(^1\)\(^2\) and RTQ,\(^3\) self-reported cognitive and metacognitive levels of reflection were equally well developed between the PC and C cohorts, the qualitative results were able to reveal more depth and contrast between the cohorts. These results showed that PC students are exposed to fewer formal ‘concrete experiences’ with guided ‘reflective observation’\(^4\) that focus on the affective domain of learning. Also, while the main trigger to reflect for all students was for extrinsic reward, this motivation did not result in depth of reflective thinking. Intrinsic triggers such as professional competency, patient advocacy and altruism along with conflict and dissonance, which were experienced by the C level students, led to deeper levels of reflection. Therefore, this study recommends more emphasis on creating ‘concrete experiences’ that include affective domains and intrinsic triggers throughout the curriculum in order to develop greater depths of reflective thinking in preparation for clinical practice. Additionally, while C students were exposed to diverse and authentic ‘concrete experiences’ during clinical practice more could be done to foster and develop reflective thinking through socially inclusive, supported and guided reflective learning.
environments. This study also found that the timing of reflection for PC and C students was predominantly after the ‘concrete experience’ \((reflection-on-action)^7\) and recommends more development of anticipatory reflection\(^{124-126}\) \((reflection-in-preparation)\) as well as \(reflection-in-action\)^7 to adequately prepare students for future clinical practice.

The results recommend creating more time, space and guided ‘reflective observation’ and ‘abstract conceptualisation’ through well-constructed ‘concrete experiences’\(^4\) throughout the curriculum. This will ensure physiotherapy students are well prepared for the demands of clinical practice and meet the reflective thinking standards of practice for registration and fostering life-long learning. The results from this study provide a valuable contribution to the growing literature on reflective learning and practice in physiotherapy education and provide a launching point for future research.
REFERENCE LIST


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## APPENDICES

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**Appendix A: Reflection-in-Learning Scale – original version**

**Reflection-in-Learning Scale (original) (Sobral, 2000, 2001)**

Please answer the items below in relation to your learning experiences in the medical program. Draw a circle around the scale number closer to your usual behaviour.

To what extent have I: [1 = Never 7 = Always]

<table>
<thead>
<tr>
<th>Item</th>
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<tr>
<td>1. Carefully planned my learning tasks in the courses and training activities of the medical program.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>2. Talked with my colleagues about learning and methods of study</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>3. Reviewed previously studied subjects during each term</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>4. Integrated all topics in a course with each other and with those of other courses and training activities</td>
<td>1 2 3 4 5 6 7</td>
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<td>8. Pondered over the meaning of the things I was studying and learning in relation to my personal experience</td>
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<td>10. Systematically reflected about how I was studying and learning in different contexts and circumstances</td>
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<td>11. Mindfully summarized what I was learning day in, day out, in my studies</td>
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<td>12. Exerted my capacity to reflect during a learning experience</td>
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<td>13. Diligently removed negative feelings in relation to aims, objects, behaviours, topics or problems pertaining to my studies</td>
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</tr>
<tr>
<td>14. Constructively self-assessed my work as a learner</td>
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</table>


Appendix B: Reflection-in-Learning Scale – modified version

Reflection-in-Learning Scale (adapted from Sobral, 2000)

Draw a circle around the scale number closer to your usual behaviour.

Please respond to the statements below in relation to your approach to learning, practical experiences and study practices within this physiotherapy course

*To what extent have I:*

<table>
<thead>
<tr>
<th>Statement</th>
<th>1 = Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 = Always</th>
</tr>
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Appendix C: Reflective Thinking Questionnaire

Reflective Thinking Questionnaire (RTQ) (Kember, et al., 2000)

Please respond to the statements below in relation to your approach to learning, practical experiences and study practices within this physiotherapy course.

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<tr>
<th></th>
<th>A- definitely agree</th>
<th>B- agree with reservation</th>
<th>C- only to be used if a definite answer is not possible</th>
<th>D- disagree with reservation</th>
<th>E- definitely disagree</th>
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</thead>
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<tr>
<td>1.</td>
<td>When I am working on some activities, I can do them without thinking about what I am doing</td>
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<td>C</td>
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<td>2.</td>
<td>This course requires us to understand concepts taught by the lecturer</td>
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<td>B</td>
<td>C</td>
<td>D</td>
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<td>3.</td>
<td>I sometimes question the way others do something and try to think of a better way</td>
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<td>D</td>
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<td>5.</td>
<td>In this course we do things so many times that I started doing them without thinking about it</td>
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<td>6.</td>
<td>To pass this course you need to understand content</td>
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<td>7.</td>
<td>I like to think over what I have been doing and consider alternative ways of doing it</td>
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<td>As long as I can remember handout material for examinations, I do not have to think too much</td>
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<td>16.</td>
<td>During this course I discovered faults in what I had previously believed to be right</td>
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Appendix D: Interview questions

1. Can you provide me with some examples of how you may have used reflection within your studies?

2. Can you provide me with some examples of when you may have been aware of the purpose of what you were learning? (How it fitted in with being a physiotherapist) RLS/6
   How did that come about?

3. Can you provide me with examples of where you may have pondered over the meaning of things you have been studying and learning in relation to your own personal experiences? RLS/8

4. Can you provide me with some examples of how you may have reviewed previous subjects during the semester? RLS/3
   Why did you do that?
   Did it help you?
   How did it help you?

5. Can you provide me with examples of where you may have thought about what you have been doing within labs or lectures (or in clinical practice) and considered alternative ways of doing it? RTQ/7

6. Can you provide me with some examples of how you may have thought about your learning strategies or problem solving strategies to reflect on their level of effectiveness? RLS/10 RTQ/11
   Did you make any changes as a result?

7. There may be times where you have negative feelings about what you are learning, have you ever tried to remove these feelings? RLS/13
   How did you do that?
Was it effective?

8. Can you provide me with examples of where you may have reflected on your actions to see whether you could have improved on what you did? RTQ/11
Did you make any changes?

9. Can you provide me with examples of where you may have talked with your colleagues about learning and methods of study? RLS/2
Did you make any changes to what you were doing as a result?

10. Can you provide me with some examples of how you may have observed how other people are learning or acting and thought of how you might take on that strategy?
Or maybe think of a better way to do it? RTQ/3

11. Can you provide me with some examples of how you may have mentally processed what you already knew about the topics or practical skills you were learning? RLS/5
Why did you do that?
Did it help you?

12. Can you provide me with some examples of how you may have mentally processed what you need to know about topics or practical skills prior to or during your learning? RLS/5
Why did you do that?
Did it help you?

13. Can you provide me with an example of where you have considered how your own point of view on a problem may be different to another’s?
Did you make any changes to your thinking?

14. Can you provide me of examples of where this course may have challenged some of your firmly held ideas or the way you look at yourself? RTQ/4
15. Can you provide me of examples of where you have constructively self-assessed your work? RLS/14

Did that make any impact on what you did after that?

16. Can you think of any strategies that might encourage you to use reflection in your studies?
**Appendix E: Pilot documents – Reflection-in-Learning Scale (modified)**

**Reflection-in-Learning Scale (adapted from Sobral, 2000)**

Please answer the items below in relation to your learning experiences in the physiotherapy course.

Draw a circle around the scale number closer to your usual behaviour.

To what extent have I: \[1 = \text{Never} \neq \text{Always}\]

<table>
<thead>
<tr>
<th>Item</th>
<th>Scale</th>
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<td>Question</td>
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<tr>
<td>Overall comment</td>
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</table>

Many thanks for your contribution.

Meredith Willmott
## Appendix F: Pilot documents – Reflective Thinking Questionnaire

**Reflective Thinking Questionnaire (RTQ) (Kember, et al., 2000)**

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<tr>
<td></td>
<td>Definitely agree</td>
<td>Agree with reservation</td>
<td>Definite answer not possible</td>
<td>Disagree with reservation</td>
<td>Definitely Disagree</td>
</tr>
<tr>
<td>1.</td>
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Many thanks for your contribution.

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PARTICIPANT INFORMATION FORM

Project Title: Undergraduate physiotherapy students' use of reflection in learning and practice.
Principal Investigator: Diana Jonas-Dwyer Associate Professor in Medical Education, eLearning, UWA
Principal Investigator Phone: 6488 6895
Principal Investigator Email: diana.jonas-dwyer@uwa.edu.au
Masters Student Investigator (conducting interviews): Meredith Willmott

You are invited to participate in this research study that is being conducted as partial fulfilment of a Masters of Health Professional Education degree at The University of Western Australia. The purpose of this study is to explore how undergraduate physiotherapy students use reflection in their course.

You have been identified as a suitable participant due to you being an undergraduate physiotherapy student. Participation in this study is voluntary. If you are willing to consent to participate in this study, you will be asked to complete the following tasks:

Part A of the study will involve completion of two questionnaires to gather information about how you use reflection in your course. The first questionnaire is a modified form of the Reflection-in-Learning Scale (RLS) developed by DT Sobral (2000). It is a 14 item questionnaire. The second questionnaire is the Reflective Thinking Questionnaire (RTQ) developed by Kember et al. (2000). It is a 16 item questionnaire. Both questionnaires should take approximately 10-15 minutes to complete. You will also be required to complete some questions to supply information regarding your degree of study, previous education, age and gender. Should you wish to complete this survey in your own time a reply-paid envelope will be supplied.

A research assistant will be in charge of recruitment of participants as well as administration and coding of questionnaires so that all responses will remain confidential and anonymous. No individual responses nor the status of your consent to participate will be made available to teaching staff within your degree. All hard copy and electronic data will be secured to maintain confidentiality.

Part B of the study will involve a short interview to clarify and gather information on how you use reflection in your course and clinical practice. The interviews will be conducted by Meredith Willmott, Masters Student Investigator.

If you choose to participate in the interview, you will be asked to provide a contact number on the Participant Consent Form. You will also be required to participate in Part A of the study as a sample of the participants consenting to be interviewed will be chosen from questionnaire responses to gain a variety of perspectives on the use of reflection. The interviews may be conducted at a time convenient to you by telephone or in person and be audio-recorded for analysis purposes only. To
maintain confidentiality and anonymity, all audio-recordings will be coded, transcribed and destroyed.

It is possible that there may be no direct benefit to you from your participation in this study, however the knowledge gained from your participation may enhance understanding of the levels and use of reflection within your academic studies, clinical placements and personal life and potentially inform educational tools to help enhance reflection in future physiotherapy students.

Consent to Part A of the study may be made independent of consent to Part B of the study. You may choose to participate in only Part A of the study (questionnaires) and choose not to participate in Part B of the study (interviews).

You have the right to withdraw your consent to participate at any time during the research. You may withdraw at any time without reason and without prejudice. If you wish to withdraw your consent to participate, your record of participation will be destroyed, unless otherwise agreed. As a participant of this study there will be no impact on your undergraduate physiotherapy course.

It is hoped that your participation and responses will provide more in-depth knowledge of how pre-clinical and clinical undergraduate physiotherapy students are using reflection during their physiotherapy studies and inform further educational activities to enhance the use of reflection within your academic studies, clinical experiences and in your future professional life. Results and a summary of this study will be published via The University of Notre Dame School of Physiotherapy.

If you are willing to consent to participate in either Part A or Part A AND Part B of this study, please complete the attached consent form.

Approval to conduct this research has been provided by The University of Western Australia in accordance with its ethics review and approval procedures. Any person considering participation in this research project, or agreeing to participate, may raise any questions or issues with the researchers at any time.

In addition, any person not satisfied with the response of researchers may raise ethics issues or concerns, and may make any complaints about this research project by contacting the Human Research Ethics Office at The University of Western Australia on (08) 6488 3703 or by emailing to hreo-research@uwa.edu.au.

Approval to conduct this research has also been provided by The University of Notre Dame.

If participants have any complaint regarding the manner in which a research project is conducted, it should be directed to the Executive Officer of the Human Research Ethics Committee, Research Office, The University of Notre Dame Australia, PO Box 1225 Fremantle WA 6959, phone (08) 9433 0943, research@nd.edu.au.

All research participants are entitled to retain a copy of any Participant Information Form and/or Participant Consent Form relating to this research project.
PARTICIPANT CONSENT FORM

Project Title: Undergraduate physiotherapy students' use of reflection in learning and practice.
Principal Investigator: Diana Jonas-Dwyer Associate Professor in Medical Education, eLearning, UWA
Principal Investigator Phone: 6488 6895
Principal Investigator Email: diana.jonas-dwyer@uwa.edu.au
Masters Student Investigator (conducting interviews): Meredith Willmott

Thank you for volunteering to participate in this study exploring how undergraduate Physiotherapy students use reflection in their course.

I (full name)
(the participant) have read the information provided and any questions I have asked have been answered to my satisfaction. I agree to participate in this activity, realising that I may withdraw at any time without reason and without prejudice.

I understand that all identifiable (attributable) information that I provide is treated as strictly confidential and will not be released by the investigator in any form that may identify me. The only exception to this principle of confidentiality is if documents are required by law.

I have been advised as to what data is being collected, the purpose for collecting the data, and what will be done with the data upon completion of the research.

I agree that research data gathered for the study may be published provided my name or other identifying information is not used.

I understand that I may withdraw my consent to participate at any time without reason or prejudice and that my record of participation will be destroyed, unless otherwise agreed.

CONSENT TO PART A (Questionnaires)  

Signature of Participant  
Date

CONSENT TO PART B  
(To be contacted for Interview conducted by Meredith Willmott AND for the Interview to be audio-recorded)

Signature of Participant  
Date

Contact details for interview (mobile phone number preferred)
Approval to conduct this research has been provided by The University of Western Australia, in accordance with its ethics review and approval procedures. Any person considering participation in this research project, or agreeing to participate, may raise any questions or issues with the researchers at any time (see information sheet for contact details).

In addition, any person not satisfied with the response of researchers may raise ethics issues or concerns, and may make any complaints about this research project by contacting the Human Research Ethics Office at The University of Western Australia on (08) 6488 3703 or by emailing to hreo-research@uwa.edu.au.

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Appendix I: Questionnaire coversheet

QUESTIONNAIRE COVERSHEET

Project Title: Undergraduate physiotherapy students' use of reflection in learning and practice.
Principal Investigator: Diana Jonas-Dwyer Associate Professor in Medical Education, eLearning, UWA
Principal Investigator Phone: 6488 6895
Principal Investigator Email: diana.jonas-dwyer@uwa.edu.au
Masters Student Investigator: Meredith Willmott

PLEASE COMPLETE ALL THE FOLLOWING:
CURRENT DEGREE OF STUDY

BACHELOR OF PHYSIOTHERAPY

OR
BACHELOR OF PHYSIOTHERAPY/
BACHELOR OF EXERCISE AND SPORT SCIENCE
(DOUBLE DEGREE)

HIGHEST LEVEL OF EDUCATION ATTAINED

HIGH SCHOOL YEAR 12 (OR EQUIVALENT) ..............................................
DIploma .........................................................................................
BACHELOR DEGREE ...................................................................
MASTERS DEGREE ....................................................................... 
PhD .........................................................................................
PARTIAL COMPLETION OF ANY OF THE ABOVE ............................................
(Not including current physiotherapy degree) Please specify number of years and
type (not specific degree) eg. 2 years of Bachelor degree

AGE

PLEASE INDICATE HERE YOUR AGE IN YEARS

GENDER MALE ........... ☐ FEMALE .......... ☐
Appendix J: Interview preamble

The information that you provide today will be recorded and then transcribed verbatim (word for word). Once all the information that is required for the study is gathered, the recording will be destroyed so it won’t be able to be linked to you. In the recording you will only be referred to as your chosen pseudonym and participant number. All your responses will remain anonymous and confidential so no one else, aside from the researchers, will have access to them. Remember that you are able to withdraw your consent at any time.

Today I am going to ask you a number of questions to discover if and how you might be using reflection within the physiotherapy course. There are no right or wrong answers and some of the questions are quite specific so if you haven’t got any examples to share, that is perfectly acceptable.

So I will just place reflection for you. It is where you revisit and rethink an experience that you’ve had and possibly compare it to what you already know or to what you think should have happened. Sometimes there’s an uncomfortable feeling or sometimes there is a positive or affirming feeling. If you experience a problem then you might think, ‘What was I thinking? What were my thought processes or my problem solving processes at the time? What’s happening to the people who are around me? What might they be thinking?’ And sometimes if it’s a recurring issue you might actually think, ‘Why does this keep happening? Is it something about what I think about myself or how I want to portray myself that might be influencing how I’m conducting myself here?’ So essentially it’s just thinking about your experiences as a whole.

So remember, there are no right wrong answers and if you don’t have any examples to provide to me just let me know. So have you understood everything that I’ve said?
(pause for response) Do you have any questions? (pause for response) And are you happy to proceed? (pause for response)
Appendix K: Shapiro-Wilke tests for normality

### Cohort test group

<table>
<thead>
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<th>Scale</th>
<th>Pre-clinical</th>
<th>Clinical</th>
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<tr>
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<td>Shapiro Wilk</td>
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* p<0.05 indicates non-parametric distribution

### Gender test group

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* p<0.05 indicates non-parametric distribution

### Current Course test group

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* p<0.05 indicates non-parametric distribution

### Previous Education test group

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* p<0.05 indicates non-parametric distribution
Appendix L: Histograms of questionnaire data for test groups

COHORT
Cohorts: Reflection-in-Learning Scale

PRE-CLINICAL
Reflection-in-Learning Scale
Cohort Group: Pre-clinical

CLINICAL
Reflection-in-Learning Scale
Cohort Group: Clinical

Cohorts: Reflective Thinking Questionnaire ‘Habitual Action’

PRE-CLINICAL
Reflective Thinking Questionnaire HABITUAL ACTION
Cohort Group: Pre-clinical

CLINICAL
Reflective Thinking Questionnaire HABITUAL ACTION
Cohort Group: Clinical
Cohorts: Reflective Thinking Questionnaire ‘Understanding’

PRE-CLINICAL
Reflective Thinking Questionnaire UNDERSTANDING
Cohort Group: Pre-clinical

CLINICAL
Reflective Thinking Questionnaire UNDERSTANDING
Cohort Group: Clinical

Cohorts: Reflective Thinking Questionnaire ‘Reflection’

PRE-CLINICAL
Reflective Thinking Questionnaire REFLECTION
Cohort Group: Pre-clinical

CLINICAL
Reflective Thinking Questionnaire REFLECTION
Cohort Group: Clinical

Cohorts: Reflective Thinking Questionnaire ‘Critical Reflection’

PRE-CLINICAL
Reflective Thinking Questionnaire CRITICAL REFLECTION
Cohort Group: Pre-clinical

CLINICAL
Reflective Thinking Questionnaire CRITICAL REFLECTION
Cohort Group: Clinical
Gender: Reflection-in-Learning Scale

Gender: Reflective Thinking Questionnaire ‘Habitual Action’
Gender: Reflective Thinking Questionnaire ‘Understanding’

Gender: Reflective Thinking Questionnaire ‘Reflection’

Gender: Reflective Thinking Questionnaire ‘Critical Reflection’
CURRENT COURSE

Current Course: Reflection-in-Learning Scale

**BACHELOR OF PHYSIOTHERAPY**

![Reflection-in-Learning Scale](chart1.png)

**BACHELOR OF PHYSIOTHERAPY/BACHELOR OF EXERCISE AND SPORT SCIENCE**

![Reflection-in-Learning Scale](chart2.png)

Current Course: Reflective Thinking Questionnaire ‘Habitual Action’

**BACHELOR OF PHYSIOTHERAPY**

![Reflective Thinking Questionnaire HABITUAL ACTION](chart3.png)

**BACHELOR OF PHYSIOTHERAPY/BACHELOR OF EXERCISE AND SPORT SCIENCE**

![Reflective Thinking Questionnaire HABITUAL ACTION](chart4.png)
Current Course: Reflective Thinking Questionnaire ‘Understanding’

BACHELOR OF PHYSIOTHERAPY

Reflective Thinking Questionnaire UNDERSTANDING
Current Course: BPhysio

BACHELOR OF PHYSIOTHERAPY/BACHELOR OF EXERCISE AND SPORT SCIENCE

Reflective Thinking Questionnaire UNDERSTANDING
Current Course: BPhysio/BSSS Double degree

Current Course: Reflective Thinking Questionnaire ‘Reflection’

BACHELOR OF PHYSIOTHERAPY

Reflective Thinking Questionnaire REFLECTION
Current Course: BPhysio

BACHELOR OF PHYSIOTHERAPY/BACHELOR OF EXERCISE AND SPORT SCIENCE

Reflective Thinking Questionnaire REFLECTION
Current Course: BPhysio/BSSS Double degree

Current Course: Reflective Thinking Questionnaire ‘Critical Reflection’

BACHELOR OF PHYSIOTHERAPY

Reflective Thinking Questionnaire CRITICAL REFLECTION
Current Course: BPhysio

BACHELOR OF PHYSIOTHERAPY/BACHELOR OF EXERCISE AND SPORT SCIENCE

Reflective Thinking Questionnaire CRITICAL REFLECTION
Current Course: BPhysio/BSSS Double degree
PREVIOUS EDUCATION PRIOR TO ENROLMENT

Previous education: Reflection-in-Learning Scale

FINAL YEAR SECONDARY SCHOOL (OR EQUIVALENT)

<table>
<thead>
<tr>
<th>Reflection-in-Learning Scale</th>
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<tr>
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<tr>
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AT LEAST 1 YEAR TERTIARY LEVEL

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<th>Reflection-in-Learning Scale</th>
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Previous education: Reflective Thinking Questionnaire ‘Habitual Action’

FINAL YEAR SECONDARY SCHOOL (OR EQUIVALENT)

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AT LEAST 1 YEAR TERTIARY LEVEL

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</table>
Previous education: Reflective Thinking Questionnaire ‘Understanding’

FINAL YEAR SECONDARY SCHOOL (OR EQUIVALENT)

AT LEAST 1 YEAR TERTIARY LEVEL

Previous education: Reflective Thinking Questionnaire ‘Reflection’

FINAL YEAR SECONDARY SCHOOL (OR EQUIVALENT)

AT LEAST 1 YEAR TERTIARY LEVEL

Previous education: Reflective Thinking Questionnaire ‘Critical Reflection’

FINAL YEAR SECONDARY SCHOOL (OR EQUIVALENT)

AT LEAST 1 YEAR TERTIARY LEVEL