

**The teaching-learning nexus:  
supporting and preparing students for  
their role as medical radiation  
technologists**

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## ATTESTATION OF AUTHORSHIP

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I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

**Andrea Thompson .....**

**Date: .....**



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## ABSTRACT

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A curriculum comprising a significant academic and clinical component is designed to prepare medical radiation technology (MRT) students for their role as medical radiation technologists. Importantly, the academic and clinical components are integrated to achieve this goal, however, it can be demanding for the students who need to meet numerous educational requirements and expectations within a three-year period. It is essential, therefore, to develop a more holistic understanding of the educational experience for the students and to establish how their learning is supported so that teaching and learning processes can be fostered and improved.

This action research study was structured in two phases. *Phase One* uncovered something of the learning experiences of MRT students. *Phase Two* instigated a learning partnership initiative to improve support for learning for medical imaging students in the clinical setting. Two key developments, which emerged during the action research process, included the introduction of an online platform to augment the learning partnership and personal digital assistants (PDAs) for students to collect evidence of their clinical learning.

In order to understand the learning experiences of students, data were gathered in *Phase One* through focus groups with MRTs and students, observations of student/teacher encounters in the clinical and educational settings and interviews with MRT and clinical tutor participants. Data were generated in *Phase Two* by a series of collaborative action research meetings with students and MRT participants during the development of the learning partnership initiative. The collection of data and analyses were mutually intertwined and the participants' contribution played a key role in the production of knowledge.

A robust relationship between a student and their MRT partner, fostered the development of the student's confidence and competence, gave them a sense of belonging and encouraged them to explore and question aspects of practice to progress their learning. The relationship was not uni-directional as it also supported the enhancement of MRTs' practice. Within the teaching-learning

nexus, setting of goals, engagement in a cognitive apprenticeship, and the impact of technology were important dimensions identified for teaching and learning.

The findings of this thesis have revealed tensions for teaching and learning for MRTs, students and clinical tutors. Ineffective supervision and disparities in teaching between the groups involved in the facilitation of learning were key tensions identified. The disparities were mostly influenced by MRTs, students and clinical tutors prioritising types of knowledge differently.

The learning partnership initiative provided a new way to support teaching and learning in the clinical setting. However, the recommendations from the study suggest the need for curriculum revision that redefines knowledge for practice and assessment requirements. A key aim should be to enable MRTs, students and clinical tutors to have a similar understanding of the expectations and requirements for practice. MRTs need to be better supported in their teaching role to enable them to make a greater investment in students' learning. In addition, a redistribution of funding for clinical education needs to be considered to support the MRTs' central role in teaching medical imaging students.

# CHAPTER ONE: INTRODUCTION

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## Overview

This thesis is an action research study that began with a focus on the learning experience of student Medical Radiation Technologists (MRTs). An understanding of how students learn and are best supported in their learning is of particular importance in view of the continuous changes and advances in technology within radiology. Medical radiation technology still stands as an emerging profession and as such is constantly subject to ongoing change. It has been evolving since the discovery of x-rays in the late 1800s and developments in recent years have been accompanied by an increasing demand for medical imaging services and changes in the radiographer's role (as MRTs are referred to in the United Kingdom [UK]) (Brown, 2004). For example, radiographers in some areas within the UK, have increased involvement in gastrointestinal radiology, which was previously the domain of the radiologist (Nightingale & Hogg, 2003). Hence, the knowledge required, and approach to practice, also continues to evolve (Larsson, Lundberg, & Hillergård, 2009). New skills such as increased technical and information technology skills are now required in view of these developments (Brown, Green, Pitcher & Simm, 2000). In addition, individuals facilitating learning for medical imaging students in the education and clinical contexts need up-to-date knowledge of practice and educational processes to enhance students' learning experiences.

## Approaches of the Study and Research Questions

Action research, the approach that guided this study, involves a robust union of participation, action and research to "improve the participants' situation" (Greenwood & Levin, 2007, p. 3), with a goal of bringing about change or improvement (Cardno, 2003). Employing action research enabled the contributions of stakeholder participants (MRTs, lecturers, students and clinical tutors) to be a pivotal part of the research process as they carefully explored and reflected on the facilitation of learning for students. Each action research cycle in this two-phase study informed subsequent cycles. Hence, the nature of action research means that a study could not be 'mapped out' at the commencement of the research as each cycle and actions within cycles are determined by previous

cycles and actions. Most importantly, this approach strongly supported the opportunity for change and improvement in practice, that is, the improvement of learning and teaching for students and MRTs, respectively.

In this study, various actors were central to knowledge production with knowledge being produced in “the context of application”. Gibbons, Limoges, Nowotny, Schwartzman, Scott and Trow (1994, p.4), define this as Mode 2 knowledge production. Knowledge is produced with others and therefore the process acknowledges their interests. Mode 2 knowledge production is further characterised by reflexivity and flexibility, and is able to incorporate numerous views (Hessels & van Lente, 2008). With participants being central to the research process and knowledge production, action research provides an appropriate vehicle for the production of Mode 2 knowledge.

Conceptually, the aim of *Phase One* of this study was to understand MRT students’ experiences of learning and how they are negotiated and supported to shape their professional capacities. The primary research question that guided *Phase One* of the study was:

*How do MRT students’ learning experiences shape their professional capacities?*

Sub-questions in *Phase One* of the study were:

- *In what ways do students engage with their learning experiences in the clinical and academic settings?*
- *How are these experiences supported by other individuals?*
- *What knowledge is required for MRT practice?*

The second aim of the study was to develop, implement and evaluate an intervention to instigate change and to foster and improve the facilitation of quality learning experiences for medical imaging students. The concept for the intervention was established in response to the findings of *Phase One* of the study. The direction for the second phase of the study was unclear at its outset, which is characteristic of action research. That is, the initiative was yet to be developed by the participants. During the initial phase, in which a deeper understanding of

medical imaging students' experiences of learning was established, the main issues associated with both the academic and clinical settings were highlighted. The issues were concerned predominantly with support for students during clinical learning. It was therefore pertinent in *Phase Two* of the study, for the research participants to collaboratively design an initiative to support the development of formalised learning partnerships comprising MRTs and Year One MRT students. The research question that guided *Phase Two* of the study was:

*How has learning for students and teaching for MRTs changed following the introduction of a learning/teaching initiative?*

## **Background to the Study**

Medical imaging education is designed to enable student MRTs to develop skills, attitudes and competence to become legitimate members of the MRT profession. The medical imaging curriculum is frequently reviewed and updated to ensure relevancy and currency of learning outcomes, teaching and learning approaches, and assessment procedures. However, in addition to addressing the procedural aspects of a curriculum, it is imperative that students' experiences of learning are taken into account. Consideration must be given to the curriculum as 'experienced' (Barnett & Coate, 2005; Billett, 2006). Students' experiences of learning should be valued and considered in planning teaching approaches. There is currently little documented about MRT students' experiences of learning and how those experiences are supported. For this reason, an action research approach was adopted to address the two key research questions for this two-phase study.

Prior to the introduction of the undergraduate medical imaging degree in 1995, approval for accreditation was sought from the New Zealand Qualifications Authority (NZQA), a body responsible for the quality assurance of non-university tertiary organisations. The selection of content and learning experiences for the medical imaging programme was decided by stakeholders' advice. While useful and pertinent in many ways, this advice was unlikely to have been fully informed by considerations of epistemology, pedagogy and curriculum concerns. Different stakeholders, including those associated with the registration and professional bodies, lecturers aligned with the education provider and, to a lesser extent,

practitioners within the profession, continue to contribute to establishing the content, process and delivery of undergraduate programmes that prepare medical imaging professionals. These stakeholders also advise on the types of experiences that students 'need' to be exposed to in order to develop a level of competence required for the purpose of attaining both a qualification and registration to practice. Such a curriculum, which has been designed and subsequently modified by the 'experts', guides the education provider, staff and students. Nonetheless, how the learners engage in the experiences provided for them and how these experiences are supported in learning the practice of medical radiation technology is of particular concern. Although my master's thesis explored a dimension of learning for medical imaging students (the meaning of supervision for medical imaging students and their supervisors) (Thompson, 1999), a thorough examination of how the recipients of the Bachelor of Health Science (Medical Imaging) [BHSc (MI)] curriculum, engage with and experience their learning had not previously been conducted.

Hence, while the transition from diploma to degree education was welcomed in the mid-1990s, the current curriculum does not effectively take account of the students' experiences. As a part of the quality assurance procedures of the education provider that delivers the programme, students have opportunities to evaluate the courses in which they are enrolled. This is the only measure that currently enables students to inform lecturing staff and faculty management about their learning experiences, therefore providing a limited view of students' experiences.

Health professional education is designed to enable students to engage in quality learning experiences so that they can construct and acquire their professional capacities and become competent to practise as registered professionals. Practitioners and academic lecturers are in a prime position to shape students' learning. The types of interactions and activities students engage in, the students' interests and the relations between their interests and these activities will influence the knowledge they construct (Scribner, 1985; Billett, 2004). Therefore, beyond the provision of learning support in both clinical and academic settings,

there are important epistemological issues at play concerning the nature, scope, source and validity of knowledge required for effective practice.

Given the emerging and dynamic nature of the medical imaging discipline, it is important to establish a clear understanding of how the capacities for medical imaging professionals might best be developed in both educational and clinical settings. The key consideration within a curriculum for medical imaging students is to ensure that the intended knowledge to be acquired, including learning experiences and the teaching and learning approaches, is appropriate and relevant. It is essential to develop a more holistic understanding of the educational experience for the students and to establish how their learning is best supported so that teaching and learning processes can be fostered and improved. It is likely that enhancing teaching and learning practices will have implications for the profession as a whole. For example, if students' experiences of learning are more favourable, the probability of students exiting the programme before completion will decrease. In addition, those who teach and supervise students may experience greater job satisfaction if support is provided within their role as a teacher/supervisor.

## **Impetus for the Study**

The impetus for this research has been driven by two key influences. Firstly, key recommendations in the ways in which the learning experience for MRT students could be improved were identified in my Master's thesis (Thompson, 1999). Secondly, I have been an educator in medical imaging for more than twenty years and have frequently thought about the challenges MRT students confront and the quality of their learning experiences. An undergraduate degree that encompasses significant clinical and academic components places noticeable pressures on the students. For example, as academic and clinical assessment requirements increase during a semester, there is marked evidence of student stress. Students avoid class time and take sick leave during clinical time, possibly to enable them to meet assessment deadlines. In the academic setting, students appear to seek shortcuts for their study and become obsessed with ensuring they have the 'notes/handouts' relevant to the session. Further, they frequently question what they are likely to



be tested or examined on. Their behaviour suggests that when the pressure is on they employ a more surface approach to learning.

In the clinical learning setting, anecdotal evidence suggests that students also focus on assessment. They are eager to be involved in particular radiographic examinations that are associated with assessment requirements. When students' learning becomes compartmentalised to prepare for assessment, they are distracted from understanding and learning the broader role of becoming an MRT. There is no doubt that students focus on assessment with an aim to pass their degree papers. Students pay considerable fees; if they fail assessment it may mean they would need to repeat a year in the programme, with cost implications of both time and money. For those involved in the education of the students, there is also a cost of time. Therefore, the time allocated for clinical learning is valuable. For these reasons, it is imperative that students are offered quality learning experiences.

### **Conversations Prior to Embarking on the Study**

Due to the contextual nature of action research, I did not review other MI programmes with regard to documentation and clinical agreements due to the significant variation in how supervision and teaching in the clinical area is undertaken. However, it was critical that I engaged in activities prior to undertaking this study that increased my awareness of how support for clinical learning occurred in other programmes. Therefore, I networked with staff from other organisations offering radiation therapy and medical imaging programmes in New Zealand at various national meetings, attended conferences (New Zealand Institute of Medical Radiation Technologists, and Australasian Association of Educators in Medical Radiation Sciences) comprising educators primarily from New Zealand and Australian institutions. These meetings and conferences offered key opportunities to discuss and explore ways in which students were supported in the clinical setting. In addition, I currently work with medical imaging lecturers who have immigrated to New Zealand. They were previously based in universities offering medical imaging programmes in the United Kingdom. We have had the opportunity to engage in numerous discussions in relation to my study and they

have offered insights from the programmes with which they were previously associated.

### **Pre-understandings I Bring to the Study**

It is my intention that by explicating the pre-understandings I bring to the study, I will be encouraged to be open and listen beyond my understandings to explore the insights offered by participants. Further, this transparency will assist me in the process of reflexivity during my journey.

I commenced a three-year diploma in radiography in 1983. The programme was hospital-based and students were fortunate to be paid for the duration of the programme, including the time spent in the classroom. We were not required to pay fees and, therefore, there was no cost for education. Being paid by the Hospital Board meant that students were an integral part of the workforce. At the end of the first year of 'training', we were included in after-hours rosters.

The classroom teaching that took place for two days each week on the hospital site was mostly an enjoyable experience. The class size was small (about 23 students) and some robust friendships were formed. Examinations and tests were the predominant form of assessment. Final examinations were written for all providers of radiography education by a national body, the New Zealand Conjoint Board. Didactic teaching was the only approach to teaching that I remember and teaching methods characteristic of social learning were non-existent.

Within the clinical setting, students were assessed and tutored by registered MRTs who held the title of 'clinical tutor'. Clinical tutors nearly always had a dual role; a commitment to service provision and a teaching role. The priority for clinical tutors was the provision of radiography services, which meant teaching was secondary. In turn, for students, service provision was prioritised over learning. For example, if the department was busy, students were encouraged to perform the examinations that they 'could do' as busy times were not considered appropriate to learn new facets of practice. The majority of contact I had with my clinical tutors for the duration of the programme was for the purpose of assessment. Assessment mostly involved being observed performing radiographic examinations followed by a limited number of oral questions. The clinical tutor

would then complete an assessment form that consisted mostly of check boxes. Interestingly, the competency-based assessments (CBAs) that students are currently required to complete in the clinical setting are similar to the type of assessment I completed in the early 1980s. A key modification that has been made to CBA since I was a student is an extended oral component with an emphasis on problem-solving and decision-making.

Three years after I become a registered MRT, I joined the staff in the School of Radiography (hospital-based) as a part-time tutor. In 1991, I became charge tutor at the school, and, in the same year, the first year of the medical imaging programme was transferred to a local Polytechnic. In 1992, I was employed as a clinical and academic educator by the Polytechnic. Although I had various roles during the subsequent twenty years, my key role was clinical coordinator, responsible for practice-based learning for MRT education. As a part of the clinical coordinator's role, I tutored and assessed students at various clinical sites. Similar to other clinical tutors, I received no 'training' for the role. In 1992, I commenced some education papers at a local university; however, my knowledge of pedagogy was limited. I made numerous decisions about assessment and approaches to learning, based mostly on experience. In hindsight, although many of the decisions I made were appropriate, others were defective due to my lack of knowledge of pedagogy. In my current teaching, I frequently present the flawed decisions as examples about education theory and principles.

Medical imaging education has been a significant interest for me for all of my career. I enjoyed being a student and have fond memories of those years. However, although learning in the classroom setting seemed structured, my experiences of being a student in the practice setting were at times challenging, primarily because students were a part of the staff. MRTs had high (and often unrealistic) expectations of students. I remember being 'thrown in' to situations that I felt I did not have the experience or competence to manage. Learning in situations such as these was by trial and error. If the outcome was successful, I felt elated and conversely, if the outcome was unsuccessful, I experienced a feeling of incompetence. The details of some of these favourable and negative events are still very clear for me. In addition, I remember that the amount of feedback given to

students in the practice setting was very limited. As a novice student, this was problematic as I had little idea of how I was progressing. Although, it was three decades ago, my experience of being a student influences my interest in education. I am keen for students to have the best educational experience possible, with robust support for their learning. Their experiences may well impact on their future role as an MRT and as a teacher/supervisor in the practice setting.

My personal epistemology in relation to medical imaging has changed during my continuum of professional development and has been influenced by two fundamental transitions. First, in my role as an educator, I have taught as part of diploma, undergraduate and postgraduate degree programmes in medical imaging. I contributed to the development of the BHSc (MI) in 1994. Within the rationale and philosophy for the undergraduate degree, it was purported that the knowledge and skills needed for degree education differ in both type and breadth of knowledge compared with the previous diploma programme, which focussed on scientific knowledge. In addition to science-based knowledge, the BHSc (MI) includes various courses that focus on the humanities and professional practice. Second, my personal epistemology has been influenced by postgraduate study that I commenced in 1996. I was exposed to new areas of knowledge and was encouraged to develop critical thinking, problem solving and analytical and research skills, for example. Therefore, my personal epistemology has been expanded in response to being an educator and a student.

I am not confident that the current programme structure for medical imaging that I am familiar with is conducive in supporting quality learning. The duration of a three-year degree programme seems insufficient for students to achieve a depth of learning that fosters deeper thinking and understanding of aspects of medical imaging practice. The significant clinical learning time means that students are consistently occupied, either in the classroom or in the clinical practice setting. They have limited time for reflection and opportunities to 'be students'. It would be unlikely that students have time to engage in the extracurricular activities available in the educational setting. The time-pressured nature of the programme means that the students seek to find 'shortcuts' to enable them to meet their academic and clinical requirements. For these reasons, it seems the structure of

the programme does not promote the type of deep and reflective learning claimed by the authors of the degree document (Yielder & Yielder, 1994). Further, although most tertiary level students are likely to experience pressures in their study, I wonder if the pressures created by the structure of the medical imaging programme could result in negative and unfulfilling experiences for students.

I anticipate that by identifying the pre-understandings I bring to the study, I will be much clearer about how my values, assumptions, biases and views may influence the research. During this journey I have returned to my pre-understandings regularly to keep me 'on track' and to consider how they may have influenced my interpretations and critique.

## **Context**

Medical imaging plays a central role in the diagnoses for many patients referred by medical staff to radiology imaging facilities. Patients may require images acquired with computed or direct radiography (systems that have replaced the previous conventional modalities which produced hard-copy x-ray films) and/or other specialised imaging modalities including, computed tomography (CT scanning), magnetic resonance imaging (MRI), nuclear medicine (NM), mammography and ultrasound (US). These specialised modalities utilise sophisticated processes to produce detailed two-, three- or four-dimensional images to assist in diagnosis of disease and injury. Although students are introduced to specialised modalities in the undergraduate programme, postgraduate qualifications are required to practise in most speciality areas within medical imaging. The completion of a three-year undergraduate degree enables students to demonstrate the capacities required to practise as MRTs in computed and direct radiography imaging areas.

Hence, the primary role of a MRT is in the contribution to diagnosis by means of producing images using sophisticated equipment. Medical imaging practice is frequently complex due to the diversity of patient type and their level of injury and/or disease. For example, MRTs who are rostered to work during an evening shift may be involved in the imaging of patients in the operating theatre undergoing urgent surgery, patients within an intensive care department who are carefully monitored during their stay, and those who have recently presented to

the hospital as the result of injury or illness. Therefore, within the clinical setting, medical imaging students are learning in an environment which is somewhat unpredictable and could be potentially confusing for students. Students learn that they need to form relationships with patients to enable them to engage in learning opportunities and to ensure quality patient experiences. In addition, the relationships students form with MRTs and clinical tutors are vital to facilitate their learning as they develop the capacities of a professional MRT.

Students engage in a combination of academic and clinical experiences to learn their professional practice. The principal aim of the undergraduate degree programme is to develop a practitioner who is capable of a type of thinking that enables the solving of ill-defined problems to manage the complex nature of practice, particularly in view of the advances in technology (Yielder & Yielder, 1994). Similar to medical education, medical imaging education is likely to extend beyond the development of knowledge, skills and attributes as students develop a professional identity (Mann, 2011). It is anticipated that practitioners and teachers endeavour to assist students to construct and acquire knowledge by promoting conceptual understanding, critical thinking and to foster the links between theory and practice.

### **Rationale and Significance of the Study**

Teaching of medical imaging students is undertaken by lecturers in the academic setting and by clinical tutors and registered MRTs in the clinical setting. Clinical tutors have no additional preparation to perform their role and mostly learn from each other. There is a marked reliance on the contribution of registered MRTs as clinically-based teachers, as the student:clinical tutor ratio is approximately 6:1. In addition, a considerable proportion of a clinical tutor's time is dedicated to assessment. Although the involvement of MRTs is central to students' clinical learning, in most instances they are not given the support or guidance to enable them to effectively fulfil their role (Thompson, 1999). They are therefore required to take on a role with a limited understanding of teaching and learning. Baird (1996) argued that it is crucial that the university prepares clinical radiographers (as MRTs are referred to in Australia) to enable them to teach and supervise students.

In the absence of support to facilitate teaching, it is probable that experienced MRTs teach in the way they were taught. If workplace practices are underpinned by history and traditions of the workplace (Billett, 2002), then MRTs' approach to teaching may be based on their prior experiences. If MRTs' teaching does not reflect contemporary educational approaches, such as student-centred learning with an emphasis on reflection and problem-solving, it is possible that the support provided for students' learning will not encourage deeper learning and understanding.

The rationale for the BHSc (MI) postulated that degree level rather than diploma level education was required to address the advances in technology and to foster research and development of professionals within a changing healthcare environment (Yielder & Yielder, 1994). At the time that the transition from diploma to degree education occurred, I observed that although changes to teaching and learning approaches were suggested in the BHSc (MI) degree document (for example, assessment strategies that encouraged self-assessment and reflection), they appeared to occur in the education setting but not in the clinical learning setting. MRTs were not advised or guided about the expectations for teaching and learning within the newly-introduced degree programme. Therefore, it is likely that the status quo was unchanged for MRTs' facilitation of students' learning in clinical settings, following the introduction of a degree programme.

A limited understanding of students' learning experiences and inadequate preparation of MRTs who teach the students in the clinical setting must have an impact on learning experiences for students. The aim of this thesis is to develop an enhanced understanding of the educational experiences for the students and establish how their learning is supported. In turn, this will enable teaching and learning processes to be fostered and improved. A key recommendation from the research for my master's thesis (Thompson, 1999) was to conduct a study using a different methodology, such as action research, to effect change by introducing an intervention for students and their clinical supervisors. This study fulfils that recommendation.

## **Structure of the Thesis**

Chapter One introduces the thesis, providing background as to the nature of MRT practice and the challenges of preparing students for workplace practice, then argues for an action research approach.

Chapter Two gives an explanation of educational theory to provide different perspectives on the nature of learning experiences for MRT students. Educational theory has provided a means to understand the epistemology of teaching and learning in practice.

Chapter Three underpins the development of an initiative to support the facilitation of learning in *Phase Two* of the study. In particular, it highlights aspects associated with learning in the clinical setting. The key features are explained of frameworks for supporting learning, including clinical supervision and mentoring relationships. This is followed by an exploration of other important dimensions associated with learning for medical imaging students: engaging with the curriculum, the hidden curriculum and technology.

Chapter Four discusses the methodology for the study. It encompasses an explanation of ontological and epistemological assumptions, and the history and perspectives of action research. It goes on to reflect on the nature of the insights that emerged from the data, resulting in engagement with the critical paradigm, in particular, the work of Bourdieu (Bourdieu, 1984, 1985, 1990). To a lesser extent, Dewey's (1938, 1922) work has been integrated to guide the exploration of the principal theme of education, which transpired from the data. Hence, the latter part of this chapter lays the philosophical/theoretical foundation for the analysis that follows in Chapters Six and Eight.

Chapter Five explains the methods used in this study, including the action research process, ethical considerations, selection of participants, methods of data collection, approach to data analysis and measures included to establish rigour in the study.



Chapter Six explores the actions and key findings in *Phase One* of the study. The first two stages (*look-think*) of Stringers' (2007) three-stage (*look-think-act*) action research cycle are presented in this chapter. This is followed by an analysis of the data collected in relation to an exploration of the students' experiences of learning.

Chapter Seven explores the actions in *Phase Two* of the study. The final stage (*act* stage) of the first action research cycle and all three stages (*act-look-think*) of the two remaining cycles are explained in this chapter. Details are provided for the development of the actions, the formation of a learning partnership, and the development and implementation of an online platform and an e-portfolio.

Chapter Eight comprises an analysis of the data for *Phase Two*. Key themes identified by the participants during cycles of action research, many of which are of a critical nature, have been examined in this chapter.

Chapter Nine examines a key critical theme of knowledge for practice that emerged during both phases of the study. Knowledge has been examined in relation to the value, priorities and tensions for the various groups that play a part in medical imaging students' learning.

The initial part of Chapter Ten revisits the research aims and questions for the study and discusses actions to improve practice, implications and recommendations for practice, sustainability of the research outcomes, reflections on being a change agent, and considerations for providers of medical imaging education. The latter part of the chapter details recommendations for further research, originality and research contributions, value of action research, the limitations of the study, and a concluding statement.

**Please Note:** A CD has been inserted into the back cover of this document which contains 'Evidence of Actions' for the initiative that was developed in *Phase Two* of this action research study. Reference has been made to the CD within Chapter Seven.

## CHAPTER TWO: THEORETICAL FOUNDATIONS FOR LEARNING FOR PRACTICE

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### Introduction

Theory underpinning teaching educational practice in health professional education is often not explicit (Craddock, O'Halloran, McPherson, Hean & Hammick, 2013; Patton, Higgs & Smith, 2012). For many years, medical radiation technologists, and to a lesser extent lecturers associated with the medical imaging programme, have been teaching students without necessarily being able to articulate any specific theory that underpins their practice. In the absence of theory, practice is therefore fundamentally guided by *techne* (practical know-how) and *phronesis* (practical wisdom) used to make judgements in practice encounters (Polkinghorne, 2004; Smythe, MacCulloch, Charmley, 2009). Practice is enacted in *poiesis* (producing, making) and *praxis* (acting, doing good). Aristotle identified the third kind of knowledge as *theoria* (Polkinghorne, 2004), seeing such knowledge as that which arises from contemplation to inform the unchanging principles that shape understanding. Thus, educational theory has been reviewed to provide insights for contemplation on the nature of the learning experience for MRT students. Nevertheless, the nature of this action research study is to then re-focus on the “practical reasoning used to produce practical knowledge about carrying out activity in the realm of the changing [world of MRT practice]” (Polkinghorne, 2004, p.114).

### Retrieval of Literature

Databases for health sciences, medicine and education, including Academic Search Complete, CINAHL, Medline, Health Source: Nursing Academic Ed., PubMed and SCOPUS were accessed to retrieve literature. Keywords that were used to search included clinical supervision, mentoring, learning partnerships, radiography education, clinical education, learning theory and social learning theory. The literature search was further expanded using electronic search engines (for example, Google Scholar).

## **The Nature and Significance of Theory**

The theories explored in this chapter reflect the social nature of learning for MRT students. Medical imaging students learn within two contexts: the academic and clinical settings. A focus on social learning theories is appropriate, as learning in these different contexts involves numerous interactions with others and is therefore social. Within the classroom setting, in addition to lectures, students engage in interactive learning in laboratories and small groups, for example. In the clinical setting, students learn within a community involving interactions predominantly with MRTs, but also includes doctors, nurses and administration staff. It is argued in this chapter that, although it not anticipated that educational theory will suffice to provide an understanding of educational practice in this study, there are dimensions of social learning theory that support the development of a partnership for learning between a novice and a more experienced practitioner. Therefore, social cognitive theory, a socio-cultural perspective, situated learning theory and cognitive apprenticeship will be reviewed. It is acknowledged that there are some commonalities between the theories, for example, the social and contextual nature of learning. However, to highlight the central tenets of each theory, they will be explored separately.

Although theory contributes to decisions made about curricula (Mann, 2011), medical education is influenced by “tradition, ritual, culture and history...” (Hodges & Kuper, 2012, p. 25). In relation to medical imaging, I share Hodge’s and Kuper’s (2012) view. From my experience of being involved in medical imaging education for over twenty years, decisions about curricula have been mostly based on history, tradition and culture. The significance of the value of theory to support curriculum development has not been explicitly advocated by educators in the medical imaging programme I am associated with. In addition to reviewing various theories that correlate with learning for medical imaging students, related research has been reviewed to ascertain how it aligns with theoretical models. However, the literature related to learning theories in medical imaging is sparse, therefore, it has been necessary to draw on literature from other health disciplines.

## Theories of Learning

Theories of learning provide a means to understand how medical imaging students may think, act and learn so that teaching and learning approaches can be considered in curriculum design. Theories can guide educators to expose problems and to question current practice (Hodges & Kuper, 2012). For educators, theories can be seen as having the potential to enable establishment of what approaches and strategies that might be most effective for particular situations. Knowles (1990, p. 2) provides a succinct explanation about the contribution and value of learning theories:

*A good theory should provide explanations of phenomena as well as guidelines for action. But theories about human behaviour also carry with them assumptions about human nature, the purpose of education, and desirable values. The better you understand the various theories, therefore, the better decisions you will be able to make regarding learning experiences that will achieve the ends that you wish to receive.*

Knowles (1990) argues that an appreciation of theory will better inform educators' decisions related to learning. However, decisions made about learning should not be based solely on theory. This study explores the experiences of learning for medical imaging students, offering another way in which learning can be understood.

A marked number of learning theories have been developed. In addition to the social learning perspectives being discussed in this chapter, it is important to mention the behaviouralist, humanist and cognitive perspectives, as they have provided the foundation for subsequent theories of learning. The behaviouralist approach, which developed in the early part of the twentieth century, emphasized observable processes of environmental stimuli and behavioural responses. The notion of operant conditioning developed by B. F. Skinner identified that if behaviour was positively reinforced, a response was more likely to occur (Merriam, Caffarella & Baumgartner, 2012). There are aspects of behaviourism that align with learning for medical imaging students. It is likely students engage in desired behaviours and perform skills to achieve goals and standards or competencies for practice. Hence, a behaviourist approach is apparent in the development of skills and checking competencies have been achieved. Further,

giving feedback (a key influence in learning) originates from behaviourism (Hattie & Timperley, 2007).

The humanistic approach focuses on the human potential for growth. This orientation suggests that human behaviour is the result of choice. Humans are free to act as they endeavour to better themselves. A humanistic approach focuses on the individual and presupposes that he/she will take responsibility for their learning. Abraham Maslow (1970) and Carl Rogers (1983) were humanistic psychologists who promoted striving toward human growth and potential. From a humanistic perspective, teachers are seen to be facilitators of learning (Merriam et al., 2012). The development of autonomy and self-directed learning are important dimensions of a humanistic orientation (Mann, 2004) and a key intention for health professional education is to encourage the self-direction and autonomy that enables individuals to become competent individuals.

It cannot be assumed that self-direction will occur. Norman (1999) critiques Knowles' (1973) adult learning assumptions and argues that self-direction is not necessarily a valuable and productive approach for learning. He points out that for individuals to be self-directed in their learning, they need effective self-assessment skills to highlight their weaknesses, which can be difficult for learners to acquire. A difficulty with self-assessment is that it is a skill that when developed is not necessarily established, but rather it varies "by content, context and perspective" (Eva & Regeher, 2005, p. S52). However, an intent of higher education is to develop learners' judgment ability (Boud & Falchikov, 2007), which improved over time in Boud, Lawson and Thompson's (2013) study using a web-based marking system. The authors emphasised the necessity of criteria and standards to facilitate development of judgment ability.

Theorists with a cognitive orientation were dissatisfied with a behaviourist approach, suggesting that it was "too particularistic, too concerned with single events and actions, and too dependent on overt behaviour to explain learning" (Merriam, et al., 2012, p. 284). Central components of a cognitive orientation include thinking, perception, insight, acknowledging the organisation and processing of information and prior knowledge of the learner (Merriam, et al.,

2012). Hence, from a cognitive view, internal mental processes are controlled by the learner to encourage understanding and meaningful learning (Merriam, et al., 2012). The challenge for educators is to include approaches to learning that enable students to build on prior knowledge, organise their knowledge and promote thinking, and foster deeper learning.

Social theories of learning that provide a way of understanding aspects of learning for medical imaging students encompass dimensions of behavioural and cognitive theory (Mann, 2004). The influence of authors such as Bandura (1986; 1977), Collins, Brown and Newman (1989), Lave and Wenger (1991) and Vygotsky (1978), who assert that social interaction is central to the process of learning will be discussed, as an important focus of this study is to understand how students engage with, and negotiate experiences to learn in, the environments in which they are located. The key concepts of the learning theories explored and their relationship to learning for medical imaging students are presented in Table 1.

### **Social Cognitive Theory**

Social cognitive theory, which draws attention to the influence of the interaction of others on the cognitive and affective development of learners (Kim & Baylor, 2006), offers a means of understanding contextual aspects of learning for medical imaging students. Interactions with others, including peers, MRTs, doctors, nurses and administration staff, and the environment are central to Bandura's (1986) social cognitive theory. Bandura (1986, p. 18) posits:

*In the social cognitive view, people are neither driven by inner forces nor automatically shaped and controlled by external stimuli. Rather human functioning is explained in terms of a model of triadic reciprocity in which behavior, cognitive and other personal factors, and environmental events all interact as interacting determinants of each other.*

Within social cognitive theory, Bandura (1986) discusses capabilities to include those that are: symbolizing, forethought, vicarious, self-regulatory and self-reflective. The symbolising capability involves using symbols to enable medical imaging students to alter and adapt to their environment. Through symbols, individuals store experiences in representational forms and give meaning to experiences which orchestrate future behaviour (Bandura, 1986).

The forethought capability refers to people using forethought to regulate their behaviour. That is, forethought involves anticipating consequences of one's actions and setting goals. Forethought is linked to symbolic activity as individuals can have representations of desirable outcomes, which are further linked to motivation (Bandura, 1986). With assessment requirements being pivotal in an MRT student's progression, he/she may anticipate (forethought) the consequences of their actions of successfully performing a competency-based clinical assessment in representational form.

Vicarious processes are likely to be central to learning for medical imaging students through their observation of others. It is expected that observation will be more prominent for novice students with limited experience and competence. Students will observe both the skills and behaviour of their role models and will view how MRTs within the clinical setting interact with patients and others, together with the consequences of these interactions. Learning by observation and modelling have been emphasised by Bandura (1977, p. 22) who states:

*Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them of what to do. Fortunately, most human behavior is learned observationally through modeling; from observing others one forms an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action.*

Hence, the notion of modelling is also important for Bandura who argues "even when it is possible to establish new behaviors through other means, the process of acquisition can be considerably shortened through modeling" (Bandura, 1977, p. 13). It was premised by Bandura (Gibson, 2004) that individuals can learn through observation without imitation. Observation is important to reduce the likelihood of mistakes and a greater amount of observation during the process of learning is needed when students are being exposed to potentially hazardous or risky situations (Bandura, 1977). A potential key hazard in medical imaging practice is the use of radiation; therefore, students observe the approaches MRTs utilise in their practice to ensure the safe use of radiation.

Indeed, since modelling of a competent practitioner's behaviour is a significant facet of learning for medical imaging students, being placed in a partnership for

learning with a competent MRT could be advantageous for a student's learning progression. Observational experiences will be influenced by the observer's characteristics, aspects of the modelled activities and the dimensions of human interactions (Bandura, 1977). Hence, the relationship formed between the learner and the individual modelling the behaviour is important and Bandura (1977) asserts models that exhibit attractive qualities are pursued compared with those who display disengaging characteristics. Learners seek out models who are professional, competent and concerned about a student's learning (Gstøl & Skøien, 2011; Kim & Baylor, 2006). Further, individuals display behaviour similar to those who have high standards as people are rewarded for adhering to high standards (Bandura, 1977).

Role modelling is an important dimension for learning for health professional students. Bleakley (2002) creatively describes the influence of role modelling in relation to medical students suggesting that "junior doctors do not simply learn *from* consultants, but learn to be *like* the consultants they admire and respect" (p. 12). For radiation therapy students, positive role-modelling enabled students to cultivate their beliefs and practices for quality healthcare (Belinsky & Tataronis, 2007). Diagnostic radiography students in Conway, Lewis, and Robinson's study (2008) were attracted to radiographers who were enthusiastic about sharing their clinical experiences with them, were good communicators and who were aligned with the level of the student's learning. In addition, it was revealed that role modelling was central for the teaching of craft knowledge in a study of nurses who had been identified as exemplary role models (Perry, 2009). Nursing students at all stages of the nursing programme in Donaldson and Carter's (2005) research identified that their development of confidence and competence was inhibited by limited supervised practice; however, supervision by an effective role model appeared to enhance competence and confidence. Eraut (2007) points out a triangular relationship exists between challenge, support and confidence for learners. Support and feedback "are critically important for learning, retention and commitment" (Eraut, 2007, p. 420). During the process of learning for medical imaging students, support and an appropriate degree of challenge offered by effective role models are likely to develop a student's confidence. Without support, the student's development might be impeded.



However, the consequences of role modelling are not always positive. The findings of Swain, Pufahal and Williamson's (2003) study suggest that due to nursing students' powerlessness, they are likely to conform and therefore not always use recommended techniques in practice because of the influence of the people they are working with. Some students in Swain et al.'s (2003) study exhibited behaviour that was not considered best practice because they accepted and followed the practice of the nurses they worked with. Hence, practitioners whom students are learning alongside may not necessarily be 'good' role models, who model best practice. Although learners are attracted to competent role models who display attractive characteristics and high standards (Bandura, 1977; Kim & Baylor, 2006; Perry, 2009) they may not be able to select whom they learn alongside. In addition, it may be difficult initially for novice students to be able to ascertain the 'best' role models within the learning context.

The self-regulation capability is a further facet of social cognitive theory allowing individuals to have some control over their own behaviour as they can monitor and evaluate it against a standard, for example, an MRT's practice (Bandura, 1986; Mann, 2004). Students can examine their experiences in view of a further capability described by Bandura: the self-reflective capability. This capability enables students to enhance their understanding and to evaluate and change their thinking (Bandura, 1986). The self-regulative and self-reflective processes are likely to encourage goal setting for students. If self-regulative and self-reflective processes have the potential to enhance understanding and thinking together with the promotion of goal setting, they are important facets to consider by those facilitating students' learning. Educators could include strategies to foster self-regulation and self-reflection. For example, a form of partnership between a novice student and an experienced practitioner would enable the student to monitor his/her performance against the practitioner's performance. In addition, within the partnership, the educator could foster the student's reflective capabilities.

Self-efficacy, another central concept for Bandura's (1986) social cognitive theory, is enhanced by confidence and is therefore central to developing competence for medical imaging students. Self-efficacy is important for learning as it is associated

with an individual's confidence to achieve a desired behaviour and will be increased in relation to meeting a desired outcome. Self-efficacy is fostered by feedback and affects future performances. Feedback enables goals to be set (Eva & Regehr, 2005; Mann, 2011; Pelaccia, Delplancq, Tribby, Bartier, Leman, & Dupeyron, 2009). In Bradbury-Jones, Irvine and Sambrook's (2010) study, which explored the notion of empowerment, nursing students identified that their confidence was enhanced when they achieved their expectations. A study of general practice medical vocational training (Dory, Beaulieu, Pestiaux, Pouchain, Gay, Rocher & Boucher, 2009) demonstrated that individuals had low self-efficacy beliefs at the start of training due to lack of experience and competence.

Self-efficacy beliefs influence an individual's performance and will be enhanced by success (Eva & Regehr, 2005). Medical imaging students who overrate their capability may involve themselves in examinations they believe they can execute with limited supervision, resulting in failure. Eva and Regehr (2005) point out it can be problematic if individuals continually overrate their ability. Nonetheless, a balance needs to be obtained to enable individuals to believe they can progress in their learning in relation to previous accomplishments. On the other hand, students who underrate their capacity will also be affected as they may limit the examinations they involve themselves in and miss learning opportunities. A more robust self-efficacy will mean that students will persevere for longer in difficult and adverse situations (Bandura, 1986). Students are likely to develop a stronger sense of self-efficacy when they are in partnership with those who guide them (for example, MRTs and lecturers), as learners' self-efficacy increases when interacting with peers (Kim & Baylor, 2006). The development of self-efficacy is enhanced by gaining experience and learning with others.

Social cognitive theory aligns well with the development of an initiative to support learning and teaching for students and MRTs, respectively. If students are partnered with an experienced professional, they will have the opportunity to observe their partner's practice and learn alongside them. It is probable that the relationship will enhance a student's self-regulatory (monitor and evaluate their actions), self-reflective (explore their experiences for deeper understanding) and self-efficacy (increase in confidence when achieving outcomes) capabilities by

being in a supportive, structured learning arrangement with an MRT. The development of the dimensions of Bandura's (1986) social cognitive theory may also be pertinent for MRTs. When a student observes an MRT's practice, he/she may challenge and question the MRT, encouraging the MRT to evaluate (self-regulatory capability) and reflect (self-reflective capability) on their practice. An MRT's self-efficacy may be enhanced by developing confidence in their role as a teacher/supervisor/guide in the relationship.

## **A Sociocultural Perspective**

### ***Impact of the Context***

Learning and teaching are complex processes for medical imaging students and their teachers (MRTs), respectively. Sociocultural theories provide a lens to explore how knowledge is co-constructed through social and individual processes. Within supervisory relationships, sociocultural theories provide a way of understanding "the complex interactions associated with supervising and learning professional craft knowledge" (Spouse, 2001, p. 515). Understanding the complexities of the context will help to make sense of how contextual dimensions can influence learning. Rogoff (1990) highlights that although there have been marked advances in understanding cognitive development, limited attention has been given to context. Context is far more than the physical location in which an activity such as learning takes place; rather, it is a container in which the learner is dropped (Lave & Wenger, 1991). In addition to physical location, some of the numerous other elements that constitute the context are history, culture and prior knowledge of the learners, teachers and the learning institution, gender, roles and responsibilities of those who interact, and the curriculum. Interactions with various dimensions of the context assist learners to make meaning as they learn (Alfred, 2002).

The significance of socially-constructed settings has been emphasised by Eraut (2004a) who argues that the environmental and cultural artefacts influence learning and the development of cultural knowledge. In a radiology setting, cultural knowledge has been constructed over time, most likely by individuals and groups. Registered MRTs hold cultural knowledge that students are yet to possess. Eraut and Hirsh (2007) differentiate between codified cultural knowledge which

has been published and non-codified cultural knowledge, which is 'contained' within an organisation. The authors maintain non-codified cultural knowledge is acquired through social interaction in the workplace and is frequently taken-for-granted (Eraut & Hirsh, 2007). On account of the contextual nature of non-codified knowledge 'contained' within a clinical setting, it would be difficult to acquire this type of knowledge in the classroom. Rather, students will obtain it by engaging in dialogue and activities in their interactions with others in clinical practice settings.

The context, including the social interactions between learners and others, is fundamental to learning; nonetheless, consideration of the individual within the social context must also be acknowledged as an individual's personal life history contributes to what he/she brings to a learning situation (Billett, 2002). Dewey (1938) argues that educators need to consider learners as individuals to try to understand their experiences of learning. If the guide/teacher is in a learning partnership, the student will enable the guide/teacher to understand what the learner brings to a situation. Billett (2005) highlights the significance of the interdependency between the social and individual agencies to foster learning and emphasises that neither one of these agencies is solely sufficient to enhance learning. Billett's theory of workplace learning, which has been developed over a number of years, highlights the complexity of learning in the workplace and involves a relationship of ongoing negotiation between the workplace and the learner. To understand how medical imaging students engage with their learning experiences and how these experiences are supported by others, attention needs to be given to both the individual's contributions to the learning situation and the social experience.

From a sociocultural perspective, if learning occurs through interaction, negotiation and collaboration, then formalised support provided by an effective MRT partner may assist with the learner's cognitive development. Within a student/MRT partnership, a sociocultural tradition would argue that the MRT in partnership would be able to draw the student's attention to the norms, discourse and tools within a medical imaging context. Cognitive activity is social in that people are usually directed by social norms, set goals with others and undertake the necessary actions to achieve their goals (Rogoff & Lave, 1984).

The experiences available to learners are formed by the offerings of the workplace (Billett, 2005) and working patterns are a key influence on the learning opportunities within the setting (Eraut, 2006). Medical imaging students are at a designated placement for the duration of the programme. However, the contributions and potential experience offered by a placement will determine if a student will be required to spend time at additional placements to gain the necessary experience to practice as a competent professional. Although the goals are likely to be similar across clinical sites, how they are achieved will be influenced by the tools (for example, equipment), individuals assisting students to solve problems and an institution's (clinical site) protocols and/or policies. Whether students learn in different areas within the same clinical site or different clinical sites, their learning will be affected by the context, including the social interactions with others.

Activities that shape individuals' learning in clinical workplace settings are distinct from other environments such as educational settings (Billett, 2002; Gstøl, & Skøien, 2011). Egan and Jaye (2009) point out that medical students are exposed to different types of "learning opportunities, different learning processes, and different outcomes" (p.109) in educational and clinical settings. Students in educational settings are involved in lectures and simulations, for example, while they are involved in activities primarily associated with patient care in the clinical setting. In the educational setting, learning is more individualised, whereas learning in the clinical setting is social and is dependent on the interaction with others. Further, Egan and Jaye (2009) posit that the staff from the educational setting does not have control over the activities in the clinical setting, these are mostly orchestrated by clinical staff. These settings will have different and sometimes distinct discourses, artefacts and social partners. The point here is that the physical and social environment is more than a backdrop; it is richly contributing to individuals' cognition as Rogoff and Lave (1984) propose. Vygotsky conceptualised learning as a "complex mediated act" (Guile & Griffiths, 2001, p. 118) comprising the individual, the object (the task or activity) and artefacts such as communication and technology.

In consideration of a sociocultural perspective, a prime goal for learning in the workplace is intersubjectivity, a shared understanding between a learner and an individual guiding the learner (Rogoff, 1990). It is the shared understandings that form a foundation for communication, both verbal and non-verbal. Intersubjectivity implies a different bond than in a characteristic teacher/student relationship, such that the teacher and student in partnership jointly attempt to find solutions to problems (Driscoll, 2005). Billett (2002) points out that guided learning is important, as aspects of practice cannot be learnt through trial and error. Billett (2002) further suggests that guidance should be more than learners observing and imitating a practitioner's behaviour, rather "intentional guided learning" (p. 465) may be necessary. An outcome of a recognised alliance formed between an MRT and student could be intersubjectivity as a result of a strong bond for learning. Shared understanding and joint problem solving may enhance the student's confidence and their learning may be more meaningful. Guided learning within a structured learning partnership that focuses on the learning needs of the student is likely to enhance intersubjectivity, which in turn will enable students to contribute to the community of medical imaging practice. When students' learning allows them to contribute to the community "it enhances their motivation, confidence and sense of professional identity" (Eraut, 2005, p. 4). However, currently, opportunities for enhancing intersubjectivity and a shared understanding could be limited in a clinical learning setting, as medical imaging students learn from a diverse group of MRTs and therefore have few opportunities to engage in a partnership for learning. Further, a partnership in which intersubjectivity is enhanced may promote higher order thinking.

### ***Higher-Order Thinking***

The knowledge required and approach to practice in medical imaging continues to evolve in response to both developing technology and differing patient needs. Patients are typically better informed, more aware and encouraged to take increased responsibility for their health than ever before. Therefore, there is a growing need for MRTs to engage in more challenging encounters with patients (Williams, 1998). Hence, at both an undergraduate and postgraduate level, there is a need to develop professionals in whom higher-order thinking is promoted to assist them to respond to changes in technology and patients' needs. Current

conceptualisations of sociocultural theory draw heavily on the work of Vygotsky (1978), who was particularly interested in how social interaction can lead to higher mental functioning in individuals and claimed that higher-order thinking mostly has a social genesis (Wertsch, 1985). For example, primary functions such as memory and perception can develop into higher functions through assimilation into social practices. Social practices may include tools such as language (for example, 'medical imaging' or 'radiographic' language) and cultural artefacts that are employed as a community works toward common goals (Boreham & Morgan 2004). That is, the kinds of learning required for complex work such as medical imaging are found in the social world.

Vygotsky posits that higher mental processes can be understood as internalised social relationships (Wertsch, 1985). Therefore, if medical imaging students are closely linked with MRTs for their learning, then dialogue will help them to more effectively internalise activities. Wertsch and Stone (1985) maintain that external signs and dialogue in social interaction are significant for the internalisation process. This is significant as students and practitioners need to engage within the clinical learning environment in dialogue and the discourse that is integral to the setting in order to transmit instructions, knowledge and meaning. In clinical practice, dialogue is central to the tripartite relationship developed between the student, practitioner and patient to ensure competent practice and high-quality safe care. In order to promote higher-order thinking, practitioners need to encourage higher-level questioning to help students make sense of their experiences and the complexities found in medical imaging. Effective questioning may also assist students with reasoning processes (Steves, 2005). The absence of questioning or a predominant use of lower-level questions may discourage reflection and deeper learning. Hence, both the dyadic (practitioner and student) and triadic (practitioner, student and patient) relationships that are formed during learning are an important way that the individual interacts with his/her social world. In addition, McMahon (2006) promotes the importance of ensuring an assessment schedule promotes higher-order thinking. Ensuring that students have some choice with regard to assessment and the inclusion of assessment types to encourage higher-order thinking such as reflective diaries and portfolios are examples given by McMahon (2006).

Hence, from a sociocultural perspective interactions within a sociocultural practice are likely to foster the development of higher-order functions. Spouse (2001) argues that the interactions between the student and mentor need to be robust for students to do well in a clinical learning setting. Social interaction helps to orchestrate cognitive development by guiding the learner “to adapt to the intellectual tools and skills of the culture” (Rogoff & Lave, 1984, p. 4). It is through social interaction that more experienced individuals in a context can assist to find solutions to problems. Both the formal and informal interactions between people and the influence of institutions have parts to play in cognitive development. If cognitive development is influenced by the interactions between students and more experienced individuals, then the quality of the interactions must be effective. Hence, commitment would be required by the student and the experienced individual. In addition, if the experienced individual has some knowledge about the student’s capability then the learning can be tailored to the student. Ideally, learning should be organised in a form of partnership to enable the learners and those who facilitate their learning to spend time with each other, so they are aware of what each individual brings to the learning encounter. In turn, the development of a trusting relationship that fosters learning may enable the ‘teacher’ to challenge, question, engage in problem-solving with the student and assist him/her to develop independence in their learning.

It is important not to underestimate the interactions of students with others and the setting in the cognitive development of medical imaging students. Further, personal histories will influence the types of interactions that occur. For example, a student who has a marked respect for individuals in positions of authority may be reluctant to interact with those in senior positions. An effective interaction between a practitioner and a learner is likely to orchestrate the zone of proximal development.

### ***Zone of Proximal Development***

Although Vygotsky’s notion of the zone of proximal development (ZPD) was originally defined for the development of children, it can be appropriately applied to the development of medical imaging students learning alongside practitioners. Hence, the ZPD is a term coined to highlight the learning potential as a result of



collaboration between a learner and a more experienced colleague. Vygotsky defined the ZPD as:

*the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers (Vygotsky, 1978, p. 86)*

A student who learns in tandem with an MRT could be guided to their potential development by the more experienced MRT. It is likely a student under the guidance of an MRT would need to spend time with the MRT so the MRT is clearly aware of the student's capability and level of independence. Once the student's capability has been established, the MRT could then guide them to their potential, providing a balance of support and challenge with appropriate problem-solving opportunities. MRTs will offer and role model concepts related to medical imaging, attitudes, rules and procedures and interpersonal encounters with patients and staff. Students need to be guided through activities that exceed their level of competence (Brown & Ferrara, 1985). Hence, a partnership for learning, in which the learner and their more experienced guide know each other, will provide opportunities for learners to be extended.

An understanding of how a student develops toward becoming autonomous is important for both students and those who guide and support them. The participation of 'others' is central to enable students to progress. If MRTs were to guide students in a formalised partnership, they could assist students to acquire cultural knowledge, achieve goals, foster higher-order thinking, solve problems and enable them to reach their potential within the complexity of a medical imaging context. Hence, sociocultural theory is applicable to medical imaging education. This view could be aligned with the applicability of sociocultural theory to medical education, which has been argued by Bleakley (2006) and Hodges & Kuper (2012). The contribution of others is fundamental to understanding learning through situated learning theory.

## **Situated Learning Theory**

Situated learning theory provides a way of understanding learning and is also part of the sociocultural tradition that posits that participation within a 'community of practice' is central to learning. Lave and Wenger (1991) discuss the process of 'legitimate peripheral participation', which they explain refers to the premise that "learners inevitably participate in communities of practitioners and that the mastery of knowledge and skill requires newcomers to move toward full participation in the socio-cultural practices of a community" (p. 29). Legitimate peripheral participation (LPP) is therefore concerned with the way those who are new to a community become a part of it. When learners have access to a culture of practice, they learn about the intricate aspects of that culture. An understanding of practice will develop as learners' participation changes (Lave & Wenger, 1991). The newcomers are introduced to artefacts and are included in activities providing a pathway towards full participation. It is through participation within the community that meaning can be given to activities (Siebert, Mills & Tuff, 2009). The journey for learners may be towards full participation or partial participation. As Egan and Jaye (2009) point out, while medical training would broadly be leading students towards full participation, there are parts of their training (for example, in various teams or departments) in which they may not acquire full participation.

A simplistic view of situated learning is insufficient. Eraut (2000) warns of a straightforward perspective of situated learning that does not acknowledge the various types of learning that occur in a situation and the impact of the participants' histories. Further, it cannot be assumed that the move toward LPP occurs without difficulty. The notion of power relations needs to be considered in terms of participation or non-participation. For example, it is likely to be disempowering for an individual to be restrained from participation (Lave & Wenger, 1991). Aspects of Lave and Wenger's (1991) notion of situated learning which have not been addressed include what individuals learn cognitively in a community of practice and the role of the individual in the process of knowledge development (Eraut, 2000; Yakhlef, 2010;). Learning in groups can be problematic as the membership of groups change. Further, an individual may only acquire a part of the group's knowledge. However, students need to learn to be part of a

group to acquire the group knowledge required to practise effectively. Radiographic examinations of greater complexity require the involvement of more people. For example, a patient who has been subjected to multiple trauma will be immobile; therefore, more than one MRT will need to be involved in the examination. Hence, in addition to gaining individual knowledge, learning in groups to enable the acquisition of group knowledge will be important for MRT students.

Spouse (1998) emphasises the need for some form of sponsorship to enable LPP and identifies that this is different from a learner being aligned with a supervisor as sponsorship involves “the incremental and planned process of student participation in taken-for-granted activities of the community” (p. 348). Spouse (1998) provides evidence that in the absence of mentors, LPP was a challenge for students and they found it difficult to become involved in learning activities. Their development was subsequently halted. The *ad hoc* approach to supervision and teaching for MRT students that currently exists (outside of this study) is unlikely to reflect the type of support advocated by Spouse (1998) as students spend a minimal amount of time with numerous MRTs. A partnership with an MRT may assist students to gain LPP by the MRT ‘showing them the ropes’ and enabling them to become a part of community. A further framework, based on situated learning in which learning can be supported, staged and progressed is cognitive apprenticeship.

### **Cognitive Apprenticeship**

Cognitive apprenticeship provides a framework for learning and is a concept that was initially devised by Collins et al., (1989). This approach evolved from the traditional apprenticeship model in which an apprentice was guided by an expert to learn ways of performing tasks. Dimensions of a traditional apprenticeship model are still apparent today in various fields such as nursing (Grealish, & Smale, 2011) and medicine (Bleakley, 2002; Steketee & Bower, 2007). A traditional apprenticeship approach involves the apprentice initially observing the master, then performing the task under the master’s guidance until they can do it unaided. As Morris and Blaney (2010) point out, a traditional apprenticeship approach focuses on the individual and suggests a unidirectional relationship. The approach

does not consider that the master or expert may also learn from the student. This is different from social learning theories, which promote the interactions with others for learning.

Although the traditional and cognitive apprenticeship models both involve guided learning, there are some key differences between them. As mentioned previously, traditional apprenticeship focuses on developing skills, guided by a master with observation being a key dimension of the process. Cognitive apprenticeship, on the other hand, focuses on the thinking associated with a task, that is, the cognitive and metacognitive facets of a task. Reflection is significant for cognitive apprenticeship as a way of monitoring and correcting performance, enabling the learner to compare his/her performance to that of the expert.

Cognitive apprenticeship involves an interplay between a novice and an expert so that development and externalisation of dialogue is gradually internalised by the learner (Collins et al., 1989). The notion of apprenticeship highlights that activity is pivotal in learning and knowledge development, and the influence of context is significant (Brown, Collins & Duguid, 1989). The ways in which knowledge is constructed by students will be influenced by the type of apprenticeship approach used. In other words, practitioners who employ a cognitive apprenticeship approach are likely to emphasise the application of knowledge in the performance of tasks and problem solving and promote reflection to enhance understanding. This is different to a traditional apprenticeship model in which the main focus is on the performance of skills.

Modelling, coaching, scaffolding, articulation, reflection and exploration are the teaching approaches of a cognitive apprenticeship. The initial three dimensions (modelling, coaching and scaffolding) of a cognitive apprenticeship are characteristic of a traditional apprenticeship (Collins, 2006). An apprentice initially observes the expert's performance (modelling), which usually involves a series of interrelated skills. The expert would make internal cognitive processes explicit, for example, heuristics used to accomplish the task. Coaching under the guidance of the expert provides an opportunity for the apprentice to execute the process that has been previously modelled. During the coaching stage, the expert

observes the student. Central to coaching is the process of scaffolding, in which the necessary support is provided, in the form of suggestions, feedback and reminders. Once the apprentice has mastered the skill, the expert steps back and reduces his/her involvement (fading), only making suggestions for refinement of the skill (Collins et al., 1989). Articulation involves any way in which students “articulate their knowledge, reasoning, or problem-solving processes in a domain” (Collins et al., 1989, p. 482). Articulation can be promoted by questioning and encouraging students to verbalise their problem solving. In addition, in joint endeavours, a learner can take on the role of a “critic” to convey their understanding in problem-solving (Collins, et al., 1989). The process of reflection offers students a way of evaluating their problem solving ability against that of an expert. During exploration, students are encouraged to problem solve on their own. This model provides an excellent opportunity for learners to develop and integrate skills and conceptual knowledge as they advance from novice to expert (Collins et al., 1989). Such an approach is likely to enhance understanding as the different stages in cognitive apprenticeship will encourage learners to think and reflect on their experiences and therefore make sense of them.

Sixth-year medical students found cognitive apprenticeship to be a valuable approach, providing a foundation for self-assessment, feedback and evaluation (Stalmeijer, Dolmans, Wolfhagen & Scherphier, 2009). However, the students noted that aspects could be improved. For example, teachers did not always explain their actions when modelling a particular activity. The students revealed teaching skills were deficient for some of their teachers. It was not reported if the teachers had been exposed to courses or workshops addressing the fundamental principles of teaching. A further exploration could involve an evaluation of teaching within a cognitive apprenticeship framework following participation in activities to support their role as a teacher.

As demonstrated by Daley, Menke, Kirpatrick and Sheets (2008), the expert in the apprenticeship does not need to be a registered professional. The cognitive apprenticeships successfully developed in their study were formed between a novice and senior student. Further, a cognitive apprenticeship model is not solely reliant on human contact. Technologies such as digital video disc (DVD), closed-

circuit television (CCTV) and digital recording can be incorporated into part of the model, for example, modelling of moving and handling skills (Woolley & Jarvis, 2007).

An inefficiency of the traditional apprenticeship is that the problems and tasks learners encounter were orchestrated by the workplace (Collins et al., 1989; Stalmeijer, et al., 2009). On the other hand, in cognitive apprenticeship, the tasks and problems are selected to highlight the power of certain approaches or methods, provide students the opportunities to apply the methods in diverse settings and to gradually increase the complexity of the tasks. Therefore, tasks are selected to correspond with the changing demands of learning. Although the tasks selected for medical imaging students in the clinical setting are to some extent determined by the demands of the workplace, the affordances of the workplace are arranged to reflect the ability level of students. For example, a novice student in the first year of the programme will be subjected to less complex examinations and procedures than an experienced student in the final year of the programme. There is of course an advantage of tasks being selected by the demands of the workplace. Students learn skills such as prioritising workflow, which is a prime capability required for practice as patient's imaging will be frequently scheduled according to the degree of urgency.

Cognitive apprenticeship is likely to be an ideal model for teaching and learning for medical imaging students, as a key aim of the undergraduate degree programme is to develop a practitioner who is capable of higher-level thinking to solve complex problems (Yielder & Yielder, 1994). If a cognitive apprenticeship approach is employed, it is intended that it will foster interactions between students and lecturers/practitioners that encourage deeper understanding and learning.

Table 1 presents the key concepts of the learning theories discussed above and their relationship to learning for medical imaging students.

### Table 1. Key Concepts of Social Learning Theories Explored

<b>Social Cognitive Theory</b>	<ul style="list-style-type: none"> <li>Theory developed by Albert Bandura (1986) focuses the cognitive and affective development of the learner through interactions with others</li> <li>Bandura has identified five capabilities of learners to assist to understand the process of learning. For example, the vicarious capability explores the influence of observation and consequently role-modelling in the process of learning.</li> <li>Social cognitive theory aligns with the development of an initiative to support learning and teaching for students and MRTs, respectively</li> <li>A partnership will enable students to observe their partner's practice and promote capabilities such as self-regulation (monitoring and evaluating their actions); self-reflection and self-efficacy (increase in confidence when achieving outcomes).</li> </ul>
<b>Sociocultural Perspective</b>	
<i>Influence of context</i>	<ul style="list-style-type: none"> <li>A socio-cultural perspective highlights the influence of the context on learning and knowledge development</li> <li>Knowledge is co-constructed through social and individual processes, therefore, social interactions and what an individual brings to a learning situation are important considerations for learning</li> <li>A medical imaging student's cognitive development may be influenced by support provided by their MRT partner</li> <li>In addition to the physical location, other facets that constitute the context include, history, culture, prior knowledge of learners, teachers and the learning institution, gender, roles and responsibilities of those who interact, and the curriculum (Lave &amp; Wenger, 1991)</li> <li>Eraut (2004a) highlights the development of cultural knowledge which is influenced by environmental and cultural artefacts</li> <li>Experiences available to medical imaging students in the workplace are formed by the offerings of the workplace</li> <li>Sociocultural perspective emphasises the notion of intersubjectivity or shared understanding between a learner and individual guiding the learner (Rogoff, 1990)</li> </ul>
<i>Higher Order Thinking</i>	<ul style="list-style-type: none"> <li>Vygotsky posits higher mental processes can be understood as internalised social relationships, therefore, interactions between MRTs and students comprising questioning and dialogue</li> </ul>

<p><b><i>Zone of proximal development (ZPD)</i></b></p>	<p>may promote higher order thinking</p> <ul style="list-style-type: none"> <li>• ZPD defines the learning potential between a learner and a more experienced colleague</li> <li>• ZPD is the 'gap' that needs to be filled by learners as they reach their potential</li> <li>• A partnership between a student and an MRT is likely to help a student reach their potential to enable independent practice and to exceed their level of competence</li> </ul>
<p><b><u>Situated Learning Theory</u></b></p>	<ul style="list-style-type: none"> <li>• Theory posits that participation within a 'community of practice' is central to learning</li> <li>• The notion of legitimate peripheral participation suggests newcomers within a community move toward full participation when they learn the socio-cultural practices of the community</li> <li>• Hence, medical imaging students can increase their participation as they learn practices within the radiography community through interaction with others</li> </ul>
<p><b><u>Traditional Apprenticeship and Cognitive Apprenticeship</u></b></p>	<ul style="list-style-type: none"> <li>• Both traditional and cognitive apprenticeship arrangements involve the learner being guided by an expert</li> <li>• There are key differences between the two arrangements: <ul style="list-style-type: none"> <li>(i) Both apprenticeship arrangements focus on developing skills, however, a cognitive apprenticeship focuses on the thinking associated with a task, that is, the cognitive and metacognitive facets of a task</li> <li>(ii) Reflection is integral to a cognitive apprenticeship to enable the learner to compare his/her performance to that of an expert</li> <li>(iii) Cognitive apprenticeship suggests a deeper type of learning and understanding than a traditional apprenticeship arrangement</li> <li>(iv) The problems and tasks are orchestrated by the workplace within a traditional apprenticeship whereas the tasks are selected in a cognitive apprenticeship to highlight the power of certain approaches or methods</li> </ul> </li> <li>• It is probable a traditional apprenticeship focussing on skills is the predominant model currently employed in medical imaging clinical education.</li> <li>• The introduction of partnerships between MRTs and students to support students' learning may provide the opportunity for a cognitive apprenticeship to develop encouraging a deeper type of learning.</li> </ul>



## Summary

In this chapter, a review of educational theory, with a focus on social learning theory, has enabled some insight into the potential influences on students' learning. However, theory does not solely assist to understand the practice of education within the context of medical imaging education. Social learning theories provide a means of understanding how students may think, act and learn as a consequence of their interactions with individuals and other contextual influences. The theories discussed highlight the importance of the influence of context as students construct knowledge during the process of meaningful learning. Social learning theories highlight the significance of effective interactions and relationships for learning. In addition, the value of relationships formed in interactions for learning support the development and implementation of a partnership to facilitate learning. Although, learning through interactions with others is espoused by social cognitive, sociocultural, situated learning theories and a cognitive apprenticeship framework, this is not at the expense of consideration of the individual in learning. Billett (2005) argues that the relationship between individual and social agencies is central to learning and that one cannot sufficiently exist without the other.

In this study, social learning theory brought understanding of students' experiences of learning to include engagement with learning opportunities. Further, it highlighted the nature of support provided through the interactions, negotiation and collaboration with others. Importantly, however, it was not intended that educational theory would be sufficient to enable a comprehensive understanding of educational practice in this study. In addition to 'one' theory not being sufficient in itself, it is also realised that a theoretical model has limits within the reality of practice (Bleakley, 2006). Therefore, although I was aware that educational theories were not underpinning the reality of practice prior to the outset of this study, scrutinising various theories has been valuable to provide a means to think about and shape practice. As this action research study is situated in the world of practice, it is most important to also understand teaching and learning through the 'players', as Polkinghorne highlights:

*Two philosophers, Dewey and Heidegger, brought to the fore the importance of understanding practice through the operations of people's background (2004, p. 154).*

Although educational theory has provided a means to understand the epistemology of teaching and learning in practice, it is imperative that we seek to understand the ontology of practice through the 'players' or stakeholders. The following chapter reviews two key facets of learning: the formation of relationships and engagement with the curriculum.

## CHAPTER THREE: LEARNING IN PRACTICE

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### Introduction

This chapter explores aspects of learning, further informing and providing a foundation for the development of an initiative to support learning in *Phase Two* of this action research study. Two key areas will be discussed: forming relationships for learning and engagement with the curriculum. Clinical supervision and mentoring, focussing on types of one-to-one arrangements to support learners will be examined. The notion of belongingness, which is likely to be influenced by effective one-to-one relationships, will be then discussed. This is followed by an exploration of facets associated with engaging with the curriculum to include the hidden curriculum and technology for learning.

### Forming Relationships for Learning

Formalised support for students in the frequently busy, complex clinical settings in which they learn is likely to progress and improve their learning experiences. In a medical imaging learning setting, students are primarily supported by clinical tutors and MRTs who assist with their learning. There is an expectation that MRTs will teach students as a part of their role. However, it is unusual for MRTs to be given guidance, support and knowledge of teaching with regard to their role as a supervisor. Inadequate preparation of MRTs for their role as supervisor/teacher was identified as a problem nearly two decades ago (Williams & Webb, 1994). The need for support to prepare MRT supervisors in their supervisory role was further highlighted as a recommendation of my own master's study (Thompson, 1999). In addition, Baird (1996) emphasised the critical importance of reflection for radiography students and argued that preparation of clinical staff was necessary for their role in teaching and supervision to enable them to assist to enhance students' reflective practice.

The fact that there appears to be a lack of investment in preparing MRTs for their role as teacher/supervisor, may be that clinical education is taken-for-granted, that is, it is an assumed role of a registered practitioner. This could explain why limited

research has been conducted in this area in medical imaging. There is an established body of research available with regard to learning partnerships in the form of precepting and mentoring in areas such as nursing and midwifery (Andrews, 2007; Clutterback, 2004; Gopee, 2008; Lennox, Skinner, & Foureur, 2008; Morton-Cooper & Palmer, 2000). However, there is limited literature related to arrangements to support learning in the practice setting for undergraduate medical imaging students.

Although there are some commonalities between terms such as mentor, preceptor and clinical supervision, they also exhibit differences. Within healthcare settings a mentoring relationship is usually formed between a learner and a registered professional, while a preceptorship is commonly formed between a newly-qualified professional and a more experienced professional (Lennox et al., 2008). A preceptorship could develop into a mentorship. Hutton and Eddy's (2013) study, which explored job satisfaction for therapeutic radiographers, recommended a preceptorship to provide support during the challenging period when a graduate transitions to a qualified therapeutic radiographer. They indicated the preceptorship could then successively develop into a mentoring arrangement. Discussion related to the notion of preceptorship will not be expanded here since it is used primarily for newly-qualified professionals and is therefore not directly related to this study.

Within medical imaging practice, frameworks for supporting learning such as clinical supervision and mentoring have limited theoretical foundations. Despite the value and benefits of supportive partnerships for learning in health professional education (Bond & Holland, 2010; Kilminster, Cottrell, Grant, & Jolly, 2007; Sloan, 2005), little attention has been given to them in medical imaging.

### **Clinical Supervision**

Research into clinical supervision has been predominantly within the fields of nursing and psychology, with limited research in the allied health professions and medicine (Pearce, Phillips, Dawson, & Leggat, 2013). Clinical supervision is interpreted differently by different groups. In relation to frameworks to support learning, the term 'clinical supervision' is used predominantly in medicine (Idema,

Brownhill, Haines, Lancashire, Shaw, & Street, 2010; Kilminster, 2010; Kilminster et al. 2007; Launer, 2010). A differentiation between precepting and clinical supervision is made in nursing (Bond & Holland, 2010; Driscoll, 2007; Gopee, 2008; Morton-Cooper & Palmer, 2000). Driscoll (2005) points out that supervised practice, which is an approach used for undergraduate students in a clinical setting, is frequently referred to as clinical supervision, as it is in medical imaging (Laming, 2010; Parks, Young, & Morgan, 2012; Yelder & Steele, 2003). The notion of clinical supervision in areas such as nursing, midwifery and social work, for example, is usually considered differently to supervision in practice and usually refers to a process or 'conversation' that occurs outside the practice area (Driscoll, 2005). It is "an exchange between practicing professionals to assist the development of professional skills" (Butterworth, 1998, p. 12). Hence, it appears that there continues to be some diversity in thinking about what clinical supervision actually entails (Bond & Holland, 2010). Given that there are various specialities within each health discipline, a single approach for clinical supervision is likely to be limiting (Jones, 2006). Different frameworks for clinical supervision are utilised depending on the purpose, function and process of supervision, and the context in which it occurs. The boundaries of various definitions are not always well defined (Mills, Francis, & Bonner, 2005); therefore, there should be some clarity provided for what a framework to support learning encompasses.

Authors warn that interpretation of the term 'clinical supervision' may be problematic (Bond & Holland, 2010; Jones, 2006). For example, it may suggest a hierarchical approach and surveillance or monitoring; however, the purpose of clinical supervision is to empower rather than control the supervisee (Butterworth, 1998). Line managers are not considered appropriate as supervisors as the purpose and function of clinical and management supervision are different. The limitations of management supervision are that it is unlikely to foster reflective practice and growth of the supervisee (Bond & Holland, 2010). Further, the term 'clinical' may be interpreted as only pertaining to issues associated directly with clinical tasks.

In the absence of formal learning partnerships between students and MRTs in a clinical setting, an *ad hoc* process of supervision occurs. It is likely that MRTs

provide supervision by observing others in their supervision role and/or employing an approach that they experienced as students. It was identified in a review related to medical education (Kilminster et al., 2007) that, although supervision was regarded as valuable, the ways in which it was being performed were markedly inconsistent. Supervision is critical for the development of professionals; however, is not well established in some areas in medicine (Ditchfield & Fink, 2003). In nursing, supervision is comprehensively implemented in some areas but is minimal in others (Bond & Holland, 2010). Kilminster et al. (2007) argued that self-supervision is unproductive and the involvement of a supervisor is important; however, students need to be able to access supervisors with ease (Eraut, 2004b).

In view of the fact that a number of health professional groups have heralded supervision as worthwhile and advisable, it is of interest to note that what is actually 'contained' within a session has received little attention. Pearce et al.'s (2013) systematic review related to the content of supervision sessions in nursing and allied health revealed that there is minimal evidence about what is addressed in supervision sessions. They point out that previous research has focussed on the qualities of supervisors, effectiveness of supervision and evaluation of the process rather than addressing the content comprising supervision sessions.

Although Jones (2006) argues that there is inadequate knowledge in nursing as to how clinical supervision benefits professional practice, the benefits have been highlighted by various disciplines and include growth and development of supervisees in their work and personal life, enhanced care of patients or clients, and improvements in healthcare organisations (Bond & Holland, 2010; Sloan, 2005). Medical students in Al-Kadri, Al-Moamary, Elzubair, Magzoub, Almutairi, Roberts and van der Vleuten's (2011) study indicated that effective supervision favourably influenced their approach to learning and enabled them to improve their history taking, problem solving and integration of clinical knowledge.

However, aspects of supervision can also be problematic. Within vocational education, students often find clinical supervision to be inadequate (Bloomfield & Subramaniam, 2008). Problems may emerge if health professionals are not given

guidance about how to teach and supervise students, and preparation and support has often not been provided (Steves, 2005). Supervisors need to demonstrate certain skills such as competence, teaching and interpersonal skills (Ditchfield & Fink, 2003). Effective learning requires structure and active student engagement, and is best facilitated if supervisors are provided with the appropriate education (Kell & Jones 2007; Leinster, 2009) to facilitate personal and professional growth (Stenfors-Hayes, Hult, & Dahlgren, 2011) and examine complexities of practice (Launer, 2010).

Supervision encounters in a clinical setting may involve close or distant supervision. Kilminster et al. (2007) emphasised the importance of direct supervision, that is, the supervisor remains in the room with the student. Direct supervision was not predominant in O'Neill, Owen, McArdle and Duffy's (2006) study, as 'arm's length supervision' was identified as the principal type of learning for medical students' and doctors' training, with only seven percent of learning experiences involving direct supervision of the trainees. When direct supervision was available, medical students were motivated to use strategies that encouraged deeper approaches to learning (Al-Kadri et al., 2011). Learners may claim that they experience valuable learning opportunities in the absence of supervision; however, the management of patients may be jeopardised (Ditchfield & Fink, 2003).

The relationship between the supervisor and supervisee is central to the supervisory process. In fact, Rogers (1983) argues that a learning relationship is more important than other dimensions of learning, such as the skills of the teacher, books, and curriculum planning. Hence, it is important for students and facilitators to get to know one another, a process described by Paton (2010) as "artfully connecting" (p. 145). "Artfully connecting" requires the supervisor to learn personal aspects about their student, their previous clinical experience and academic requirements. For a supervisory relationship to be effective, several conditions should be met. These include maintaining the relationship over time; allowing the student/trainee to have some control over the supervision; trust; feedback; assessment; and engagement in reflection by both the supervisor and the student/trainee (Ditchfield, & Fink, 2003; Jones, 2006; Kilminster et al., 2007).

Although the supervisory relationship is imperative for effective supervision, Sloan (2005) maintains that it has been given little attention. An effective relationship is essential and, ideally, it should be mutually beneficial for both the supervisee and supervisor. Adams and Kilburn-Watt's (2000) study identified several benefits for supervisors of nuclear medicine technologists, including increased job satisfaction, an enhanced level of performance and greater understanding of nuclear medicine.

Ineffective relationships can be detrimental to students' learning. Löfmark and Wikbald's (2001) study, which examined the clinical learning experience for nursing students, identified that it was problematic for the student if a relationship was not developed. If supervisors did not know the students, they did not rely on them, which had negative implications for students' learning. Further, insufficient supervision and disinterested supervisors also affected students' learning. If a student does not receive the support for learning from a staff member, they may wander around the setting in an attempt to find something to do and presumably look busy (Spouse, 2001). Intimidation by staff and instructors, too much supervision and unhelpful reactions by staff were amongst the stressors highlighted by radiography students in Mason's (2006) study.

Inadequate supervision, which focuses on task-based activities and does not promote and foster inquiry, has implications for learning. In the early 1990s, at the time degree programmes for medical imaging were being introduced in the UK, Williams and Webb's (1994) study revealed that radiographers (as MRTs are referred to in the UK) supervising students focussed on task-based activities and patients' needs in teaching and learning encounters, rather than student-centred activities that stimulate inquiry. Evidence of the promotion of reflection has not been evident during supervisory encounters in radiography (Baird, 2008; Thompson, 1999; Williams & Webb, 1994). In addition, to these authors identifying the need for reflective practice for undergraduate students, Sim and Radloff (2009) recommend that continuing professional development programmes should promote practitioners to explore professional challenges and to help progress the profession to secure professional status. Students in Ernstzen, Bitzer and Grimmer-Sommers's (2009) study revealed they did not believe they learnt effectively from engaging in the process of reflection. However, the students'



clinical teachers disagreed with the students' view and suggested that the students may have been unaware that the process of reflection had enhanced their learning. Educators cannot assume students understand what reflective practice entails, and students may need some guidance to enable them to understand the process. Reflection and supervision are coupled (Launer, 2010). Therefore, if reflection is limited within the process of supervision, achieving goals of supervision may be impeded, such as exploring the complexities of practice to foster growth and development of the supervisee.

Effective reflection is central to the development of robust critical thinking skills. If learners do not engage in critical thinking and if it is not promoted by teachers/supervisors, students' depth of learning could be affected. Critical thinking skills are vital in both undergraduate and postgraduate education in medical imaging (Castle 2007; Edwards, 2005). Critical thinking should be a central consideration in curricula design to support the development of critical thinking skills in radiography students (Castle, 2007). Further, Castle (2011) posits that undergraduate students need to understand the various elements of critical thinking to enable them to develop reasoning, to assist them to evaluate research findings, for example. Students in Chow and Suen's (2001) study involving students in pre-registration health professional education, highlighted that practitioners who guide their students do not consistently promote critical thinking. It was suggested by students in this study that the reason for limited encouragement with regard to critical thinking is that mentors are task orientated and usually busy. In the absence of a partnership to support learning, in which MRT students would have limited opportunities to engage in robust dialogue with MRTs, critical thinking may not be considered a priority in learning. If critical thinking is not promoted, deeper and broader levels of understanding and sound reasoning skills may not develop. Despite the fact that educators are aware of the value of the development of critical thinking skills, MRTs may need guidance as to how to foster the development of these skills for students within the clinical setting.

Despite the type of framework implemented, the process of clinical supervision can be complex. Central to its success is the formation of robust relationships

between a student/supervisee and a supervisor. There are important facets to be considered when developing a framework for supervision. For example, there needs to be an investment of time, with the relationship ideally being maintained over time. A mutual relationship built on trust, which promotes the provision of feedback and fosters reflection and critical thinking skills, is a central consideration for the development of a framework to support facilitation of learning for MRT students.

### **Mentoring: An Approach to Support Learning**

Clutterback (2004) argues that, in some instances, the term 'mentoring' has been poorly defined and emphasises that a 'one size fits all' approach is inappropriate. Consideration must be given to the purpose of the relationship, what each individual expects from the partnership and the actual context in which the mentoring framework takes place. Bond and Holland (2010) differentiate between clinical supervision and mentoring, suggesting that clinical supervision is an interaction between two practising professionals. Mentoring, on the other hand, usually involves a student and a practising professional and, therefore, a greater power differential exists. The term 'mentor' usually refers to a person who invests time into the development of a learner and guides the learner to "achieve maturity and identity" (Gopee, 2008, p. 7). Mentors assist in empowering individuals in their learning environments (Bradbury-Jones, Sambrook & Irvine, 2007; Gopee, 2008; Morton-Cooper & Palmer, 2000). The key and most crucial function of a mentor is emphasised by Levinson, Darrow, Klein, Levinson and McKee (1978, p. 98) who asserts that it is "to support and facilitate the *realisation of the Dream*" [Italics in original].

Mentoring is well established in areas such as business and education and as Gopee (2008) points out, it is also used to support young 'at risk' individuals. A formal mentoring framework is not new to health professions such as nursing (Cottingham, DiBartolo, Battistoni, & Brown, 2011; Pease & Kane, 2010; Riley & Fearing, 2009; Wroten & Waite, 2009), midwifery (Ryan, Goldberg, & Evans, 2010; Veeramah, 2012) and physiotherapy (Ezzat & Maly, 2012; Stewart & Carpenter, 2009). To a lesser extent mentoring practices have been explored in medical imaging (Colhart, McBride, & Murray, 2010; Dunn, 2012; Kowtko, 2010). Although

there is a plethora of literature related to mentors in midwifery and nursing, Andrews (2007) points out that it is only assumed that learning will improve if students are supported by mentors and this assumption has not been robustly challenged. Saltiel (2002) offers a further criticism of mentoring type arrangements and suggests that these mentoring types of frameworks are mostly descriptive and do not focus on how to form the relationship and develop the interactions between those involved.

Three approaches to mentoring have been identified by Morton-Cooper and Palmer (2000), which are differentiated by the type and nature of the partnership. Classical mentoring allows self-selection of individuals with a shared attraction, and has a duration of twelve to fifteen years. This approach does not encompass explicit outcomes and functions. Contract mentoring has a one- to two-year duration and individuals are assigned to mentors. It has clear functions and outcomes. Pseudo-mentoring has a shorter duration than the previous approaches, of six weeks to one year. This type of approach focuses on specific tasks, with guidance from a number of mentors. The relationships formed do not predominantly foster enabling, which is characteristic of the classical approach. Outside of this study, pseudo-mentoring represents the framework currently used for MRT students within the context associated with this study.

There are challenges associated with mentoring relationships. A key dimension of teaching and learning encounters for MRTs and students is the need for a clear understanding of the goals for learning. Diagnostic and therapeutic radiographers who were mentors for assistant practitioners were challenged by not having a clear understanding of the theoretical content and requirements for performance and competence (Colhart et al. 2010). Further challenges include insufficient time, an increased workload, the need for support and completion of documentation (Colhart et al., 2010; Veeramah, 2012). There may be negative effects if inadequate mentoring is offered (Gopee, 2008). There is frequently a requirement for practitioners in health disciplines to take on an additional role as mentor, therefore, mentoring may be inadequate due to the extra demands on time and workload. Students have expectations of their mentors and may become disappointed if they do not meet their expectations as demonstrated in Pearcey

and Elliot's (2004) study of nursing students. Toxic mentors may also disable learning. Toxicity can be the outcome of a mentor/mentee relationship that is "not built on mutual trust, shared values or reciprocity" (Morton-Cooper & Palmer, 2000, p. 63).

A mentoring relationship is not necessarily a unilateral relationship benefiting only the student; the mentor's personal and professional development may also be enhanced. Authors have identified the mutual benefits of a mentoring relationship for both the learner and the mentor (Halcomb, Peters, & McInnes, 2012; Kowtko, 2010; Morton-Cooper & Palmer, 2000). For the learner, mentoring has the potential to foster their emotional development, professional confidence, knowledge development, competence and motivation, professional identity, and development of reflection and critical thinking skills, as well as improving student retention rates (Bradbury-Jones et al., 2010; Jokelainen, Turunen, Tossavainen, Jamookeah, & Coco, 2011; Kilgallon, & Thompson, 2012; Kowtko, 2010; Morton-Cooper, & Palmer, 2000 ).

The benefits of a mentoring relationship for the mentor include keeping current with research and clinical skills, fostering self-reflection through their explanations and teaching of mentees, personal fulfilment, revitalised interest in work and increased self-confidence (Ezzat & Maly, 2012; Rose 2005). In Colhart et al.'s (2010) study, mentors needed to re-evaluate and update their skills and knowledge when necessary, thereby enhancing their professional development. Further, within a learning relationship, teachers can also learn from students. Students are in a position to challenge aspects of current practice. This could result in improved healthcare delivery and the possibility of a favourable modification in a practitioner's behaviour (Rolfe & Sanson-Fisher, 2002).

Although an effective mentoring relationship comprises trust and respect, it is unlikely that the relationship will be equal due to the power differential between a mentor and mentee. Mentoring can be defined as "off-line help from one person to another in making significant transitions in knowledge, work or thinking" (Clutterback, 2004, p. 13). Clarification of words within the definition has been offered by Clutterback. He explains that 'off-line' has been used to highlight the

fact that it is most likely that one of the individuals in a mentoring relationship will have some authority in the relationship and, therefore, it can never be an entirely open relationship.

With regards to equality in learning relationships, Saltiel (2002) differentiates between mentoring arrangements and collaborative partnerships, asserting that partners in a collaborative relationship have an equal footing and they will learn from the other in the relationship. Further, partners in a collaborative arrangement have the opportunity to choose each other. It is difficult to argue that a relationship involving a student and a professional could be equal, as the professional will have knowledge and skills that the student is yet to acquire. Being recognised as a 'partner' by a supervising radiographer was important for students in William and Webb's (1994) study, which investigated supervision of radiography students. A partnership encouraged personal growth, discussion and a rapport, which enabled students to learn from their mistakes. However, although the relationship between an MRT and student will never be equal (as the MRT will have experience, a qualification and affiliations in the workplace that a student has not yet acquired), recognition of the student as a partner may reduce the power differential between the learner and supervisor. That is, a robust person-to-person relationship should be developed to attempt to remove the hierarchical nature of the traditional teacher/student relationship (Rogers, 1983).

Trust is central to a learning partnership (Rogers, 1983). A conceptual model, labelled 'partner, learn, progress' created by Henderson, Winch and Heel (2006), which intended to promote learning in the clinical setting for nursing students highlighted the importance of the formation of partnerships for learning. The authors of this model posit that a partnership based on trust would assist the student to assimilate within the setting and to be included and socialised. Nouwen (1975) eloquently explains that a teaching/learning relationship requires "a mutual trust in which those who teach and those who want to learn can become present to each other, not as opponents, but as those who share in the same struggle and in search for the same truth" (p. 86). In addition to the need for the relationship to be friendly, Eraut (2004b) proposes that both parties should feel comfortable about asking questions, irrespective of the triviality of the question.

Further, if students feel comfortable in the setting, they are more likely to ask questions as Spouse (2001) identified in her study of mentor/student nurse relationships. Nouwen (1975) suggests that teaching involves “the commitment to provide a fearless space for questioning” (p. 86) and to encourage, support and affirm the student becoming a key contributor to the learning/teaching partnership.

### **The Value of One-to-One Relationships**

Forms of clinical supervision and mentoring are supportive one-to-one arrangements that foster learning. Effective one-to-one relationships provide students with valuable support for their learning (Graham, Tso, & Wood, 2011; Newton, Jolly, Ockerby, & Cross, 2012), enabling quality time with an experienced professional as a student develops professional skills. The competing demands of the workplace, with the priority of ensuring that the work is done and patients receive a high standard of care means that one-on-one time with a professional may be a luxury. Medical students’ motivation and participation in Doran, Hadfield, Brown, Boshuizen and Scherpbier’s (2005) study was increased when they were learning alongside a supportive professional. Doran et al. (2005) argue that without support in an uncertain clinical setting, students may become demotivated. Clinical settings can be frequently uncertain, as patients who present to a clinical setting will vary in degree of illness or injury. In addition, patients may deteriorate during their time spent in a clinical setting. Therefore, support is particularly important for learning in a potentially unpredictable environment. In the absence of support, students may ‘lose their way’ and valuable learning opportunities may be lost.

Negotiation of workplace experiences can be difficult. An Australian study of nursing students identified that barriers to the translation of knowledge included lack of student engagement, lack of affordances for student learning and the influence of the teacher (Newton, Billett, Jolly, & Ockerby, 2009). These barriers demonstrate how negotiation of experiences can be a challenge for students, which in turn can affect their learning. It is anticipated that one-to-one relationships will support students’ negotiation of their learning experiences.

In consideration of the literature evaluating the value of frameworks to support learning, there is a need for further research to understand how medical imaging students' learning can be enhanced within a supportive arrangement for learning. The support provided by one-to-one relationships is likely to foster a sense of belonging.

### **Belongingness: A Precursor for Learning**

Quality clinical placements are fundamental to enable students to develop competence (Levett-Jones & Lathlean, 2008; Levett-Jones, Lathlean, Maguire, & McMillan, 2007). A sense of belonging is important for learning in a clinical setting. A study of nursing students (Levett-Jones & Lathlean, 2008) demonstrated that "belongingness is mediated by a range of individual, interpersonal, contextual and organisational factors" (p. 106). The authors of this study further reported belongingness for students was influenced by a sense of feeling safe and comfortable, enhancing the student's self-efficacy and self-concept, motivation and engagement in learning opportunities. Having the capacity to engage in learning opportunities meant that they had "a legitimate place in the nursing team" (Levett-Jones & Lathlean, 2008, p. 107). If belongingness was not attained, students were affected negatively, resulting in anxiety and limited confidence to become involved. They became more concerned with 'fitting in' than learning. Medical students whose performance was considered as borderline in Wilkinson and Harris' study (2002) avoided involvement by being absent, shy, frightened or scared. Hence, acquiring a sense of belonging would be more difficult for these students. A sense of belonging for nursing students in Sedgwick and Rougeau's (2010) study was influenced by interpersonal relationships, the individual characteristics of the student and nurse, other team members and patients and their families. In addition, students' sense of belonging was enhanced if they were treated as a nurse rather than a student. An innovative model was developed by Bourgeois, Drayton and Brown (2010) to support teaching and learning in the clinical setting for nursing students and to ensure that students' placements were carefully considered and supported. The model encouraged student involvement in activities that enabled them to become a part of the team and gain a sense of belonging. When students feel comfortable in their learning environment, they will be able to engage with their teachers and supervisors with ease. If students

gain a sense of belonging, it is likely that they will be able to get on with their learning and engage with the curriculum. Additional facets of learning, associated with engaging with the curriculum and including the impact of the hidden curriculum and technology for learning, will be discussed in the next section.

## **Engaging with the Curriculum**

The curriculum for the medical imaging programme provides a framework that is characterised by a sequential approach to how education for the students should proceed. It is intended to overtly identify the aspects that will best prepare MRTs for practice. Key components within this (and any) curriculum, include, a programme rationale and philosophy, courses within the programme, resources, learning outcomes, teaching approaches and assessment.

Knowing, acting and being are argued by Barnett and Coate (2005) to be the building blocks of the curriculum that are not considered in isolation. Knowing is seen as a very personal act in which an individual engages with the area in question. Acting involves the acquisition of skills, that is, skills not only concerned with performance, but also personal involvement. Being is concerned with developing an inner self to enable students to develop the capacities that they will need for their development in an unpredictable world. Therefore, the relationship between a student and knowledge is characterised by personal engagement.

The goals for learning in the clinical and academic components within the curriculum may not necessarily be the same. For example, although propositional and procedural knowledge are relevant to both settings, propositional knowledge (concepts and theories related to the discipline) is emphasised in the educational setting and procedural knowledge (associated with processes in professional action) in the clinical setting (Eraut, 1994). Barnett and Coate (2005) suggest that the term 'curriculum' should be a key term used in higher education as it is "through curricula, too, values, beliefs and principles in relation to learning, understanding, knowledge, disciplines, individuality and society are realized" (p. 25). In relation to the medical imaging curriculum, several important questions are raised. How frequently do educators consider the curriculum in its entirety? How often do they stand back and view the 'bigger picture' to ensure that the



curriculum is appropriate to develop the knowledge, skills and dispositions needed for MRT practice? Do students have the opportunity to contribute to the curriculum design and changes in the curriculum? Further, although the formal curriculum is transparent, how does the hidden curriculum contribute to the preparation of students for MRT practice?

### **The Hidden Curriculum**

As students learn the practice of medical imaging, it is likely that their learning will be shaped by both the formal curriculum (for example, clinical competencies, protocols and policies) and the hidden curriculum (for example, behavioural expectations, values and norms,) (Bloomfield & Subramaniam, 2008). The notion of the hidden curriculum has been explored in medicine (Hafferty, 1998; Hafferty & Franks, 1994); however, there is limited reference to it in the allied health professions (Delany, Spriggs, Fry, & Gillam, 2010). Although the overt or explicit curriculum is set out in course guidelines, learning outcomes, textbooks and lecture notes, the hidden curriculum which consists of rules that students need to learn to help them succeed, is not explicit. Cultural and organisational facets influence the hidden curriculum (Felstead, 2013) and as Gair and Mullins (2001) point out the hidden curriculum is not necessarily something that we need to search for as it is apparent in most instances.

Phillip Jackson (1968) argues two curricula are apparent in school life: the official and the hidden curricula. Mastering both curricula is necessary for the success of the learner. Jackson's work focussed on elements of the hidden curriculum within the classroom setting, such as dispositions, norms, values and social and behavioural expectations that resulted in rewards for students. Although his work concentrated on classroom settings, such elements are also likely to be contained in the hidden curriculum within a clinical learning setting. It is argued that the hidden curriculum within the clinical setting can have a marked influence on students' learning (Chuang, Nuthalapaty, Casey, Kaczmarczyk, Cullimore, Dalrymple, Peskin, 2010). The constituents of the hidden curriculum are transmitted to students through social relationships and daily routines, for example. Role modelling is a central influence on the hidden curriculum during the process of socialisation and the development of professionalism and professional

identity (Chuang et al. 2010; Harris, 2011; Michalec, 2013; Rogers, Boehler, Roberts, & Johnson, 2012). Aspects of professionalism can be contained in the hidden curriculum as evidenced in Baingana, Nakasujja, Galukande, Omona, Mafigiri, Sewankambo's (2010) study. The hidden curriculum was central to learning professionalism for health professional students, in their study. Therefore, those who facilitate students' learning enable them to 'learn the ropes' and establish the daily practices and routines that are not contained in the formal curriculum. The knowledge contained within the hidden curriculum is essential for MRT practice.

If students have the opportunity to learn within a supportive framework, such as a type of mentoring arrangement, then it is likely they will have a greater chance to access knowledge contained within the hidden curriculum. Billett (1995) argues that knowledge may be "opaque and hidden from the novices" (p.8) and may be difficult to access without direct guidance. In both the academic and clinical settings, medical imaging students need to gain the knowledge that is important for their success. For example, if a lecturer has a particular bias towards challenging equations and therefore values students being able to perform such calculations, then students may invest additional effort into learning how to successfully undertake this task. If the solving of challenging equations is important to the lecturer, there is a greater chance that students will be assessed in this area. The context of learning (that is, curriculum, assessment and pedagogical approaches) influences students' engagement with course materials, activities, teachers and others. Students usually respond to the overt or covert requirements of teachers (Ramsden, 2003).

Similarities can be seen between the hidden curriculum and 'articulation work', which is a term coined by Star (1991). Articulation work is invisible and is the work that "gets things back on track" in the face of the unexpected (p. 84). In the academic setting, it is difficult to teach scenarios that reflect the unexpected and non-routine in clinical practice as every unpredicted situation that the student confronts will be different. Students initially need to be able to construct their knowledge by observing others executing such encounters to 'get things back on track'. If close guidance is not available and they are confronted with the

unexpected, they will need to rely on previous knowledge to manage the situation. However, there is a risk to both the student and the patient associated with engaging in 'new' non-routine encounters in the absence of guidance.

The hidden curriculum does not always benefit the learner. Although students in Allan, Smith and O'Driscoll's (2011) study expected to have supernumerary status in the clinical learning setting, the clinical staff expected them to work. This misalignment meant that learning was orchestrated by the hidden curriculum, which played a part in moulding the learning context. In addition, the hidden curriculum may be a mechanism for social control. In Skelton's (1998) study, which examined the hidden curriculum of patient education for lower back pain, it was identified that general practitioners control most aspects of the educational encounter and, although a few instances of resistance were evident, the majority of patients surrendered to professional power. In view of Skelton's study, educators need to be cognisant of the power relations and their privileged position, which may result in them exerting power over the student.

Importantly, the notion of curriculum as reproduction should be addressed when exploring the meaning of the hidden curriculum, suggesting that some students will benefit more than others from the system. Further, the hidden curriculum can have a gate-keeping role in that only some students will be able to use it to their advantage (Barnett & Coate, 2005). Within medical imaging, various anecdotal instances support this perspective. For example, in clinical settings, students will be advantaged if they develop more effective relationships and may therefore be exposed to more and/or different experiences with MRTs who share commonalities, such as attending the same school or playing the same sport. If a relationship is more effective, it is likely that a student's learning will be enhanced. The student may be in a more privileged position as a result of the affordances offered. This suggests that curricula, including hidden curricula, may reproduce divisions in society.

Like all curricula, the BHSc (MI) curriculum contains rules, some of which are explicit and others which are not. There is a danger that either the formal or the hidden curricula could be undermined if there is incongruence between the aims of

the two curricula. Therefore, insight into how these processes operate is important in understanding the curriculum in its entirety and how students engage with it. Assessment is likely to be a key constituent of the hidden curriculum and Rowntree (1987) argues that “if we wish to discover the truth about an educational system, we must look to its assessment procedures” (p. 1). For medical imaging students, the assessment criteria that is valued and the way an assessment should be performed might be contained within the hidden curriculum. Students may identify such aspects when learning alongside an assessor or by being involved in the assessment process.

The hidden curriculum can exert a powerful influence on students’ learning, particularly through role-modelling as students become socialised within their profession. As Billett (1995 ) points out guidance will be necessary for students to access “opaque or hidden knowledge” (p. 8) which is important and necessary for practice. Guidance in the form of a partnership to support learning may provide a means for students to access such invisible knowledge.

### **Technology for Learning**

Advances in technology have enabled healthcare professionals to engage in different types of educational experiences. There are numerous available technologies to support a curriculum and it is most probable that new technologies will constantly evolve (Sandars, 2012). Virtual learning environments (VLEs) or learning management systems (LMSs), authentic simulation (including low and high fidelity) and mobile technologies such as personal digital assistants (PDAs) are ways in which the learner can engage differently with learning opportunities. VLEs now mostly use Web 2.0 tools and Web 2.0 technology enables an effortless interaction with others (Sandars, 2012). Doherty (2008) posits that Web 2.0 is characterised by the use of ways to enable collaboration and participation, and incorporates blogs and wikis, for example, to enable interaction with one or more individuals. Further, the sophisticated nature of Web 2.0 allows students to explore case scenarios, which may comprise simulations, test results and images, and employing a wiki would enable the group to discuss the case.

A VLE could be constructed using an e-learning management system such as Moodle in which the learner and/or teachers can interact with each other. E-learning education packages can be developed to provide opportunities for clinical teaching that may be a challenge to implement in the real world of practice. For example, difficulty in accessing a teacher or time pressures for the learners may reduce the contact between teachers and students or trainees (Doherty & McKimm, 2010). Further, it is likely that the unpredictable nature and busyness of a clinical learning environment are potential challenges that learners and teachers may face. For e-learning (for example, VLEs) and m-learning (for example, mobile learning devices such as PDAs), students need to be supported for accessibility and to encourage usage (Doherty & McKimm, 2010; Masters & Al-Rawahi, 2012). Mobile devices provide a marked range of functions including communication, the use of the internet and the inclusion of content such as applications and electronic books. A prime advantage for learners is that they can access a mobile device at any time (Sandars, 2012).

There is evidence to suggest that PDAs are beneficial in supporting learning in clinical settings (Johansson, Petersson, & Nilsson, 2012; Luanrattana, Win, Fulcher, & Iverson, 2012; Ng, 2010). They provide the ability for students to be able to instantly access information, log clinical experiences, set goals and communicate with others, and they can be used for general organisation. Further benefits of using a PDA include enhancing safer care, improved decision making and an increased level of reflection (Hudson & Buell, 2011; Ho, Lauscher, Broudo, Jarvis-Selinger, Fraser, Hewes, Scott, 2009; Masters & Al-Rawahi, 2012; Strayer, Williams, Stephens, & Yew 2008). Ho et al.'s (2009) study, which explored the logging of cases by medical students, demonstrated a greater percentage of cases logged than a paper log. The main disadvantages of using a PDA comprised the small screen size, cost and limited memory (Masters & Al-Rawahi, 2012). Cost was also an issue identified in Hudson and Buell's (2011) study of nursing students. Those who were unable to afford a device missed out on the opportunity of having one to support their learning. Students may well be disadvantaged in these situations if they are required to meet the cost of the device.

PDA's can also be used for assessment of learning in the workplace. Coulby, Hennessey, Davies and Fuller's (2011) study, which explored the use of PDA's for assessment for medical students, identified an improved level of feedback for the students. In addition, PDA's can be used to create an e-portfolio and Garrett and Jackson (2006) have evaluated the introduction of a PDA portfolio tool for reflection. Although this study identified the benefits of the tool, such as the use of the camera and logging event reminders, students preferred to use a desktop computer to record their reflective activities. The reason was not reported, however, this could have been due to the small size of the device. Hence, a device such as a PDA can be used to develop a portfolio for which a number of benefits have been reported. E-portfolios can improve knowledge and understanding as well as enhancing reflection. They provide an opportunity to improve feedback for students. However, entries within a portfolio require a time commitment (Buckley, Coleman, Davison, Khan, Zamora, Malick, & Sayers, 2009).

Although the usability and benefits of PDA's have been reported, authors highlight aspects that need to be considered when using PDA's. Luanrattana et al. (2012) warn that technical aspects such as storing information, ethical issues and systems maintenance and support need to be addressed. Further, careful consideration needs to be given both to how handheld devices are used and to ensure that usage is underpinned by learning theories of "collaboration, contextualisation, constructionism and constructivism" (Patten, Sanchez, & Tangney, 2006). This would suggest that planning students' learning is imperative to ensure that the PDA's are used in the best way to enhance their learning. On the other hand, this could be perceived as educationalising practice (Simons, 2003), which involves complete planning of students' learning rather than allowing some flexibility. Simons (2003) argues that learning should not always be organised in advance; rather, there should be some opportunities for spontaneity.

The benefits of individuals using PDA's to support their learning have been well reported. The PDA offers a variety of functions and a way to shape learning for students (individually and collaboratively) in the clinical setting. Being able to readily access information was highlighted as a key advantage of the device.

## **Summary**

This chapter has explored two key areas that have informed the development of a learning partnership initiative for medical imaging students. The initial part of the chapter provides an explanation of two types of one-to-one relationships: supervision and mentoring. This was followed by a discussion about belongingness, which is likely to be influenced by effective one-to-one relationships.

Important dimensions for an initiative to support learning in the clinical setting include recognising the significance of the relationship for learning, supervisors knowing the students they supervise and ensuring that adequate supervision is provided. The importance of reflection and critical thinking for students' learning has been emphasised by several authors (Baird, 2008; Castle, 2007; Williams & Webb, 1994). Learning for students is likely to be improved if it occurs in a defined framework to support learning.

The latter part of the chapter has focussed on facets associated with engaging with the curriculum; the hidden curriculum and technology for learning. If the hidden curriculum comprises ways in which students' knowledge and actions are constructed beyond their formal learning, a learning partnership may be an effective way for students to learn covert but essential knowledge for practice. The contribution of technology has been discussed in the final part of this chapter. The benefits of VLEs and mobile devices such as PDAs have been elucidated. The benefits and the potential pitfalls for employing PDAs were considered and informed the choice to incorporate this device to support learning in the third action research cycle in this study.

## **Moving Forward from the Literature**

In the previous two chapters, literature has been reviewed to provide insight into some important facets that have informed this action research study. Chapter Two explored educational theory and offered a means to understand the epistemology of teaching and learning in practice in medical imaging. Social learning theories have been discussed and facets have been identified that support the development of a partnership for learning between a novice and a more experienced

practitioner. However, it was argued in this chapter that a sole reliance on educational theory will not suffice to provide an understanding of educational practice in this study. It was anticipated that the contributions of the action research process would inform educational practice through the lens of the 'players' or stakeholders situated in the study.

Chapter Three reviewed two key one-to-one relationships: clinical supervision and mentoring. These have provided a means of informing the development of an initiative to support learning in *Phase Two* of the study. Importantly, a key assumption that has been highlighted is that students' learning will be improved if students are supported by mentors. However, this assumption has not been widely challenged (Andrews, 2007), particularly in medical imaging. *Phase Two* of this study aimed to establish if teaching and learning improved within a learning partnership arrangement.



## CHAPTER FOUR: METHODOLOGY

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### Introduction

The first part of this chapter provides a discussion of the epistemological and ontological assumptions inherent in the theoretical perspective and methodology for the study. This will be followed by a discussion of the origins, emergence and central tenets of action research, and the reasons for selecting the method. The latter part of the chapter introduces two key writers who have informed the analysis chapters within the study. Stringer's (2007) approach has provided the overall framework for this action research study (refer to Chapter Five). However, in addition to utilising Stringer's (2007) process for analysis, other writers were introduced to explore the themes, that emerged from the data, enabling a deeper level of analysis. Some key ideas of Bourdieu (Bourdieu, 1984, 1985), a critical theorist, have been integrated to provide a way to uncover the overarching theme of power that surfaced in the findings of the study. For example, issues and concerns including, constraints, a sense of acceptance by participants that 'this is just how things are', lack of autonomy, and marginalization were revealed during both phases of the study. My grasp of the understandings of Bourdieu's work has been supported by authors such as Mahar, Harker and Wilkes (1990); Maton (2008); Swartz (1997); and Thomson (2008). Their 'once removed' discussion of Bourdieu's work has offered me a more accessible link to the insights emerging from the data. To a lesser extent, Dewey's (1922, 1938) writing has guided the exploration of the principal theme of education that transpired from the data. In its genesis, this thesis was not grounded in the writings of any one philosopher, nor does it pretend to have achieved the philosophical depth of a thesis grounded in critical theory from the outset. Nonetheless, the inclusion of ideas of writers within the analysis stage of the study has provided an additional lens to make meaning of the data.

## **Research Paradigm, and Ontological and Epistemological Assumptions**

A central dimension of research is the identification of the paradigm in which the research is located. The notion of a paradigm or worldview, which fundamentally influences how one sees the world and determines their perspective, developed from the work of Thomas Kuhn's in the early 1960s (Reason & Bradbury, 2001). For researchers, a paradigm identifies the philosophical foundation, which subsequently influences how knowledge is defined and how the research proceeds in relation to the approach, selection of participants and data collection methods. Paradigms are belief systems that hold a particular ontological (nature of the world), epistemological (the grounds for knowledge) and methodological position (Cohen & Manion, 1994). Denzin and Lincoln (2000) point out there are four interpretive paradigms: positivist and post-positivist; constructivist/interpretive; critical; and feminist-poststructural.

The empiricist tradition involves evidence being empirically tested. The researcher records data external to the action and then interprets the data, which is primarily statistical. Positivism is rooted in this tradition (McNiff, 1988). The aim of the positivist approach is the creation of generalisable knowledge that is validated by measurement and achieved by prediction and control. The researcher's position in relation to the setting is neutral and detached (Coghlan & Brannick, 2005). Therefore, a positivist approach was not suitable for this study, which seeks to understand the perceptions and actions of the participants with both the researcher and participants creating understanding and knowledge together. In addition, McNiff (1988) argues such an approach for educational research would involve answering the questions of the researcher, rather than those involved.

The interpretive or constructivist paradigm, which aims to address multifaceted dimensions of human behaviour, developed in the middle of the twentieth century (Cohen & Manion, 1994). Whereas the methods of the empiricist tradition involve quantitative measurements, the interpretive approach comprises mostly analysis of qualitative data (McNiff, 1988). Further, a positivist approach maintains there is

a single reality. Denzin and Lincoln (2000) establish that the central tenets of this paradigm are:

- A relativist ontology (there are multiple realities): the adoption of ontological position of relativism, that is, realities are presented as multiple constructions, socially and experientially based
- A subjective epistemology (knower and respondent co-create understandings)
- A naturalistic set of methodological procedures (p. 21).

The initial aim of this study was to develop an understanding of the experiences of learning for medical imaging students and how their experiences are supported and negotiated as they develop their professional capacities. Subsequently, an initiative was designed in response to the understandings that emerged in the first part of the study. In both parts of the study, the perceptions and actions of the participants have been explored to identify ways to contribute to the improvement of teaching and learning for medical imaging students. Hence, the focus is about the development of new knowledge, improvement and change to enhance teaching and learning for teachers and students, respectively. From an interpretivist perspective, knowledge is socially constructed (Hinchey, 2008). Although the constructivist/interpretive paradigm formed the foundation for the initial part of this study, dimensions related to inequalities, injustice and marginalisation emerged from the data so there was a need to draw on critical theory to explore these issues. Critical theory which developed out of the 'Frankfurt School' in the early twentieth century focussed attention on challenging the dominant ideology, inequalities and status quo. Historical realism, which suggests reality has been moulded by "social, political, cultural, economic, ethnic, and gender values" (Guba & Lincoln, 1994, p. 110 ) is the ontological stance for the critical paradigm.

Whitehead and McNiff (2006) explain that "ontology refers to a theory of being, which influences how we perceive ourselves in relation to our environment including other people" (p. 22). My personal ontological position focuses on a social world that is continuously constructed by interactions between people. This position encouraged me use action research to enable participants to offer various perceptions, explanations, descriptions and understandings, contributing to

constructing a reality. My ontological stance has also been influenced by the critical paradigm. In addition to the participants' contributions, I have been able to use a critical lens to explore the issues at a deeper level, to 'make the invisible, visible' and to identify constraints and inequalities with regard to the education of medical imaging students.

Epistemology refers to "a theory of knowledge (what is known) and a theory of knowledge acquisition (how it comes to be known)" (Whitehead & McNiff, 2006, p. 23). My epistemological position has been influenced by my ontological stance as I maintained that the knowledge about teaching and learning for medical imaging students would be best created with others through interactions with the 'teachers' and 'learners'. Further, as the researcher, I have attempted to understand the complexities of teaching and learning by uncovering assumptions, the 'taken for granted' and inequalities embedded in medical imaging education practice.

Therefore, identifying the paradigm (in particular, ontological and epistemological positions) helps to justify the selected methodology. Action research was the approach chosen for this study, as the participants were a central and significant part of exploring existing knowledge and creating new knowledge as understandings emerged.

## **Action Research**

Action research involves a robust union of participation, action and research with an intention to "improve the participants' situation" (Greenwood & Levin, 2007, p. 3). The key aim of action research is to foster change and improvement through the generation of "spiralling cycles of research and action to address new or emerging issues" (Cardno, 2003, p. 1). In essence, it is concerned with events that are significant for stakeholders. The participants are pivotal to the research process and the researcher and participants work with each other towards achieving improvement. Kemmis and McTaggart (1988, p. 5) claim:

*Action research is simply a form of self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own practices, their*

*understanding of these practices, and the situations in which these practices are carried out.*

Hence, individuals and groups can examine and reflect on their own practices with the intention to improve their current practice.

### **The Emergence of Action Research**

The central tenets of action research are best understood by first discussing the development of this approach. The emergence of action research has been shaped by various movements, which have been outlined by McKernan (1996) and are summarised in Table 2. An initial movement, the Science in Education Movement emerged in the nineteenth and early twentieth century. This development was characterised by the application of the scientific method to education. The next association which contributed to moulding action research was the work of John Dewey, an American philosopher, “who applied the inductive scientific method of problem solving as a logic for the solution of problems in such fields as aesthetics, philosophy, psychology and education” (McKernan, 1996, p. 8). In 1933, Dewey identified stages of reflective thinking and, as his work developed, he argued the need for education to be a collaborative process. Dewey posited the need for “democratic communities” (Holly, Arhar, & Kasten, 2005, p. 7), suggesting that ‘all’ should be responsible for learning.

Following Dewey, John Collier used the term ‘action research’ in the 1930s and early 1940s for his research concerning the relations between white and native Americans. Collier argued that participative research was vital for improving the relationships between ethnic groups (Passmore, 2006). Around a similar time, action research appeared to emerge through the works of a social psychologist Kurt Lewin (Coghlan & Brannick, 2005; Elliott, 1991). Lewin’s approach to action research comprised a series of spirals consisting of planning, action and evaluation (Kemmis & McTaggart, 1988). During the 1950s and early 1960s, the action research approach was employed for investigations in industry. It developed in the United States of America (USA) at the Massachusetts Institute of Technology (MIT) and in the UK at the Tavistock Institute (McKernan, 1996).

Corey, a curriculum theorist prominent at this time, was interested in how action research could influence change and improvement in curriculum development (Holly et al., 2005). However, the end of the 1950s saw the decline of action research and it became subject to criticism. The decline was thought to be due to a split between science and practice. It resulted in teacher researchers being separated from teaching and therefore not allowed the opportunity to study issues in the field (McKernan, 1996).

**Table 2. The Emergence of Action Research**

Late 1800s/Early 1900s	<ul style="list-style-type: none"> <li>• Science in Education Movement</li> <li>• Scientific method applied to education</li> </ul>
1930s John Dewey	<ul style="list-style-type: none"> <li>• Applied inductive scientific approach of problem solving to various fields including education</li> <li>• Stages of reflective thinking were important for Dewey</li> </ul>
1930s and early 1940s John Collier	<ul style="list-style-type: none"> <li>• Used action research for studies concerning the relations between white and native Americans</li> </ul>
Mid 1940s Kurt Lewin	<ul style="list-style-type: none"> <li>• Used action research to examine groups experiencing problems</li> <li>• Approach involved a series of spiralling steps of planning, acting, observing and reflecting</li> </ul>
1950s and 1960s MIT and Tavistock Institute	<ul style="list-style-type: none"> <li>• Action research approach was used for investigations in industry</li> </ul>
1953 Stephen Corey	<ul style="list-style-type: none"> <li>• Promoted the use of action research in education and improving curriculum design</li> </ul>
Late 1950s	<ul style="list-style-type: none"> <li>• Decline of action research</li> </ul>
1960s Lawrence Stenhouse	<ul style="list-style-type: none"> <li>• Teacher-researcher movement, emphasising the need for teaching to be based on research</li> </ul>
1970s John Elliott	<ul style="list-style-type: none"> <li>• Emphasised the importance of practitioners examining their own practices using a self-reflective process</li> </ul>
1980s Donald Schön	<ul style="list-style-type: none"> <li>• Posited a technical-rational approach to professional education could not resolve practitioners' 'messy problems'</li> <li>• Emphasised the importance of reflection for practitioners</li> </ul>
Late 1980s Carr and Kemmis	<ul style="list-style-type: none"> <li>• Critical theory and educational research</li> </ul>

The teacher-researcher movement, which emerged from the UK during the 1960s, also played a role in shaping action research (McKernan, 1996). This was a turnaround from the previously discussed approach that resulted in teachers and researchers being separated. Stenhouse (1975), who was central to the teacher-researcher movement, asserted that all teaching should be informed by research. Further, he argued that research and curriculum development are central to a teacher's practice and "that the curriculum is a means of studying the problems and the effects of implementing any defined line of teaching" (Stenhouse, 1975, p. 143). In the 1970s, John Elliott was involved in a project (the Ford Teaching Project, 1972-1974) that supported teachers to examine their own practices, with self-reflection being a central part of the process (McKernan, 1996).

The development of reflective practitioners was also promoted by Schön (1983) during the 1980s. He argued that the predominance of a technical-rational approach to professional education did not provide the opportunities for practitioners to resolve the 'messy problems' that they are frequently confronted with. Further, Schön posited that the routinised work of professionals is largely tacit, that is, decisions and judgments are made without thinking. He highlighted that learning occurs when professionals reflect on their tacit knowledge and advocated the process of reflection-in-action (Schön, 1983, 1987).

In the latter 1980s, Kemmis and Carr advocated critical theory and educational action research in a newly published book, *Becoming critical: Education, knowledge and action research* (McKernan, 2008). Kemmis and colleagues have employed this type of research at Deakin University in Australia to explore not only advances and originality in their own practice but also to examine and intervene in institutional policies related to teaching such as student assessment, curriculum development and evaluation (Kemmis, 2006). In addition to improving outcomes, this approach allows participants to find meaning and overcome constraints, and encourages practitioners to critique their situation. Cardno (2003) posits that a key aim of critical action research is to expose "disempowerment and injustice created in industrialised societies and by social class, gender and ethnicity" (p. 7).

Throughout the development of action research, the notions of collaboration, participation, democracy and reflective thinking have been emphasised. With the exception of the brief decline in action research during the 1950s, the vital importance of teachers being researchers, that is, researching issues or problems within their own fields, has been strongly advocated. In my role as a medical imaging educator, action research has provided me with a valuable means to explore the issues for learning and teaching for students and MRTs, respectively.

### **The Central Tenets of Action Research**

The central tenets that underpin action research have influenced the selection of this method for my study. The key principles include the cyclical nature of action research; responsiveness and flexibility; participation and collaboration; improvement of practice and reflection (Cardno, 2003; Dick, 2002; Kember, 2000; Kemmis & McTaggart, 1988; McNiff, Lomax, & Whitehead, 2010; Reason & Bradbury, 2001; Stringer, 2007).

### ***Cyclical Nature of Action Research***

Action research involves iterations of stages or cycles in which a problem is defined, an action is planned, and the action is then performed and evaluated (Coghlan & Brannick, 2005; Dick, 2002; Kemmis & McTaggart, 1988). Hence, action research develops through a self-reflective spiral of planning, action, observation and evaluation (Cardno, 2003; Kemmis & McTaggart, 1988). Adjustments are made during the cycles of action research and it is usual for a study to move through two or more cycles (Dick, 2002; Kember, 2000). The cyclical nature of action research has enabled the participants and the researcher in this study to develop, implement and evaluate an initiative to support the facilitation of learning. A method that comprises a self-reflective cyclical approach allows adjustments to be made by those involved as the process evolves (Dick, 2002). Movement through the stages and cycles is systematic; however, it is able to accommodate random surprise elements within its method (McNiff, 1988) which leads to an additional tenet of action research.



### ***Responsiveness and Flexibility***

Action research is responsive and flexible, which is enabled by the cyclical nature of the process. It needs to be able to respond to emerging changes during the process (Dick, 2002). The selection of an approach that allowed flexibility was of key importance for this study. For example, the design of a teaching and learning strategy for *Phase Two* of this study could not be established until the main issues associated with teaching and learning had become known in the initial study phase. Further, clarification of appropriate participants occurred as the study progressed and data emerged. Subsequently, appropriate individuals were invited to participate. For example, when student participants identified in the initial stage of the study that the key challenges related to teaching and learning were of a clinical nature, then the most appropriate participants were invited to participate in the second phase of the study, namely Year One students and MRTs. Action research emerges as an evolutionary and developmental process (Reason & Bradbury, 2001) so it aligned well to address the two key aims in each phase of this study.

A responsiveness and flexible approach enabled a mini or 'spin-off' cycle to be incorporated in the study. As Cardno (2003) points out, as action research is a dynamic process, there is a chance that the participant group may explore an issue that emerges during the study. A mini or 'spin-off' cycle was conducted by two MRT participants in response to the favourable outcomes observed during the first action research cycle. The MRT participants were responsible for key areas within the radiology department. They had observed the benefits of the learning partnership for the students and therefore set up a 'buddy system' to ensure all students (in each year of the programme) were paired to work alongside an MRT in their areas.

### ***Participation and Collaboration***

Action research is participative and collaborative (Cardno, 2003; Dick, 2002; Kember, 2000; Kemmis & McTaggart, 1988). Action research is "only possible *with, for and by* persons and communities, ideally involving all stakeholders both in the questioning and sense making that informs the research, *and* in the action which is the focus" (Reason & Bradbury, 2001, p. 2; italics in original). The benefits

to participants of being involved in an action research study are apparent in consideration of the dual aims outlined by Reason and Bradbury (2001). Firstly, it aims to generate knowledge and action useful to a group of people. Secondly, it aims to “empower people at a second and deeper level through the process of constructing and using their own knowledge” (p. 1). Therefore, as Reason and Bradbury (2001) posit action research is concerned with the production of knowledge that will be useful in people’s day-to-day lives. It is not limited to the development of new practical knowledge, as it also leads to “new abilities to create knowledge” (Reason & Bradbury, 2001, p. 2). Nevertheless, action research allows individuals to “negotiate their meaning with other knowing individuals” (p. 29). Participation is fundamental to action research and Reason and Bradbury (2001) argue that the interests of those directly concerned are central to the practical and theoretical outcomes of the research.

Further, in relation to the participative nature of this approach, the importance of the group in action research is ardently argued by Kemmis and McTaggart (1988) who maintain that if an individual, rather than a group, moves through the cycles of action research, then it is not action research. However, with regard to the individual, action research also has a part to play. As well as changing the culture of groups it may also change individuals (Kemmis & McTaggart, 1988). Since the participants are a pivotal part of the research process, action research is about “research *in* action, rather than research *about* action (Coghlan & Brannick, 2005, p. 4; italics in original). Action research contributes to human emancipation and flourishing of the community to “lead us to different ways of being together, as well as providing important guidance and inspiration for practice...” (Reason & Bradbury, 2001, p. 2). The powerful component of action research is that practitioners will have gained some insight as to how they can influence the future (McNiff, Lomax, & Whitehead, 2010).

The participative nature of action research was a significant reason for selecting this approach. Stringer (2007) outlines that action research allows those affected by an issue, a means of exploring it to gain an enhanced understanding. New understandings may then assist individuals to find effective solution/s to the problem. Lecturers, MRTs, and Year Two students were key participants during

data collection in *Phase One*. In *Phase Two*, MRTs and Year One students participated in the development, implementation and evaluation of a learning partnership initiative.

At the commencement of the study the type of initiative to be designed was unknown. However, the concept emerged from data collected in the initial phase of the study. Whether the strategy was to be designed in the academic or clinical setting, it was imperative that participants were part of the development in order to gain their 'buy in'. Further, I intended to employ an approach that would empower participants by construing knowledge that would be useful for their daily practice (Reason & Bradbury, 2001). A key intention of the study was to contribute to improving learning, and action research allowed the testing of ideas to try and improve aspects of practice (Kemmis & McTaggart, 1988).

### ***Improvement of Practice***

A fourth tenet of action research is its key aim of improving practice (Cardno, 2003; Elliott, 1991; Kember, 2000; Kemmis & McTaggart, 1988). In their definition of action research, Kemmis and McTaggart (1988) posit "the linking of the terms 'action' and 'research' highlights the essential feature of the approach: trying out ideas in practice as a means of improvement and as a means of increasing knowledge about the curriculum, teaching and learning" (p. 6). In addition to the aim of improving practice, if appropriate, action research may also involve instigating a change or changes in the setting in which the practice occurs (Zuber-Skerritt, 1990). Action research has been succinctly defined by Elliott (1991) as "the study of a social situation with a view to improving the quality of action within it" (p. 69). When the strategy of change for improvement of practice has been implemented, it needs to be evaluated to determine its success "in making a difference to practice" (Cardno, 2003, p. 18). A key aim of this study was to develop an initiative that would improve teaching and learning for MRTs and medical imaging students, respectively, and therefore instigate a change and improve practice (Zuber-Skerritt, 1990). Participants in the study were encouraged to reflect and explore aspects of teaching and learning during the development of the initiative with the intention of improving the support for teaching and learning in the clinical setting.

## ***Reflection***

The importance of reflection is a further central tenet of action research. It is emphasised by Dick (2002) that the processes and outcomes of each cycle should be critically reflected upon. It is the combined reflection about processes and outcomes that Schön has referred to as reflective practice, and others including Elliott have coined the term action research (Elliott, 1991). Action research involves an approach in which research and action are intertwined and are occurring together (Dick, 2002). Therefore, action research is about working towards practical outcomes and the emergence of new understandings through action and reflection (Reason & Bradbury, 2001). This may lead to new thinking and issues, which will establish a trigger for another cycle of investigation to be evaluated and reflected on.

Action research has allowed participants to reflect on the ideas that they have tried out. To be able to explore the nature of issues associated with teaching and learning, action research has provided the opportunity for participants to ‘unpack’ and make meaning of their experiences. In turn, this has encouraged the emergence of new understandings for the participants through the processes of action and reflection (Reason & Bradbury, 2001).

The cyclical nature and flexibility of this approach and the importance of participation and collaboration, together with reflection with the view of improving practice, have been central considerations for the selection of an action research approach for this study.

## **Guiding and Informing the Analysis**

As the data emerged two key authors were introduced to enable a deeper exploration and analysis of the data. Various authors’ (Mahar et al., 1990; Maton, 2008; Swartz, 1997; Thomson, 2008) understandings of the works of Pierre Bourdieu assisted to ‘unpack’ an overarching theme of power that became evident in the data. Hence the critical nuance of action research has been strengthened by Bourdieu. To a lesser extent, the writings of John Dewey guided the analysis of a key theme related to education.

## Critical Lens

Although a framework provides both structure and guidance for research, Carr (2006) has suggested that a methodological approach may be constrictive. He promotes a non-methodological approach to action research and argues that methodology embedded with rules and concepts restrains the development or improvement of praxis “by concealing both its historical and cultural embeddedness” (p. 433). Carr (2006, p.433) maintains:

*Practical knowledge and understanding can only be developed and advanced by practitioners engaging in the kind of dialogue and conversation through which the tradition-embedded nature of the assumptions implicit in their practice can be made explicit and their collective understanding of their praxis can be transformed”.*

Hence, open dialogue within communities will enable assumptions that are historically and culturally established in practitioners’ practice to be examined through an approach to research that can encourage historical consciousness (Carr, 2006). The inclusion of the ideas of some key writers has helped me to explore and make meaning of assumptions revealed in the data.

Early critical theorists including Horkheimer, Adorno and Marcuse were concerned with the predominant influence of positivist science (Carr & Kemmis, 1986). They argued “science’s role had become one of legitimating social action by providing ‘objective facts’ to justify courses of action” (Carr & Kemmis, 1986, p. 132). Habermas’ (1971) theory of knowledge-constitutive asserts that knowledge emerges from activities influenced by the interests of human beings. Therefore, interests shape knowledge formation (Carr & Kemmis, 1986). Habermas’ interests comprise technical, practical and emancipatory domains. The technical interest is related to empiric-analytic science and “is the interest of human beings in acquiring knowledge that will facilitate their technical control over natural objects” (Habermas, 1971, p. 135). The practical interest produces knowledge for understanding. The third interest, the emancipatory interest, is concerned with humans being able to be “self-reflective and self-determining” (Kendall, 1992, p. 6). The emancipatory interest underpins critical social science (Carr & Kemmis, 1986). Kemmis’(2006) research group identified different types of action research in relation to Habermas’ knowledge-constitutive interests. They recognised that a

significant amount of action research exhibited a technical approach and the research was seen to be favourable if the goals were met. A practical form of action research involves both improving practices and helping practitioners see how their goals are shaped in relation to understanding their position in context. Critical or emancipatory research involves practitioners critiquing the setting in which they work. They can attempt to develop an understanding of how historical, cultural and social dimensions influence the setting (Kemmis, 2006).

The inclusion, involvement and contribution of participants, supports a critical approach for action research. The action research process enabled MRTs, clinical tutors, medical imaging students and me as the researcher an opportunity to understand and uncover the constraints within the context of medical imaging education. Further, it has allowed the researcher and participants to explore the current situation in relation to the experiences of learning and teaching for students and MRTs, respectively. The participants have had the opportunity to voice their ideas and perspectives. The process has been empowering as participants were positioned to contribute to a change for improvement of practice. This is similar to a practical action research approach identified by Kemmis (2006). Although the study has enabled the participants to provide their perspective and highlighted issues and constraints, they have not been involved in a deeper critical analysis of the issues. This has been undertaken by me as the researcher. In other words, while I was seeking 'change' in a co-participatory way, I did not engage the participants to critically explore issues; rather, this was carried out by me in writing this thesis.

### ***Pierre Bourdieu***

Within this study, the notion of power became clearly evident through the categorising and coding of the data (Stringer, 2007) and the interactions and movement of MRTs, clinical tutors and students within the *field* of clinical practice. The relationship between power and knowledge is a central tenet for critical theorists and acts to question the 'taken for granted' and to uncover distortions of reality at a societal, institutional or an individual level (Cheek, Shoebridge, Willis, & Zadoroznyj, 1996). Using a critical theory approach, Bourdieu's concepts of *field*, *habitus* and *capital*, which were developed in the 1960s (Robbins, 2008) and

defined by Bourdieu in 1977, provide a way of understanding the social world (Thomson, 2008). Therefore, in this study, the concepts of *field*, *capital* and *habitus* have been used to develop an understanding of power that has been evoked as a result of the interactions and movements of those in the *field* (students, MRTs and clinical tutors). *Field*, *habitus* and *capital* help to understand the position and practices of individuals in a *field*. Further,, Bourdieu's (Bourdieu, 1984; Maton, 2008; Swartz, 1997) theory of practice explains how practice emerges from the combination of *field*, *habitus*, and *capital*. In addition to *field*, *capital* and *habitus* Bourdieu has introduced a number of other terms (*doxa*, *illusion*, *practice* and *symbolic violence*).

A *field* is a dynamic concept comprising a field of forces (Mahar et al., 1990). A *field of forces* is characterised by tensions when people and groups interact. Hence, within a *field* that is characterised by conflict, practices happen (Swartz, 1997). The relationship between *fields* is important; one *field* can affect adjacent fields. A struggle within a *field* occurs between those in dominant and subordinate positions. Of interest to Bourdieu is the tension between those agents who are already positioned in the *field* and newcomers. The tensions created by newcomers have also been explored by Lave and Wenger (1991). The tensions occur because of "the different ways in which old-timers and newcomers establish and maintain identities conflict and generate competing viewpoints on the practice and its development" (Lave & Wenger, 1991, p. 115). The configuration of a *field* is relational, so if one position moves within the *field* then all other positions are affected (Swartz, 1997). Social space is an important aspect of *social fields*. Thomson (2008, p. 8-9) explains:

*A social space may be conceived as comprising multiple fields which have some relationship to each other, and points of contact. The social space of the individual is connected through time (life trajectory) to a series of fields, within which people struggle for various forms of capital.*

People can occupy a common *social space*, which Bourdieu called the *field of power*. The *field of power* comprises many *social fields* such as "the economic *field*, the education *field*, the *field* of the arts, bureaucratic and political fields, and so on" (Thomson, 2008, p. 70). The relationship between *fields* is important, for example,

the type schooling individuals experience in the education *field* may determine how they are positioned in the economic *field* (Thomson, 2008). Within this study, the education *field* is significant as students are enrolled in an education programme, to pursue the quest to become a registered MRT, which will also determine their position in the economic *field*. As a medical imaging student progresses through the programme, his/her *social trajectory*, that is, the pathway an individual takes over time that is influenced by the volume and structure of his/her capital (Bourdieu & Wacquant, 1992), will change.

*Doxa* is an important concept within a *field* and,

*“...refers to pre-reflexive, shared but unquestioned opinions and perceptions mediated by relatively autonomous microcosms (fields) which determine “natural” practice and attitudes via internalised “sense of limits” and habitus of the social agents in the fields” (Deer, 2008, p. 120).*

*Doxa* is the set of values and discourses that are rules of play in the *field*, and therefore, *doxa* is embedded in the *field* and defines the *field*. Further, the concept of *doxa* suggests that both the established agents and the newcomers in the *field* “share a tacit acceptance that the *field* of struggle is worth pursuing in the first place” (Swartz, 1997, p. 125). The analysis for this study demonstrates the introduction of newcomers (students) into the *field* had a noticeable influence on the *field*. Each *field* produces a type of *illusio* that Bourdieu recognises as “the sense of investment in the game and the outcome, interest in the game, commitment to the presuppositions – *doxa* – of the game” (Bourdieu, 1990, p. 66). At any moment, the structure of the *field* is defined by the forces created between the players (Bourdieu & Wacquant, 1992).

Bourdieu asserts that a social *field* comprises people or institutions (social agents) and that social agents have a position in the *field*. There is competitiveness within the *field* as agents maintain or improve their position (Thomson, 2008). *Capital* influences the position of those within a field. For Bourdieu, power that results from the interplay of *capital* within each *field* is the centre of social life (Swartz, 1997).



Bourdieu (Thomson, 2008, p. 69) defined four types of *capital*:

- economic (money and assets);
- cultural (e.g. forms of knowledge; taste, aesthetic and cultural preferences; language, narrative and voice);
- social (e.g. affiliations and networks; family, religious and cultural heritage) and
- symbolic (things that stand for all other forms of capital and can be 'exchanged' in other fields, for example, credentials).

The analysis of data in this study shows the influence of *capital* and the resulting power evoked on the players in the *field*. For example, clinical tutors hold significant *symbolic* (qualification and experience), *cultural* (knowledge and medical imaging language) and *social* (networks and affiliations within the clinical setting) *capital*. Conversely, analysis of the data has shown the effect on MRTs of having less *capital* (particularly, *cultural capital*) within the *fields* they occupy.

Bourdieu's concept of *capital* and how power is evoked within a *field* allow the recognition of the tensions between individuals, groups and organisations. The analysis of data in Chapters Six (*Phase One*) and Eight (*Phase Two*) has revealed such tensions. In a significant paper titled, *The social space and the genesis of groups*, Bourdieu (1985) argues that it is vital to consider that a *social field* is not influenced only by *economic capital*. That is, he posited power and equality should not be conceived from a solely materialistic view but rather the concepts of *cultural*, *social* and *symbolic capital* should also be considered, as power and dominance emerge from cultural, social and material resources (Crossley, 2008).

*Symbolic capital* includes factors such as, physical strength and wealth which leads to others paying attention to those who possess such attributes (Bourdieu, 1998). Groups, such as families and tribes, possess *symbolic capital*. Using *symbolic* power against another implies *symbolic violence*. *Symbolic capital* engenders a sense of duty and inferiority in others who look up to those who have that power. Further, *doxa* can also be thought of as misrecognised forms of *symbolic* power that support the inherent logic of practice and the relationships of those within the field (Deer, 2008). The notions of misrecognition and *symbolic violence* are intertwined. Individuals may be exposed to *symbolic violence*, for example, treated as inferior or

halted in achieving their aspirations. However, individuals' perceptions of such situations are skewed as they see that it is just the way things are.

Hence, individuals, groups and institutions that have accumulated *capital* (for example, qualifications and experience) have a strong position within the *field* and a *field* has an unequal distribution of *capital*. Bourdieu argues *capital* influences domination (Mahar et al., 1990). Analysis of the data has revealed the unequal distribution of *capital* between clinical tutors, MRTs and students. However, as students progressed within the partnership to support learning (*Phase Two*) they acquired *capital* and enhanced their position in the *field*.

Polkinghorne (2004) argues that Bourdieu's "personal stamp on practice theory" is through the concept of *habitus* and Bourdieu asserts that "practices are the consequence of interaction between an individual's historically developed dispositions (*habitus*) and a specific field of contention" (p. 59; italics in original). Hence, there is a symbiotic relationship between *habitus* and *field*, that is, they exist in relation to each other. An individual's *habitus* develops from interactions with and socialisation through family and friends and one's *habitus* influences the way an individual interacts with the world and others. *Habitus* is portrayed by how one thinks, speaks and presents him/herself, for example, and "it captures how we carry within us our history, how we bring this history to our present circumstances, and how we then make choices to act in certain ways and not others" (Maton, 2008, p. 52). Within a group, the *habitus* of each individual is comparable to other members of the group as they have similar experiences. Similar behaviour within a group suggests that individuals follow similar internalised social rules (Polkinghorne, 2004). Therefore, *habitus* is individual as it comprises attributes such as personal values, traditions, culture and beliefs but is cultivated through learning and socialisation (Rhynas, 2005). *Habitus* therefore influences how individuals and groups engage in practice.

Structured structures and structuring structures are two central features of *habitus*. *Habitus* is the outcome of early socialisation encounters in which external structures are internalised. *Habitus* "adjusts aspirations and expectations according to the objective probabilities for success or failure common to the members of the same class for a particular behaviour" (Swartz, 1997, p. 105). For

example, the likelihood of success or failure is internalised and then changed into individual expectations. *Habitus* sets limits for what is and is not possible and for a particular group (structured structures). Subsequently, the expectations or aspirations are externalised in action, therefore reproducing objective structures. Hence, what is likely or unlikely for a group develops through socialisation. Reflexivity can help individuals to make sense of their situation. Bourdieu (Swartz, 1997) emphasises the importance of reflexivity, that is, a comprehensive practice of self-critique.

The relationships of the concepts discussed above need to be demonstrated to understand Bourdieu's theory of practice. Bourdieu (1984, p. 101) explains the relationships by using an equation:

$$[(\text{Habitus}) (\text{capital})] + \text{field} = \text{practice}$$

Practice emerges from the interactions between an individual's *habitus* and their position in the *field* (*capital*) in the current context of the *field* (Maton, 2008). Therefore, "practices are thus not simply the result of one's *habitus* but rather of *relations between one's habitus and one's current circumstances*" (Maton, 2008, p. 52; italics in original). Hence, when there is an interaction between *habitus* and *field*, the resulting action will be indicative of the "structure of that encounter" (Swartz, 1997, p. 141). Practice, therefore, is not solely influenced either by *habitus*, *capital* or *field* but rather, it is the blend of these entities that forms practice.

Practice that emerges as a result of the interactions between an individual's *habitus* and their position in the *field* may contribute to reproduction. Reproduction is the unconscious transferring of behaviours from one generation to the next without questioning their relevance. Bourdieu was interested in understanding and demonstrating how inequalities in the education system in particular are perpetuated (Swartz, 1997). Education is a key method of transferring this power in social reproduction and leads to a transfer of specific beliefs and behaviours that assume *symbolic capital*. As demonstrated in the analysis of data in this study, medical imaging students learn from others to

reproduce behaviours recognised as successful. A summary of Bourdieu's notions are included in Table 3.

**Table 3. Bourdieu's Terminology Defined**

<b>Term</b>	<b>Definition</b>
<i>Field</i>	Is a dynamic concept comprising a field of forces (Mahar et al., 1990). A <i>field of forces</i> is characterised by tensions when people and groups interact (Swartz, 1997). The relationship between <i>fields</i> is important; one <i>field</i> can affect adjacent fields.
<i>Habitus</i>	An individual's <i>habitus</i> develops from interactions with and socialisation through family and friends. One's <i>habitus</i> influences the way an individual interacts with the world and others. <i>Habitus</i> is portrayed by how one thinks, speaks and presents him/herself, for example, and "it captures how we carry within us our history, how we bring this history to our present circumstances, and how we then make choices to act in certain ways and not others" (Maton, 2008, p. 52).
<i>Capital</i>	Bourdieu (Thomson, 2008, p. 69) has identified four types of capital: <ul style="list-style-type: none"> <li>• economic (money and assets);</li> <li>• cultural (e.g. forms of knowledge; taste, aesthetic and cultural preferences; language, narrative and voice);</li> <li>• social (e.g. affiliations and networks; family, religious and cultural heritage)</li> <li>• symbolic (things that stand for all other forms of capital and can be 'exchanged' in other fields, for example, credentials).</li> </ul> Bourdieu's concept of <i>capital</i> and how power is evoked within a <i>field</i> allow the recognition of the tensions between individuals, groups and organisations.
<i>Doxa</i>	Is the set of values and discourses that are rules of play in the <i>field</i> , and therefore, <i>doxa</i> is embedded in the <i>field</i> and defines the <i>field</i> (Swartz, 1997).
<i>Illusio</i>	Is an individual's interest and investment in 'the game' (Bourdieu, 1990)
<i>Practice</i>	Practice emerges from the interaction of an individual's <i>habitus</i> and their position in the <i>field (capital)</i> (Maton, 2008).
<i>Symbolic Violence</i>	The use of power ( <i>capital</i> ) to dominate individuals. Symbolic violence may be misrecognised (Swartz, 1997).

In addition to Bourdieu's work guiding the analysis in each phase of this study, Dewey offers a means to understand interactions in learning, the influence of the curriculum, and the relationship of habits, impulses and intelligence.

### ***Dewey on Education***

A broad, key theme that emerged from the data in this study was education; hence, some of Dewey's ideas have been used to during the analysis of the data. John Dewey (1959-1962), an American philosopher, educator and reformer proposed some significant educational theories. He argued the value of a progressive

education in contrast with traditional education, the latter emphasising the centrality of experience in education. He was particularly interested in the learner's social world and their interactions in learning (Dewey, 1938). In fact, Dewey (1938) emphasised the importance of the significance of experience of education some decades ago and was probably considered by traditionalists of education to be presenting a radical viewpoint. However, many of the aspects he has posited are relevant to current thought in education.

The influence of the curriculum was also important to Dewey and he argued the need for the learners' experiences to be integrated within the curriculum (Dewey, 1922; Dewey, 1938). He contended that a direct correlation cannot be made between experience and education as some experiences are "mis-educative" (Dewey, 1938, p. 13) and could hinder the development of expanding and advancing experience. Therefore, the quality of the experience is imperative. For experiences to have an educative value, there must be growth, with each experience feeding into the next. Choosing experiences that transpire into future experiences is a challenge but an important consideration for educators as they are able to help select these types of experiences (Dewey, 1938). Educators are in a position to judge which experiences facilitate and impede growth. In addition to the internal nature of an experience for an individual, Dewey asserted the environment must also be taken into account and educators are in a position to recognise dimensions, which contribute to 'growing' experiences. Dewey's ideas about the importance of incorporating students' experiences into the curriculum are central to this study. The key aim of *Phase One* was to develop an understanding of student MRTs' experiences of learning. In *Phase Two*, an initiative was developed to support the facilitation of students' learning. Students were key contributors to the development of the initiative.

Dewey (1922) suggests that our conduct is guided by the intersection of habits, impulses and intelligence. He argues that individuals "pick up our society's habits and customs in much the same way babies pick up language" (p. xii). Further, the social world influences our habits and determines which habits are valuable. Impulses are "spontaneous, natural, and unlearned actions" (p. xiii) and they emerge when established habits become out dated or are in conflict. Impulses,

therefore result in the development of new habits and customs. A combination of habit and impulse is required for observation, memory and judgement. Intelligence is a process by which an individual contemplates various approaches to action in response to problems. Dewey (1922) asserts that the approach to action we employ will be dependent on our reaction to the different courses of action, for example “with pleasure or pain, attraction or aversion” (p. xiii). Hence, in the clinical setting, students are not simply learning skills from MRTs. When MRTs’ habitual actions are not sufficient to complete parts of an examination, impulses may step in to enable them to complete their act. It is likely that students will observe and attempt to try to understand an MRT’s ‘process of intelligence’ when faced with challenges that require some adaptation to their practice.

## Summary

The initial part of this chapter comprises an explanation of ontological and epistemological assumptions, and the history and central tenets of action research. Within this discussion, the suitability of an action research process for this study has been justified. The latter part of this chapter has offered a condensed outline of critical theory as a critical lens was needed to uncover dimensions of a critical nature that emerged from the data. Following this, some key writers have been introduced including Bourdieu (Bourdieu, 1984, 1998, 1990; Bourdieu & Wacquant, 1992; Crossley, 2008; Deer, 2008; Mahar et al., 1990; Maton, 2008; Polkinghorne, 2004; Swartz, 1997; Thomson, 2008) and Dewey (1922, 1938) who have aided the analysis of data (Chapters Six and Eight) in relation to the themes of power and education. Bourdieu’s concepts of *field*, *capital* and *habitus* have been used to inform the analysis. These concepts have provided a valuable way of exploring power that has been evoked as a result of interactions between the key players (MRTs, students and clinical tutors) in the *field*. The significance of Dewey’s work has been discussed in the final part of this chapter and has offered a way of understanding aspects of a broad theme of education that emerged in this study. Important foci for Dewey include students’ experiences and interactions in learning, and the significance of consideration of their experiences within a curriculum. Further, Dewey’s concepts of habits, impulses and intelligence and their connections provide ways to consider the complexity of learning, particularly in non-routine situations. Therefore, the latter part of this chapter builds the

philosophical/theoretical foundation for the analysis that follows in Chapters Six (*Phase One*) and Eight (*Phase Two*).

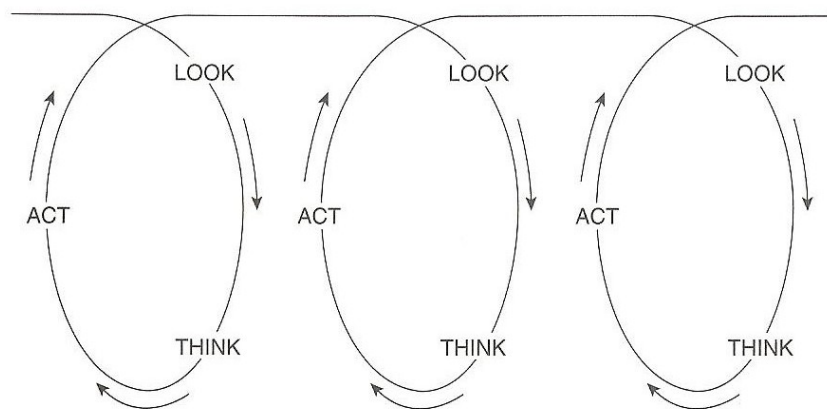
## CHAPTER FIVE: THE METHOD

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### The Action Research Process

This chapter describes the action research process, ethical considerations, selection of participants, methods of data collection, approach to data analysis and measures included to establish rigour in the study.

Action research frequently comprises a cyclical three-, four- or five-step process. Initially the researcher and the participants define the problem and plan the action. The action is consequently performed and evaluated followed by further planning (Coghlan & Brannick, 2005). The approach that guided this study is an adaption of Stringer's (2007) three-step process, the *look-think-act* routine (Figure 1).



**Figure 1: Stringer's *Look-Think-Act* Routine (Stringer, 2008, p. 9)**

As Stringer (2007) maintains although the *look-think-act* routine is a simple process, it is a powerful framework as individuals involved can “commence their inquiries in a straight-forward manner and build greater detail into procedures as the complexity of the issues increases” (p. 8). The first step in the routine, *look* involves gathering data and defining and describing the situation. During the *look*, stage, collected information helps to build a picture by understanding the experiences of those involved (Stringer, 2007). The *look* stage is similar to the *reconnaissance* stage, a term employed by some authors (Cardno, 2003; Elliott, 1991). *Reconnaissance* is a process that establishes what is occurring in the field and provides a means of finding out about the main circumstances. The



*reconnaissance* phase consists of two subdivisions: an in-depth description of the situation and an explanation of the situation.

The second stage, *think*, comprises a period of exploration and analysis. A key question that would be posed at this point is, 'What is happening here?' Interpretation and explanation are also central to the *think* stage to establish how/why aspects of the situation are as they are. It is during the *think* stage that participants share their experiences, enabling insights to be gathered and clarity to be enhanced. This allows participants to work together to construct solutions to address the problem/s. Stringer (2007) argues that "by working collaboratively, participants develop collective visions of their situation that provide the basis for effective action" (p. 67). The *act* stage involves planning/developing, implementing and evaluating. Within each step, and at the end of each step, the participants will observe, reflect and act. Stringer (2007) points out that action research is not necessarily a methodical process, as participants may need to return to a previous point, rethink and revise processes. However, some form of order and direction is provided by a framework such as Stringer's (2007) that encourages the researcher to continuously think, question and reflect.

Following each action research cycle, an evaluation of the cycle occurred to establish the value of the changes that have been made through the action research journey. In this study, a qualitative, reflective approach (rather than a formal evaluation) was employed for the evaluation of each cycle. The question asked at the evaluation stage for each cycle was, 'What was the impact of the intervention on the students, MRTs and education provider?' The evaluation at the end of each cycle was undertaken primarily by the researcher. However, the participants' contributions played an important part and I have taken into account their thoughts, opinions and insights that were presented during the action research meetings. In addition to the evaluation of each cycle, as the researcher, I have offered my personal reflections and insights following each action research cycle.

### **Adjustment to Stringer's *Look-Think-Act* Routine**

In *Phase One* of the study, the *think* stage of analysis occurred following the actions within this exploratory phase (Chapter Six). The *think* stage in *Phase Two* of the

study comprised the participants identifying, interpreting and reflecting on key actions in each action cycle to enable a way forward to the *act* stage. Participants reflected, engaged in dialogue and made decisions about the *act* stage. Therefore, a deeper level of analysis did not occur at this point. An adjustment was made because there was evidence at initial action research meetings of critical issues requiring an in-depth analysis. Therefore, rather than undertaking an in-depth analysis mid-cycle, the analysis for *Phase Two* (Cycles Two and Three) was undertaken at the completion of these action research cycles and is found in Chapter Eight.

### **Phases and Cycles within this Study**

This study had two phases. The aim of *Phase One* was to develop an understanding of the experiences of learning for medical imaging students as they develop their professional capacities. The findings of this phase informed *Phase Two*, which involved the development, implementation and evaluation of an initiative to support teaching and learning. Three cycles of action research were conducted (Figure 2).

*Phase One* encompasses the *look* and *think* stages of the first action research cycle. The formation of a learning partnership in *Phase Two* comprises the *act* stage of the initial action research cycle. In addition, a spin-off cycle emerged from the first action research cycle. Two subsequent cycles followed, each comprising a *look-think-act*-routine: the development of an online platform (Cycle Two) and an e-portfolio using a PDA (Cycle Three). Table 4 provides a detailed timeline for the phases, cycles and activities that occurred within the entire action research process.

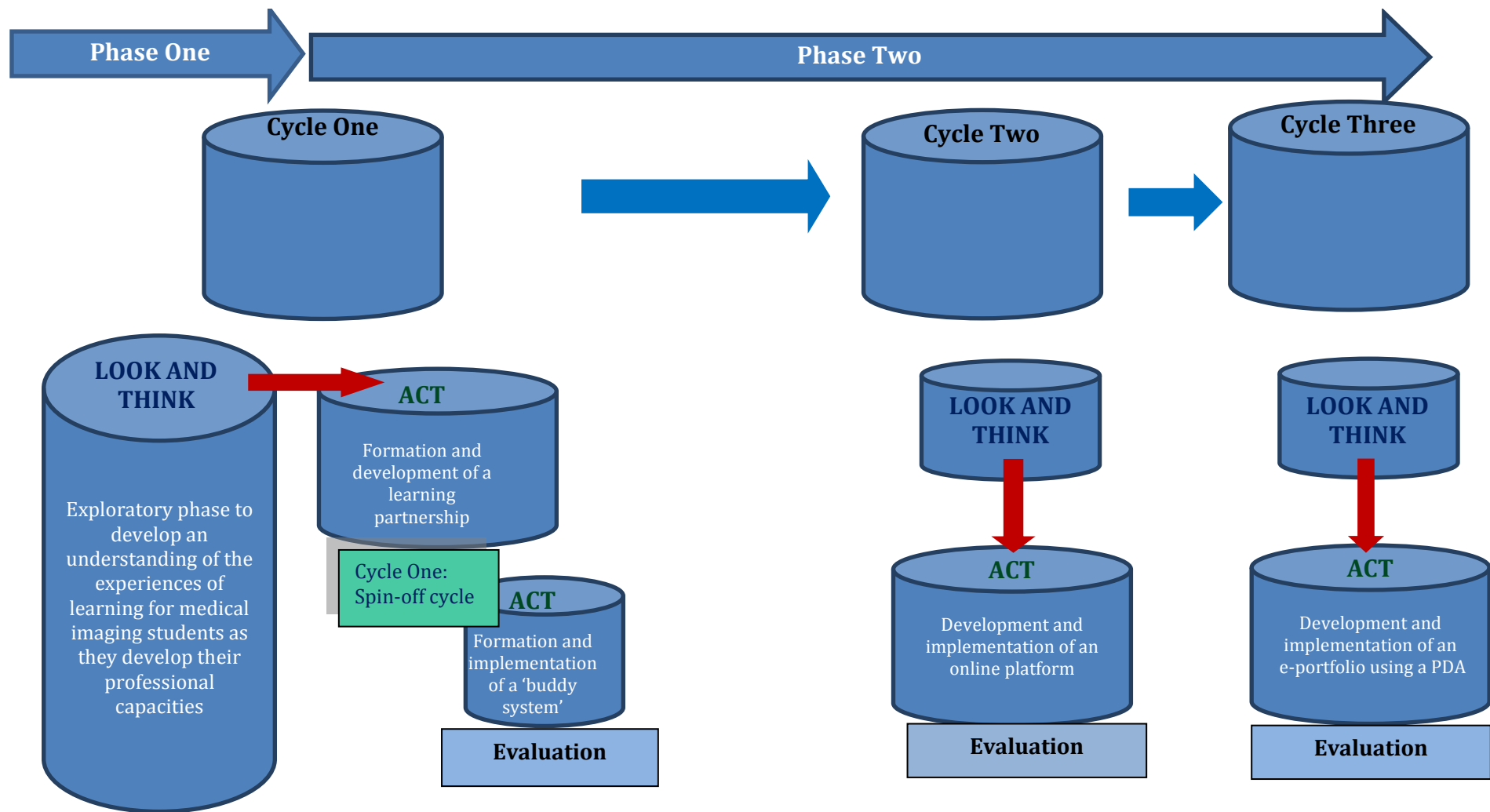


Figure 2. Phases of Study and Action Research Cycles

**Table 4: Timeline for Research Actions and Data Collection**

	Phases and Cycles	Participants	Dates
Understanding Students' Learning Experiences	<b>Phase One</b>		
	<b>Cycle One (Look and Think)</b>		
	Focus Group	Year Two students	7 March 2008 to 31 May 2008
	Observations in classroom with different lecturers	Year Two students / Lecturers	
	Focus Group	MRTs	
	Observations of student/MRT encounters in the clinical setting	Year Two students and MRTs	
	Interviews	MRTs	
	<b>Analysis Phase One</b>		
Development of Learning Partnership Framework	<b>Phase Two</b>		
	<b>Cycle One (Act)</b>		
	Recruitment of MRT and students	MRTs and Year One students	2 April 2009 to 6 July 2009
	<b>Inaugural meetings</b> with MRT and student groups	MRTs and Year One students	
	Identified issues associated with facilitating student learning in the clinical setting		
	Overview of study and action research approach employed for study		
	Broad components of learning partnership identified and discussed		
	<b>Meeting</b> with students	Year One students	
	Discussed the components for an <i>Individual Learning Portfolio</i>		
	Critiqued supervisory framework		
	<b>Meeting</b> with MRT group	MRTs	
	Development and refinement of documentation to support learning partnership, including a <i>supervisory framework</i>		
	<b>Meeting</b> with students	Year One students	
	Confirmed components for <i>Individual Learning Portfolio</i>		
	<b>Meeting</b> with all participants	MRTs and Year One students	
	Learning style/preference questionnaires completed		
	Background questionnaires completed		
	Supervisory framework amended		
	MRT/student partners established		
	Suggested a 'buddy system' could be established (spin-off cycle) in two key areas in radiology department		
	Participants suggested an online platform could be developed to augment the learning partnership		
	<b>Learning Partnership commenced</b>	MRTs and Year One students	
	<b>Implementation of 'buddy system' (mini-cycle)</b>	MRTs and Year One students	
Online Platform	<b>Evaluation Phase One</b>	Researcher and Participants	8 July 2009 to 30 May 2010
	<b>Researcher's Reflections</b>	Researcher	
	<b>Cycle Two (Look, Think and Act)</b>		
	<b>Meeting</b> with advisor from Learning Technology Unit	Learning Technology Unit	
	Decision made regarding E-learning platform (Moodle)		
	<b>Meeting</b> with PACs Advisor		
	Online platform developed over next two weeks	Learning Technology Unit	
	<b>Online platform introduced</b>		
	First posting on Moodle	Year One student	
	<b>Meeting</b> with all participants	MRTs and Year One students	
	<b>Meeting</b> with students	Year One students	
	Suggestions and changes made regarding the documentation students need to complete on Moodle		
	<b>Meeting</b> with MRT participants	MRTs	
	Suggestions made regarding documentation MRTs need to complete on Moodle		
	<b>Meeting</b> with MRT participants to explore engagement with online platform	MRTs	
Introducing PDAs	<b>Meeting</b> with all participants to explore engagement with online platform	MRTs and Year One students	
	<b>Evaluation</b>	Researcher and Participants	
	<b>Researcher's reflections</b>	Researcher	
	<b>Cycle Three (Look, Think and Act)</b>		
	<b>Meeting</b> with students	Year One students	
	The need for electronic storage of portfolio contents identified		
	Investigated suitable electronic devices for e-portfolio (PDA)	Researcher	
	<b>Students commenced using PDAs: Meeting with students</b> to hand over PDAs	Year One students	
	<b>Meeting with students</b> to discuss PDA usage	Year One students	
	<b>Meeting with students</b> to discuss PDA usage	Year One students	
	<b>Evaluation</b>	Researcher and Participants	1 December 2009 to 30 May 2010
	<b>Researcher's reflections</b>	Researcher	
	<b>Analysis Phase Two</b>		

## **Ethical Procedures**

Regardless of the research approach employed for a study there are numerous ethical principles that must be addressed, including ethical approval, informed consent, the researcher's relation to participants (refer to pages 89 and 90), and dissemination of results.

### **Ethical Approval**

Ethical approval for this study was required by a number of organisations (Appendix A). Approval was granted by the Northern X Regional Ethics Committee, a Health and Disability Ethics Committee (a New Zealand Ministerial Committee). Approval was also granted by the AUT Ethics Committee (AUTEC), as I have undertaken my PhD within this University. The student participants within the research were enrolled at a large polytechnic tertiary institution; hence, approval was granted by the institution's ethics committee, based on letters of approval from AUTEC and the Northern X Regional Ethics Committee. Finally, institutional approval was granted by the District Health Board (DHB) in which the study was located, following approval by the Northern X Regional Ethics Committee, as the MRT participants were located at two sites within the DHB. This action research study required two rounds of ethical approval as the participants and location for *Phase Two* of the study were unknown at the outset of the study. Approval was gained for *Phase Two* from the appropriate organizations (which turned out to be the same organisations as *Phase One*) when the required location and participants were established.

### ***Informing and Protecting the Participants***

Research necessitates obtaining informed consent and co-operation of individuals who assist in the study. It seeks to respect and protect the rights of individuals while also placing some responsibility on the individual by highlighting voluntary consent (Cohen & Manion, 1994). All participants in this study were provided with information prior to participation, which included the purpose of the research, what their involvement would entail, the risks and benefits associated with participation and how their anonymity would be protected (Appendix A). Participants then signed a consent form (Appendix A). Participation was voluntary for all participants. To conceal the identity of the participants and maintain

anonymity, I chose a pseudonym for each participant. All participants were assured that the audio recording and the transcriptions of the recordings of discussion would be stored on a computer with password protection. The data will be destroyed six years after analysis has been completed. All documents will be shredded appropriately and computer files will be erased.

### ***Dissemination of Results***

All participants were offered a précis of the outcomes of the study. An evaluation of the initiative will be disseminated to the tertiary institution in which the medical imaging students are enrolled, and to the team leader at the clinical site in which the study participants are located. Participants will be acknowledged for their ownership of the developed initiative. In addition to the researcher presenting outcomes of the research at relevant conferences, it is intended that key findings will be published in peer reviewed journals. To date, key findings of this research have been shared within workshops and contributed to curricular development. This has been further discussed in Chapter Ten.

### **Participants**

Although participants are central to most methods employed in qualitative research, they are key players in action research. As Greenwood and Levin (2007) point out, action research entails the union of “action, research, and participation” (p. 5). In *Phase One* of the study, students and MRT participants explored their experiences of teaching and learning during the facilitation of focus groups. In addition, observation enabled the researcher to view interactions involving students and their teachers in the classroom and clinical setting. Interviews were conducted with an MRT and clinical tutor following observation periods in the clinical setting. Research occurred with the participants ‘in action’ when the teaching and learning strategy was implemented in *Phase Two* of the study. The mix of participants assisted to provide a holistic understanding of teaching and learning processes for medical imaging students.

## **Participants: *Phase One***

### ***Student MRT Participants***

Year Two student MRT participants were selected for a focus group in *Phase One* of the study as they had more experience of the processes of teaching and learning than Year One students. Year Three students may have been appropriate for this study; however, their learning was likely to be more independent and self-directed than Year Two students; therefore, they may be less dependent on teaching, and the teaching and learning processes may not have been as evident, when compared with the Year Two group.

I informed the Year Two group of the study and indicated that I would be recruiting participants the following week. I explained that a process of purposive sampling would occur, as it was important that the focus group comprised student participants who were located at a variety of clinical sites, rather than one site. This approach to sampling was to ensure that students' perceptions of learning were gleaned from students learning in different clinical learning sites, to highlight the key issues associated with learning in the clinical areas common to the group. An invitation requesting volunteers was distributed by colleagues to the Year Two cohort. Eight students in Year Two from five of the eight clinical sites providing placements for students' clinical learning agreed to participate in the focus group.

Although, student participants for the focus group were recruited from a variety of clinical sites, approval for observation in the clinical setting, was obtained at one site only. This particular District Health Board (DHB) provides a significant number of placements for students' clinical learning (10 clinical placements for each of the three years of the medical imaging programme). I met with students who had a designated placement at the DHB site and informed them that I intended to recruit two students to be a part of a process of observation of teaching and learning encounters with MRTs in the clinical setting. An invitation was sent to all students at the designated clinical site. I advised students that I would include the first two students to respond. Six students volunteered to be a part of the study; therefore, those who contacted me first were included.

In addition to selecting participants for both the focus group and observation of teaching and learning encounters in the clinical setting, the entire Year Two cohort agreed to allow me to observe three classroom sessions involving different courses (subjects). Eighteen students attended the first classroom session and 25 students attended the two remaining sessions. Different lecturers facilitated each classroom session.

There was a possibility that student participants may have been reticent to share information with participants who were in a position of power (MRTs, clinical tutors and the researcher). Students were therefore encouraged to engage in open and honest dialogue and it was emphasised that the sharing of their experiences could markedly contribute to potential improvement of teaching and learning. It was also reiterated that their anonymity would be protected.

### ***MRT and Clinical Tutor Participants***

An initial overview of the study was given to a group of MRTs at a radiology department within the DHB. Some MRTs within the group worked at two sites within the DHB. The sites differed in that one offered an outpatient service and the other provided a 24-hour service and comprised mostly inpatients. An invitation to participate in a focus group in *Phase One* of the study was placed on the notice board within the radiology department. Six MRTs (two worked at two sites within the DHB and the remainder were employed at the site offering an outpatient service only) volunteered to participate in a focus group. It was important that I included MRTs from the two clinical sites, as the sites are markedly different in the type of service they offer (acute versus outpatient). Hence, MRTs located at different sites may have differing views and perceptions about teaching and learning due to the different contexts in which they practise.

A second invitation was placed on a notice board in the radiology department to invite MRTs to participate in teaching and learning encounters with Year Two students within the clinical setting. The participants were advised that they would be involved in two to three sessions of observation. I indicated that I would terminate the sessions when no new data related to the teaching and learning



encounters were generated. An MRT and clinical tutor volunteered to be part of this process and agreed to be interviewed following the observation process.

### ***Medical Imaging Lecturer Participants***

An overview of the study and the requirement for lecturer participants was discussed at a staff meeting and an invitation was sent to staff via email. Three medical imaging lecturers agreed to allow me to attend their classroom sessions to observe teaching and learning interactions within the classroom.

### ***Phase One: Relationship of the Participants to the Researcher***

Although I, the researcher, knew the cohort of students involved in this study, I was not directly involved in processes of teaching or assessing with them during or beyond the period of data collection. I reassured students that their involvement in the research would not be detrimental to their achievement in the programme. I informed the student participants that the information they provided would be used for the purpose of this study only.

I was not employed at the clinical site in which the focus group (MRTs) and observation of teaching/learning encounters were conducted. Although I did know some of the MRT/clinical tutor participant group, I did not know them well. The MRT community is small; therefore, knowing some of the participants was unavoidable. I worked closely with the medical imaging lecturers involved in teaching and learning encounters in a classroom setting. Occasionally, I was involved in team teaching with the lecturer participants involved in the study, so I deemed that they would be comfortable with me observing their classroom sessions.

### ***Participants: Phase Two***

#### ***MRTs and Clinical Tutor Participants***

The clinical leader of the radiology department in which the study was located indicated that four partnerships between MRTs and students would be manageable for the purpose of rostering MRTs and students in the same area. At the commencement of *Phase Two*, an invitation was placed on a notice board in the radiology department where the study was located. This was a different location

to that of *Phase One* of the study, in which observation of MRT/student encounters had occurred. For *Phase Two*, I selected the larger clinical site that offered a 24-hour service and comprised mostly inpatients. The key reasons I selected this site were that there was a larger staff than the other two sites within the DHB and workload was frequently unpredictable due to the nature of the patients who presented to this site. The impact of these factors was likely to mean that robust support for students' learning would be vital. Four MRTs with a range of experience (5 to more than 30 years) volunteered to be a part of the development of a teaching and learning initiative.

Soon after the volunteers had been recruited, two of the MRT participants needed to withdraw: one had resigned from his position and the other had been offered a new position in a specialty area. An invitation was resent to the radiology department and two further participants were subsequently recruited: an MRT and a clinical tutor.

### ***Student MRT Participants***

I provided an overview of my anticipated study to the Year One students at the clinical site in which the study was located. I advised the students that I would include the first four students to respond. This was necessary, as eight students volunteered to be a part of the study. Year One students were selected for *Phase Two* of the study as the data collected in *Phase One* suggested that the support in the clinical setting would be most beneficial to Year One students. However, the students were Year Two students at the conclusion of data collection as data continued to be collected for the first four months of the students' second year in the programme. Following recruitment, one student participant needed to withdraw from the study as she had not passed a number of courses in the first semester so would be unlikely to continue in the programme. I approached one of the four participants who had volunteered at the time the initial invitation was sent but who was surplus to requirements. This student participant agreed to be involved.

### ***Phase Two: Relationship of the Participants to the Researcher***

The research group in *Phase Two* of the study comprised MRTs, Year One medical imaging students and myself. The MRT group had not participated in *Phase One* of the study. Although I knew some of the MRT group who were employed by the site the study was located, I did not know them well. I did know the medical imaging students as I had taught them in the early part of the same year that the learning partnerships were formed; however, I was not involved in teaching and/or assessment for this group during the time they participated in the study and after the period of participation.

### **Data Collections Methods**

Focus groups, interviews, participant observation and action research meetings were methods used to collect data in this study. Stringer (2007) points out that the data types used in action research are dependent on the problem or issue being investigated. However, he suggests interviews, focus groups and participant observation are suitable methods in action research. These methods provide ways for the participants or stakeholders to offer their perspective. In action research participants are “knowingly engaged in seeking to develop understandings and solutions...” (Stringer, 2007, p. 65). The data collection methods, rationale for methods, number of participants and data collection hours have been summarised in Table 5. All audio recordings from interviews, focus groups and action research meetings were transcribed by me and remained confidential to the parties involved. Whilst this was a time-consuming process, I considered it necessary to enable me to become immersed in the data.

### **Focus Groups**

A focus group is “a carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment” (Krueger & Casey, 2009, p. 2). Hence, perceptions, viewpoints, ideas and feelings are revealed during the interactions of the group participants. Kreuger and Casey (2009) suggest that focus groups have six characteristics or features: they involve people; who are assembled in groups; who possess certain characteristics; who provide data, which is of a qualitative nature; within a focussed discussion. As Morse and Field (1995) suggest, a focus group is typically composed of seven to

ten participants who have some knowledge about the topic. Krueger (1994) advises that the size of a focus group is determined by two conditions: it must be small enough for everyone to participate and large enough to produce a diversity of perceptions.

Two focus groups were conducted in *Phase One* of the study, each approximately one hour in duration. Stringer (2007) emphasises the need for careful consideration of the questions to be used in the focus group interview to ensure a focussed discussion. Questions that guided the focus group are included in Appendix B. Prior to conducting the focus group with the Year Two student group, I reminded them that they could contribute to an extent that was comfortable. Stringer (2007) emphasises that all participants should be given the opportunity to contribute. The majority of students who participated, engaged in a thorough and insightful conversation. However, two students within the group appeared reticent. It was the more vocal students within the group who encouraged the reserved students to contribute by asking them about their experiences at their designated clinical site. Hence, I felt that the two quieter members of the group had sufficient opportunity to offer their thoughts, perceptions and insights. If the more confident students within the group had not offered a way to include the students in the discussion, I would have needed to carefully pose questions to the quieter individuals. This may have been less comfortable for them in comparison to being questioned by their peers.

The MRT focus group included a reticent member and the group included the participant in a similar way to the student focus group. The focus group, consisting of six MRTs included one new graduate who appeared reserved and initially did not engage in the discussion. However, it was the other members of the group who gently asked for the reticent MRT's thoughts and opinions. This meant it was unnecessary for me to directly ask the quieter individual questions to ensure that opportunities for all individuals to contribute had been provided. It may have been more comfortable for the reticent individual's colleagues to encourage participation, rather than me as the facilitator/researcher.

**Table 5. Data Collection**

	<b>Method of Data Collection</b>	<b>Rationale for Data Collection Methods</b>	<b>Number of Participants</b>	<b>Data Collection Hours</b>
<b>Phase One</b>	Focus Group Year Two students	To develop an in-depth understanding of students' experiences of learning in the academic and clinical settings. Questions for focus group were developed and critiqued with supervisors, through insights from the literature and informal conversations with Year Two students.	8	1
	Focus Group MRTs	To develop an in-depth understanding of MRTs' perceptions of students' learning experiences. Questions for focus group were developed from areas/issues identified in the initial focus group with students.	6	1
	Observation of two MRT/student encounters/pairs in a clinical setting (two observations of each encounter/coupling) <i>Duration: 2 ½ hours/session</i>	Students and MRTs highlighted issues related to support in the clinical setting during the focus groups. Observation was undertaken in order to observe student/MRT teaching and learning encounters as during the focus groups with MRT and student groups much emphasis had been placed on issues associated with teaching and learning in the clinical setting. Hence, observation contributed to the process of method triangulation (Stake, 2000). A protocol for observation was employed (Appendix B).	2 students 1 MRT 1 Clinical Tutor	10
	Interviews	To develop an in-depth understanding of MRTs perceptions of students' learning experiences. Broad questions for the interviews were developed initially in the ethics proposal, and sub-questions were developed following observations in the clinical setting to allow further exploration of dimensions of observations. This again allowed method triangulation (Stake, 2000).	1 MRT 1 clinical tutor	1 1
	Observation of lecturer/Year Two student encounters in a classroom setting <i>Duration: 1 hour</i>	My understanding of classroom interactions was based on my own experience, therefore it seemed appropriate to observe the interactions of other lecturers and students to establish commonalities/differences in interactions. Although observation mostly affirmed my experiences of classroom interactions, it was important that I did not allow my experiences, expectations and assumptions to dominate my interpretations.	1 lecturer, 18 students 1 lecturer, 25 students 1 lecturer, 25 students (same student cohort)	1 1 1

<b>Phase Two</b>	Action research meetings • MRTs (4 meetings) • Students (8 meetings) • Combined meetings of MRTs and students (2 meetings) <i>Average duration for meetings: 1 hour</i>	In collaboration with MRTs and students the action research meetings enabled discussion and decision-making in relation to the development, implementation and evaluation of a learning partnership initiative. It was during these meetings that decisions were made by the participants and researcher about the activities for each subsequent stage of the action research process. Therefore, discussion within these meetings influenced amendments (additions or deletions) to aspects of the learning partnership framework (for example, the addition of an online platform and the introduction of PDAs for students to collect evidence of their clinical learning). Facets that were problematic were amended (for example, the separate documents [ <i>Record of a student engaging with a case</i> ] for MRTs and students to complete were combined).	4 MRTs 4 students	14
	<b>Total</b>			<b>31</b>

The initial focus group consisted of eight second-year medical imaging students from five of the eight clinical sites that provided placements for students. The second focus group comprised six MRTs located within the DHB.

Focus groups were an appropriate data collection method for this study. Students engaged in a focussed discussion about their experiences and perceptions of learning. MRTs were also involved in a focussed discussion, which allowed them to explore and engage in dialogue about their perceptions of teaching and learning for medical imaging students. The focus groups were audio recorded and subsequently transcribed.

### **Complete Observer and Observer-as-Participant**

Participant observation enables the researcher to observe how people carry out their everyday activities (Stringer, 2007), therefore, as the researcher I observed learning activities and the interactions between students/MRTs, students/clinical tutors and students/lecturers. Prior to engaging in observation, my understanding of teaching and learning within the classroom was based solely on my own experience as a lecturer. Therefore, it was important that I observed the interactions between students and other lecturers to ensure a wider exploration

and to identify any differences in relation to my understanding. The key insights identified during the periods of observation are discussed in the following chapter.

Prior to the observation sessions I referred to a list of triggers as a reminder of potential interactions and contextual dimensions to observe. These are included in the observation protocol in Appendix B. I observed three classroom sessions (different courses) with different lecturers and the same cohort of Year Two students. Within the classroom setting, I was engaged in a passive role as a complete observer (Morse & Field, 1995) and therefore I did not interact in the session. For each session, I was seated at the back of the classroom and it is likely that once the session commenced, students had forgotten I was situated in the classroom.

In the clinical setting, my role in participation was observer-as-participant (Morse & Field, 1995). The MRT introduced me to each patient who presented for an examination. When the examination commenced, I observed the encounter through the window at the x-ray control panel. I intended that this position would mean that I was less obvious to the MRT and the student, enabling them to perform radiographic examinations at ease. In addition, I was not in the way of the MRT or student as they performed the examinations. However, I did participate in a minimal way, for example, to help transfer a patient to an x-ray table. Being in the position of observer-as-participant allowed me to focus on observing the teaching/learning encounters rather than the task at hand. A key disadvantage of this position is that I may have been considered to be an 'outsider' by the participants so there was a risk that they may not have appeared comfortable with my presence. Fortunately, the participants appeared to be at ease with me being a part of the process and instigated conversation about supervising students during breaks. A drawback of observation in the clinical setting is that observation periods are frequently orchestrated by the patients presenting. In the clinical site where I was undertaking observation, there was sometimes a lull if patients did not attend their examinations, despite a booking system.

I was involved in two sessions (2 ½ hours duration) with each student/MRT pairing (two pairs). Although I had advised the participants that up to three

sessions of observation may be necessary, I terminated the sessions when no new data related to the teaching and learning encounters were generated.

In qualitative research bias is considered to be a challenge. A researcher cannot claim that it can be completely removed due to the nature of this type of research. It is important that researchers recognise the biases that they bring to a study and be open to them. Potential bias can be reduced by introducing a number of strategies to enhance the trustworthiness of research. Therefore, within this study during the process of participant observation, I implemented the following strategies:

- (i) As the researcher, for one month prior to engaging in observation I spent an afternoon each week at the clinical site that observation was to take place. The primary purpose of these visits was to develop an understanding of new technology recently introduced to the site. However, the visits also enabled the staff to become familiar with my presence.
- (ii) A protocol (Appendix B) was used to enhance the consistency of observations. Therefore, in addition to making notes about the date and time of the observation, the physical setting and the people involved, I focused my attention (and subsequently documented) on the interactions between people in the setting, the types of activities that occurred and any unusual occurrences that were observed.
- (iii) In addition to the information (Appendix A) provided to the participants prior to the observation periods, at the start of each observation session I reminded participants that my key focus was to observe teaching and learning encounters between students and their teachers (MRTs, clinical tutors and lecturers). That is, it was not my intention to critique a teacher's or student's practice.
- (iv) I carefully considered where I would position myself during observation to reduce the participant's sense of me 'being present'. Hopefully, this encouraged the participants to get on with their activities without my presence influencing their behavior. During the observation periods I positioned myself outside the radiology room (I could observe through the



window at the control panel) in the clinical setting, and at the back of the classroom in the academic setting.

- (v) At the end of the observation period in the clinical setting, I spent time debriefing with the student and MRT who I had observed. I outlined the key interactions and activities I observed. In the academic setting I had a conversation with each lecturer at the end of the session to delineate my key observations. This was a way of checking that I had documented my observations accurately and it gave me the opportunity to check that particular behavior/activities/interactions were less likely to be influenced by my presence.
- (vi) Following the observations, interviews with participants enabled a further opportunity to clarify behavior/interactions/activities that were observed.

### **Interviews**

Stringer (2007) suggests that interviews are an appropriate data collection method in action research, offering the participants the opportunity to “describe the situation in their own terms” (Stringer, 2007, p.69). Two in-depth semi-structured interviews were conducted: one with a part-time clinical tutor and the other with an MRT both of whom were also participants in the observation of student/MRT teaching and learning encounters. Semi-structured interviews were employed to encourage an open dialogue between the researcher and the participant. Broad interview questions were developed for the ethics proposal for the research and sub-questions (Appendix B) were further developed following the collection of data during the focus groups and observation (Appendix B) enabling method triangulation (Stake, 2000). May (1991) warns of some of the challenges associated with interviewing in qualitative research, in particular, the need to adjust the content of the interviews in response to data collection and analysis. In this study, it was necessary to adjust some of the interview questions in response to data collected in focus groups and observation.

As the researcher, I provided a general overview for the study for each participant, followed by open-ended questions with the intention of focussing the participant’s perceptions and experiences but also allowing them freedom of expression.

Both participants engaged freely in conversation and appeared to be unguarded in their disclosures. During the interviews, I was aware of my own perceptions and experiences to remain open to the views of the participants.

The interview with the clinical tutor was conducted on the education provider's premises. The interview with the MRT was conducted in a quiet conference room in a clinical site (within the DHB) in which the study was located. Interview data were audio recorded and subsequently transcribed. Qualitative research has been criticised for the issue of bias associated with data collection or analysis and May (1991) suggests audio recording "allows auditability of data collection procedures" (p.198). The transcripts were returned to the participants for comments and/or correction.

### **Action Research Meetings**

The action research meetings, which occurred throughout the duration of the study, were an integral part of the action research process as productive discussion contributed to the design, implementation, amendments and evaluation of the teaching/learning initiative. During these meetings decisions were made by the participants and researcher about the activities for each subsequent stage of the action research process.

Eight action research meetings were conducted with student participants, four with MRT participants and two with a combined group of student and MRT participants (14 in total). The average duration of each meeting was one hour. The meetings with students occurred at the educational institution and all other meetings were held at the clinical site in which the study was located. During the initial action research meeting with MRT participants, I recorded notes by hand related to our discussion. I realised, however, this was an ineffective way to record information as it was difficult to capture the depth of the participants' discussion. The eight participants who were present at the combined meetings generated significant dialogue. Therefore, I recorded the discussion on a voice recorder and transcribed it for subsequent meetings. I continued to take notes by hand during the remaining meetings and made additional notes in a journal. At the end of each meeting, I summarised the points discussed to ensure that I had gathered an

accurate representation of the key points highlighted. Action points were also identified. At the beginning of the following meeting, the key points from the previous meeting were reviewed and discussed.

## **Processes for Analysis**

Two approaches have been used for the analysis of data in this study. Firstly, Stringer's (2007) process for data analysis has been employed to manage and interpret data collected in this study. Secondly, two key writers, Bourdieu (Bourdieu, 1984, 1985, 1990; Bourdieu & Wacquant, 1992; Crossley, 2008; Deer, 2008; Mahar et al., 1990; Maton, 2008; Polkinghorne, 2004; Swartz, 1997; Thomson, 2008) and Dewey (Dewey, 1922, 1938) have been incorporated into the analysis chapters to provide a means of uncovering and interpreting the issues related to overarching themes of power and education. The ideas of the writers who have guided and informed the analysis are included in the methodology chapter (Chapter Four).

### **Stringer's Approach for the Analysis of Data**

The analysis (*think stage*) for *Phase One* of the study is included in Chapter Six. In *Phase Two*, a process of exploration and interpretation occurred in the *think stages* during Stringer's (2007) *look-think-act* routine (for each cycle), however, the core of the analysis for this phase is found in Chapter Eight. The approach offered by Stringer (2007) focuses on two key processes and he points out that either one or both of these processes can be used. This study has employed both of Stringer's suggested processes for analysis. The first process involved categorising and coding of data. The transcripts were read several times to "identify units of meaning" (Stringer, 2007, p. 98). The process enabled large amounts of data to be extracted and defined into concepts and ideas and emergent patterns and themes then became apparent. Stringer (2008) suggests the *verbatim principle* should be applied, that is, to use the terms and ideas of the participants whenever possible so that interpretation of the data through the researcher's lens is diluted. This initial process has the potential to lose the perspectives of the participants because of the merging of a diverse range of data. Hence, the initial process has been combined with Stringer's second process for data analysis, which involves selecting key experiences and unpacking them to highlight the key features of the experiences to

make them meaningful. Further, as Stringer (2007) asserts, a key intention of analysis is to reveal data that accurately reflects the participants' perspectives; therefore, it was important that I as the researcher, was mindful of own my views and understandings to enable me to be open to the views that were different. At the beginning of this thesis (Chapter One) I have highlighted the understandings that I brought to the study.

## **Rigour**

Rigour in qualitative action research is established by a demonstration of trustworthiness. In this study, the notions of triangulation and reflexivity and the four facets of trustworthiness (credibility, transferability, dependability and confirmability) defined by Lincoln and Guba (1985), have been employed to enhance rigour.

## **Triangulation**

Triangulation comprises employing multiple, different sources, methods and views to explore a research topic (Stringer, 2008). Stake (2000) posits triangulation involves incorporating many perspectives to enhance meaning. In my study, stakeholders (students, MRTs and clinical tutors) have been included. They have shared their views through focus groups, observations in the classroom and clinical settings, interviews and action research meetings within different contexts. The intention of the inclusion of multiple data collection sources and different groups of individuals to explore the same phenomenon was to provide appropriate and relevant sufficient accounts to illuminate an understanding of the research problem (Stringer, 2008).

## **Reflexivity**

Reflexivity involves researchers reflecting on the process of the research in an attempt to understand how an individual's values, assumptions, biases and views may influence the research. Koch and Harrington (1998) posit research characterised by reflexivity comprises an "ongoing self-critique and self-appraisal" (p. 6). They further argue that the researcher influences the research product through "data generated; a range of literature; a positioning of this literature; a positioning of oneself; and moral socio-political contexts" (p. 6). Therefore, if

research is influenced by the politics of location and positioning, then reflexivity is a critical process (Koch & Harrington, 1998). Reflexivity goes beyond a process of reflection, it endeavours to ascertain, acknowledge and address the limitations of a study (Fontana, 2004). At the commencement of this study, I highlighted my pre-understandings and expressed my views and assumptions with regard to teaching and learning for medical imaging students. The key purpose was to ensure transparency and to acknowledge any of my preconceived ideas. In this study, I have used a journal to document important and significant aspects within the research process. For example, journal entries were undertaken predominantly following action research meetings to document my insights and to ensure that details were not lost. Throughout the study, I have undertaken ongoing self-analysis and critique by responding to the question, 'How do I know what I know?' Further, I have documented my reflections at the end of each action research cycle. Reflexivity enhances the credibility of qualitative research (Jootun, McGhee & Marland, 2009).

### **Credibility**

Credibility within this study has been achieved in several ways. Firstly, it has been established by diverse case analysis (Stringer, 2007), which focuses on inclusion. Stakeholder participants who were central to the area of exploration for this study have played a significant role in the research. Secondly, as the researcher, prolonged engagement with the participants in a series of action research meetings has enabled me to build trust and check on information collected at previous meetings enabling me to report the participants' perspectives as accurately as possible. My involvement in observation in the classroom and clinical settings and participation in the action research meetings helped me to understand the culture of the settings in which the students and their teachers were located. Lincoln and Guba (1985) assert that prolonged engagement will help to identify and consider distortions (researcher and/or participant) that may penetrate the data. Thirdly, credibility was enhanced by the triangulation of data. Fourthly, different 'sources', including supervisors, have read my thesis and provided feedback to further ascertain credibility.

### **Transferability**

Quantitative studies aim to generalise the findings to other groups and contexts outside the study, however, this is not the aim of a qualitative action research study. The findings of this study apply only to the context for the study. However, there could well be aspects of the study that are applicable to other individuals, groups and contexts. It is intended that a description of the changes that were showcased in this research will be published to enable other institutions to have insights relevant to their own contexts.

### **Dependability**

Dependability is established by the demonstration of credibility. Readers of the research should be able to trust that “all measures of a systematic research process have been followed” (Stringer, 2007, p. 59). Dependability is related to the consistency of the findings and a study is shown to be dependable if it is audited. Throughout this study my supervisors have read my interpretations as they have guided me through the study. Dependability has also been addressed by the data being returned to participants (interviews) and/or checked by participants (for example, action research meetings) for accuracy.

### **Confirmability**

Confirmability is established by an audit trail, which provides sufficient evidence in the body of the research to enable the reader to confirm the findings identified by the researcher. Data collection and analysis processes have been provided in detail and participant excerpts have been included to support the analysis and findings.

### **Summary**

Chapter Four has described the methods used in this study. The ethical considerations, including approval processes for the two-phase study have been explained. A justification for the selection of participants at various stages in the study has been provided. In addition, the methods of data collection, and their appropriateness for this action research study, together with processes for analysis have been discussed. Finally, the considerations to establish rigour have been detailed.

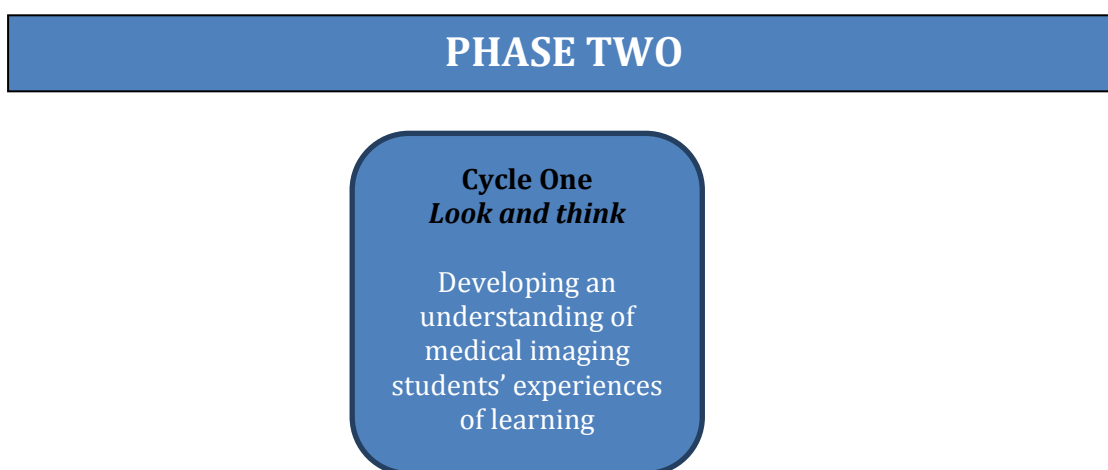
My experience of enacting this method was undoubtedly positive. The central involvement of the participants had a definite sense that 'we were all in it together'. We explored dimensions of teaching and learning which 'mattered' to those involved, and probably influenced their robust level of commitment. The flexibility of the method was imperative as at the start of this journey, the type of initiative to be developed was unknown. Nonetheless, the flexibility and the 'unknown' nature of the method were accompanied by a sense of 'risk'. I came to realise that continuous communication with the participants was critical to ensure that we progressed in a forward direction and did not lose our way. In addition, I had been warned prior to embarking on this journey that action research 'takes time'. I am convinced this is by no means a myth. The regular, social interaction with the participants resulted in the formation of some sound professional relationships. Hence, action research has been a valuable method for this study.

## CHAPTER SIX: PHASE ONE RESEARCH ACTIONS AND ANALYSIS

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### Introduction to *Phase One*: Cycle One (*Look and Think*)

This chapter explores the actions and key findings in *Phase One* of the study, which aimed to understand the experiences of learning for medical imaging students and how their experiences are supported and negotiated as they develop their professional capacities. The initial part of this chapter describes the exploratory phase, which encompasses the *look* and *think* stages of Stringer's (2007) three-stage (*look-think-act*) action research approach for Cycle One (Figure 3). The *act* stage of Cycle One occurred in *Phase Two* of the study. The latter part of the chapter provides an analysis of the data collected in relation to an exploration of the students' experiences of learning.



**Figure 3. Cycle One: *Look and Think* Stages**

### ***Look Stage***

The *look* stage involved gathering information to describe and build a picture of the situation, that is, the experiences of learning for medical imaging students. Data were gathered by conducting focus groups, observation of teaching and learning encounters in the clinical and academic settings and interviews.



## **Unveiling The Participants' Experiences**

### ***Making Connections in Focus group Discussions***

During the focus group with student participants, the students did not hesitate to engage in energetic, enthusiastic and honest discussion. They were keen to share their experiences of teaching and learning with respect to both the clinical and academic learning environments. A marked amount of data emerged from this focus group. I wondered if their enthusiasm to offer their stories and experiences could be due to not having had the opportunity to do this previously. The focus group data revealed tensions associated with students' learning in both the clinical and academic settings; however, the lack of adequate support for learning in the clinical setting was undoubtedly a key tension for the students.

In the MRT focus group, MRTs offered both their experiences of teaching and supervision and perceptions of how students learned. In the initial part of the discussion, participants appeared guarded in sharing their views about their teaching practices; however, before long, conversation flowed. The hesitation may have been due to MRTs being uncomfortable about articulating their experiences in the presence of others. The data for the MRT group highlighted various tensions that participants had experienced in their teaching and supervision role.

### ***Making Connections in the Classroom***

In the academic setting, observation of three, classroom sessions occurred, each one hour in duration. The sessions I observed were those of lecturers who had volunteered to be a part of the study. The courses involved were an applied course (Radiographic Imaging 2), and two predominantly theoretical courses (Anatomy 2 and Imaging Science 2). I was fortunate that a physics lecturer had volunteered to be a part of the study, as I was particularly interested in observing the physics-based Imaging Science 2 course. This was because participants in the student focus group had referred to their limited engagement with physics-based courses and the difficulty of understanding the relevance of these courses to clinical practice.

Within the Radiographic Imaging 2 course, students learn about radiographic procedures mostly involving the introduction of contrast media (dye) into patients

to delineate vessels, organs and structures. The course lecturer was an MRT. Of the 30 students enrolled in the course, 18 students attended the session; an assignment was due on that same day for another course, which is likely to be the reason for the notable absenteeism. For this session, the lighting was dimmed slightly as numerous radiographic images were projected onto a screen. There was a sense that the students enjoyed this session as the course content related well to what the students experienced in the clinical setting. I observed that the students grasped the content and application of aspects addressed in this course. This was affirmed by the questions they asked, the interaction with the lecturer and the positive nodding of heads. The interactive nature of the session, in which the students were noticeably engaged, established some important learning opportunities for the students. I wondered about the extent that students who did not attend the session would be disadvantaged.

In the Anatomy 2 classroom session, 25 students were present. The lecturer for this course was a medical doctor. The Anatomy 2 course was somewhat different to the Radiographic Imaging 2 course in that was more challenging due to the complexity of the lecture material. The delivery of the session was mostly didactic. Although there was less opportunity for interaction and making direct links to the clinical setting compared with my observation of the Radiographic Imaging 2 session, the students were mostly absorbed in the lecture. Overall, they did not appear to be distracted as they focussed on the lecturer and the notes that supported the lecture for the duration of the session. Some students engaged in a whispered conversation with their neighbour, which appeared to be related to the session. At the conclusion of the session, a hint related to an assessment for this course was provided by the lecturer, which the students appeared to eagerly record.

Twenty-five students were present at the session for the Imaging Science 2 course which was taught by a physicist. The students were not provided with notes and the lecturer used the white board to explain concepts, some of which were complex. It was evident students were encouraged to 'think' in this course. The lecturer seemed to have developed a rapport with the students and he had a sense of humour that the students enjoyed. A number of students seemed distracted and

a few appeared disinterested. This was evidenced by students quietly chatting and/or not focussing on the lecturer.

Observations of the three classroom sessions showed both similarities and differences. The students were clearly engaged in the Radiographic Imaging 2 and Anatomy 2 sessions. However, there was not the same sense of engaged interest in the Imaging Science 2 course. With the exception of the notable disinterest of some students in the Imaging Science 2 course, no key ideas to guide the ongoing phases of this study arose directly from these observation sessions. However, a key point raised about the relevance of physics for their learning by students in the focus group, conducted prior to the observation sessions, may explain the noticeable disengagement of some students in this course. Overall, the manner in which learning was happening in the classroom sessions seemed valued by all the stakeholders (except the distracted and absent students).

### ***Making Connections in the Clinical Setting***

Observation of encounters between a student and an MRT and a student and a clinical tutor occurred in the setting. The setting selected was a public outpatient radiology clinical setting that caters predominantly for patients who have been referred by a general practitioner or a specialist. The majority of the cases seen in this setting were patients with conditions requiring orthopaedic diagnosis and/or treatment.

Observation within this setting suggested the activities were mostly predictable events. The majority of patients had an appointment; therefore, there was minimal uncertainty with regard to the daily workload and it appeared that there was sufficient staff (including students) to manage it. The workload appeared to be mostly constant.

The MRTs and students viewed the information about the arrival of patients on a computer screen. At this point, learning opportunities for students were established. Patient examinations were sometimes distributed to ensure the examinations were suitable for a student's level within the programme. For example, cervical spine and shoulder examinations were typical examinations

undertaken by for Year Two students. When a radiographic examination was deemed suitable for a student, the availability of a radiography procedure room (there were six in the department) was checked. Once a room had been secured, the patient was greeted in the waiting room and taken to a cubicle to change into a gown (if required for the procedure). While the patient was changing, the MRT and student discussed the patient's referral information. Students articulated how they intended to approach the procedure, including the images they would take. Therefore, students were encouraged to engage in the process of decision making. During the observation periods, it was evident that although logical, the teaching and supervisory approach used by MRTs was mostly *ad hoc*, which might have made learning more challenging for novice students. At this point, I considered that it may be beneficial to the students if MRTs were provided with a framework that fostered a more routinised approach to teaching and supervision.

Although there was a sense of investment in students' learning by the MRT/clinical tutor participants, their encounters with students revealed some differences in teaching approaches. The approach to teaching by the clinical tutor appeared to be more confident, and questions were asked to foster understanding and deeper learning. The MRT appeared to spend time explaining the aspects of the examinations and the tasks with which the student was involved. Questioning was not central to the MRT's teaching approach. When the student questioned the MRT about a technical aspect of examination, the MRT replied, "Do what you are taught to do". This suggested that the MRT was nervous about teaching aspects of practice that could be different to what the student was taught in the academic setting or by their clinical tutor. The MRT appeared anxious when the student asked questions.

Further, I noticed from my observations within the department that students who were not involved in this study approached MRTs to request their involvement in examinations. It appeared that MRTs did not ask students to join them in patient examinations and I noticed that MRTs frequently embarked on examinations without a student.

## **Think (analysis) Stage**

The following section is an analysis of the data (the *think* stage) collected in *Phase One* of the study, that has sought to understand the experiences of learning for medical imaging students and how their experiences are supported and negotiated as they develop their professional capacities. The key themes that emerged from the analysis of data in *Phase One* focused on tensions for both students and MRTs and, related to this, a need for fresh approaches to teaching and learning.

### **Tensions for Students**

Although the data revealed that learning for medical imaging students was affected by tensions in both the academic and clinical settings, the tensions were predominantly evident in students' clinical learning. Within the academic setting, students are taught by course lecturers who are qualified MRTs and/or specialists in anatomy, pathology and physics. They are therefore in contact with significantly less 'teachers' in the academic setting than the clinical environment, where they are taught and supervised by numerous MRTs. Within the clinical setting, students also interact with other health professionals including, nurses and radiologists. Central to students' learning are patients who present with different levels of illness, mobility, consciousness, pain, anxiety and frustration. The academic setting could be perceived as relatively 'structured' and possibly a less stressful environment than the clinical setting, which is frequently unpredictable and busy. Students could feel more comfortable in the classroom setting as the small class size may mean they have a closer connection with their teacher, as suggested by a student participant in the focus group:

*I think because it is a smaller class like you actually feel more connected to the teacher, it's not like you're sitting there in a lecture with 200 plus people [interrupted by Bella, and they know your names] and yeah they know your names.*

**Cam, Student, Focus Group (FG)**

Tensions revealed by students in *Phase One* of the study included a perceived disparity between guidance provided by MRTs and clinical tutors and ineffective supervision in the clinical setting. A tension for students in the academic setting, was the relevance of some of the information students were required to learn.

## ***Disparity Between Guidance Provided by MRTs and Clinical Tutors***

### **• *Seeking a Clinical Tutor's Time for the Purpose of Assessment***

The clinical tuition that students receive is determined by a formula enacted by the education provider that delivers the medical imaging degree programme. The formula takes into account the time allocated to each individual student and the number of weeks for which tuition is provided (1.5 hours per week per student, multiplied by approximately 23 academic weeks). The following students shared their views about the difficulties they encountered:

*Sometimes because there are so many of us [students] at ... [clinical site] you don't get to practise a case [a patient's examination to be assessed] with the tutor before the assessment. So straight away when the patient comes we just do our assessment and clinical tutors have their own standards and that can sometimes cause a mismatch between the clinical staff and the tutors....*

***Rachel, Student, FG***

*...clinical tutors, like they actually know what they want you to learn as opposed to MRTs who are just interested in telling you their shortcuts and their tricks and stuff. The clinical tutors actually tell you what you need to know and the correct set-up. So when you can get a good morning or afternoon with one of them when they actually go through a procedure with you, I find that the quickest way of learning procedures.*

***Cam, Student, FG***

*A clinical tutor will tell you exactly what you need to know. I try to spend time with my clinical tutor as she lets me know about the depth I need. They [tutors] spend time on things like image criteria and critique – we often get asked about these things in depth when we are assessed.*

***Talia, Student, FG***

In the excerpts above, the students have suggested that clinical tutors possess the 'knowledge' they need and that some MRTs' knowledge was insufficient for students' learning. Talia has highlighted the importance of the depth of knowledge clinical tutors offer and Rachel has inferred that spending time with a clinical tutor (assessor) prior to an assessment would be beneficial. Steves (2005) study highlighted clinical tutors' capabilities in nuclear medicine. Clinical tutors for nuclear medicine technologists have their 'finger on the pulse'. They know what the students 'need' including, knowledge and standards for effective practice. A student's desire to spend time with a clinical tutor suggests the "backwash effect", a term coined by Biggs (2003) which posits that what students learn and how they

learn will depend on what they perceive will be assessed. The impact of the hidden curriculum can be seen here as students are likely to be recognising nuances and elements of knowledge that appear important to attain as they learn with clinical tutors. Although, the backwash effect could be seen as a negative effect, it could also be viewed in a positive light. For example, when learning alongside clinical tutors students may recognise elements of knowledge that require a deeper, rather than a surface approach to learning. Hence, students perceived clinical tutors as knowing the 'correct' way to do an examination, valuing that over the everyday manner in which MRTs were regularly going about their practice.

Further, with an emphasis on the need to spend time with tutors, the difficulties of not being able to access their tutors created frustrations for the students. Students drew attention to their experiences with regard to the low clinical tutor-student ratio:

*There are so many students it is virtually impossible.*

**Natasha, Student, FG**

*I've never worked one-on-one with my tutors except in an assessment situation.*

**Bella, Student, FG**

Students also perceived that clinical tutors have 'standards' that are different to the MRTs they learn alongside, therefore creating a tension. An opportunity to learn with a clinical tutor will enable students to recognise the tutor's standards prior to an assessment and students will be rewarded if they meet the high standards modelled by the clinical tutors (Bandura, 1977). Students could become more anxious if they are unsure of an assessor's expectations, which may impair their performance.

Fairness of assessment means that those being assessed will have equal opportunity to demonstrate their knowledge, skills and attitudes. If the majority of assessment is performed by clinical tutors, and students have had less opportunities to learn alongside clinical tutors, they may be disadvantaged when they are assessed. If both MRTs and clinical tutors assessed students, it is probable the results may be different as MRTs have less experience in assessment. Further, the clinical tutors' standards may be different (that is, possibly higher) than MRTs.

However, if MRTs became more involved in assessment with the appropriate support, the power interplay between MRTs and clinical tutors will change. If MRTs are recognised for involvement in assessment, their *symbolic capital* (recognition as an assessor) will increase.

- ***Impact of Power Relations on the Players***

Although clinical tutors and MRTs mostly hold similar qualifications, they maintain different positions within a clinical learning setting, from a student's point of view, that is, clinical tutors occupy a more elevated position. The knowledge (*cultural capital*) and status (*symbolic capital*) that the clinical tutors possess means that their position is more established. The consequence of MRTs not having the knowledge and possibly the teaching skills that clinical tutors possess is that they struggle to elevate their position. It is concerning that whilst the majority of students' learning involves MRTs, students perceive that the MRTs do not have the knowledge they need, particularly for the purpose of assessment. Bourdieu's (1985) principle of distinction explains the differences in the structure of a *social space* as perceived by those who are part of the structure. A *field* within a *social space* is dynamic and comprises a *field* of forces. Players within the *field* struggle for a position in it (Mahar et al., 1990). Hence, the possession of *capital* evokes a power interplay between the MRTs and clinical tutors within the *field*. Students placed their clinical tutors in a position of high standing. Therefore, clinical tutors hold power that has resulted from the *capital* (*symbolic, cultural*) they have acquired.

Importantly, *cultural capital* is also enhanced by credentials. The majority of clinical tutors did not have any additional qualifications and students may not have known that their qualifications were similar to those of MRTs. Nonetheless, students continued to hold clinical tutors in an esteemed position. Bourdieu (Swartz, 1997) maintains *symbolic capital* is a type of power but not recognised as such ('misrecognised') as it has been legitimised by those in the *field*. Hence, the activity of teaching undertaken by clinical tutors is an example of *symbolic capital* or "denied capital" (Swartz, 1997, p. 43). The clinical tutors' teaching practice is legitimised as their interests are disguised.



The balance of power between the clinical tutors and MRTs was further disrupted by the clinical tutors' gate-keeping role, in decision making with regard to assessment of students' clinical competence. Clinical tutors are the key link between the student's clinical learning site and the education provider. Conversely, for the most part, MRTs do not have a significant part to play in a student's trajectory as only a few MRTs were involved in assessment of students' competence and therefore they had a limited gate-keeping role.

If students perceive that they need to acquire their knowledge specifically from clinical tutors, there is a risk of a narrow development of MRT practice. Many MRTs have significantly more experience than clinical tutors. In view of the fact that students are keen to learn about how clinical tutors perform their practice, it could be argued that there is the risk of students becoming clones of their clinical tutors. This could encourage *reproduction*, as students will learn to reproduce recognised successful behaviours of their clinical tutors. From a broader perspective, this situation could affect potential development and change in practice within a clinical site as students learn particular ways of doing things. If clinical tutors continue to achieve their interests, they "unwittingly reproduce the social stratification order" (Swartz, 1997, p. 7) and perpetuate the power relations.

Therefore, the data revealed that students' learning was affected by the disparity between what clinical tutors and MRTs can provide for them. Students have a strong desire to learn alongside clinical tutors, as they perceive they have the *cultural capital* (knowledge) and *symbolic capital* (reputation and prestige) they need for successful completion of assessment. The difficulties of being able to access their clinical tutors due to the low clinical tutor:student ratio (approximately 1:6) was emphasised by the students. It was not practical or possible for students to be learning primarily alongside tutors. They were supervised mostly by MRTs. Students' learning was at times further complicated by not being able to negotiate and access effective supervision to support their learning progression.

### ***Ineffective Supervision***

Students highlighted the challenges they confronted during supervision. It was apparent that students were keen to work alongside MRTs who in some way supported their learning and they tried to avoid those who they deemed as difficult. Students disclosed their frustration of working with MRTs who were challenging to learn with:

*In some places it's easy to avoid people but in... [clinical site], it's such a small area and you have to work with someone you don't like and you just try to make the best of it and it's always the student who has to make the compromise [agreement by others in the group] rather than the MRTs. Like sometimes there's traumas coming through and all the MRTs you like are not available and the one that you absolutely despise is there, she's there to check your films and she can criticise and you just have to take a deep breath and just take everything in.*

***Talia, Student, FG***

*I just get annoyed with staff, with MRTs, like there's certain ones at ... [clinical site] that I just don't work with [agreement by others in group]. I'll check the roster, if I'm in a certain location and if I see them [on the roster] I'll go somewhere else.*

***David, Student, FG***

*At ... [clinical site] sometimes, there's an MRT who forces you into doing things that you don't want to do and like you can't say no because they just force you into it. It was hard as a first year [Student].*

***Natasha, Student, FG***

*Being told to do things you are not really ready for and you've got to do them by yourself.*

***Wendy, Student, FG***

*When we were just beginning, after a month or so, because we were incredibly short-staffed they actually encouraged us to do lots of things by ourselves but if we were really unsure about it, they would stand behind the window and just watch how we do it and how it came out. This was the rule 'you watch one, you do one'. They over-expect at times.*

***Talia, Student, FG***

*Staffing issues also, like if they don't have enough staff they'll leave you in theatre by yourself or down in ED [Emergency Department].*

***Natasha, Student, FG***

The significance of an approachable teacher is important for the students in the excerpts above. Undoubtedly, unapproachable, unhelpful, intimidating, disinterested teachers can affect students learning (Löfmark & Wikbald, 2001;

Mason, 2006). Students have further identified that there are MRTs who they would prefer to avoid as they do not support their learning. This raised the question of why some MRTs fulfil their supervisory role and others avoid it. A clinical tutor provided his view:

*A lot of the time you hear people say well it's written into my contract that I have to teach a student and therefore I will but I don't really want to. And I think that's a bit sad because if we gave them the support and understanding so that they could give students good feedback and improve their knowledge base I think they would actually enjoy it more. It's good having students around, they keep us on our toes, they teach us a lot of the time.*

**Simon, Clinical Tutor, (INT)**

The majority of medical imaging students are located in teaching hospitals (public system). Within the teaching hospitals, it is usually identified in an MRT's position description that he/she is required to be involved in student teaching. The clinical tutor in the previous excerpt suggests that MRTs may be more satisfied in their teaching and supervisory role if they were given support and the tools to perform it. Indeed, there are other potential reasons why MRTs may make a limited contribution to students' learning. The demands of their job and the need to provide an efficient, effective service for patients may mean they do not have any additional energy or drive to teach students. Further, because there is no formal arrangement that involves, for example, pairing an MRT with a student, their limited contribution may be unnoticed.

- ***Powerlessness of Students***

The experiences described by these students accentuates their powerlessness and the need to compromise in their learning encounters. In situations such as these, there is an obvious imbalance of power in the MRT/student liaison. The imbalance of power is created by the knowledge and experience (*cultural capital*), affiliations (*social capital*), and qualification and position (*symbolic capital*) that an MRT holds. Students' learning could be impeded if they find it difficult to speak up and ask questions, or refuse to engage in an examination they are uncomfortable about performing, at the risk of being deemed incompetent. In the previous excerpts, Talia and Natasha have reported the difficulties of being coerced into undertaking examinations when they were first year students. It appears that due to staff

shortages, they were placed in an uncomfortable situation of performing examinations outside their competency level. Students who experience difficulties in negotiating supervision support and who do not have the courage to articulate their limitations enter a potentially unsafe situation. The consequence of a student's lack of courage is that he/she could make an error/s and deliver an unnecessary dose of radiation to the patient. Both the student and the patient are vulnerable in such a situation. Further, MRTs who coerce students into potentially unsafe situations breach both the MRT Code of Ethics (Medical Radiation Technologists Board, 2004) and the Health and Disability Commissioner's Code of Health and Disability Consumers' Rights (Health & Disability Commissioner, 1996).

Powerlessness of students was also evidenced when they were not given the level of supervision they needed. Students disclosed that they were at times under- or over-supervised, which suggests that the MRTs do not know the students or have not taken time to establish the students' capabilities. Medical students in Al-Kadri et al's, (2011) study became stressed and anxious if supervisors placed them in situations that exceeded their ability. If too much supervision was provided, students became frustrated as it impaired their intention to become more competent, allowing greater autonomy. Bella shares her experience of being over-supervised:

*But like you go and approach someone and say look, "could you just oversee this cause I'm not a hundred per cent sure". I'm pretty sure I've got it sussed but I just need someone to double check before I expose [radiation]. Often it's just that I want them to oversee and they come in and move the patient, you know, half a centimetre and they don't just say, "do you want me to check that you are centred in the right place"...they just come in and do it. It's also quite demeaning you know, it makes me feel very little and some people don't do it the right way they're like, "how come you haven't centred properly" they're quite blunt in front of the patient and in those sorts of instances I walk out of the room as I get agitated.*

**Bella, Student, FG**

In this situation, the student has become frustrated with the MRT who has taken over the examination because they have assumed that because the student has asked for help she was not capable of completing the examination. Such an event could humiliate the student and cause him/her to lose confidence, which is likely to interfere with their learning. Importantly, the patient may perceive that their

examination was being conducted by someone who was not competent. The patient may also be perturbed by the student leaving the room. Behaving in a manner that makes a student and possibly a patient feel uncomfortable implies *symbolic violence*, on the part of the MRT, a legitimising power that has been accepted by the MRT and the student (Swartz, 1997). The MRT has used *symbolic power*, that is, used his/her position to step in and physically take over. A student is not in a position to easily challenge the MRT's behaviour in the example given here. Although the student's learning may be interrupted by an MRT taking over the examination, it is likely that the student will choose to comply, as challenging the MRT could create conflict that may also have implications for the student's learning.

Insufficient supervision can also affect a student's learning by creating unnecessary anxiety. Bella shared her experience of been placed in theatre without supervision, providing a further example of a student's powerlessness.

*Like I've been left in theatre before, multiple times. We are incredibly short-staffed at times. I have to go in there by myself and I say "my name is .... and I'm a student. I've only done this procedure once before. I'll do my best. You'll have to put up with me" ... I'm absolutely anxious, I'm scared but I'm not an anxious person.*

**Bella, Student, FG**

An increased level of anxiety is unlikely to foster learning. The student has felt embarrassed about having to declare her limited experience in a theatre situation in which there is likely to be more than three staff present. She was also positioned in a situation that could potentially be unsafe for the student due to her limited level of competence in the area. However, it seemed that she had no choice in this situation. Although the student was placed in a non-negotiable situation, if the experience was favourable, she could gain competence and consequently an increase in *cultural capital* (knowledge) and *social capital* (affiliations). However, if the experience was negative, the student's hope to gain competence would be interrupted.

Conversely, it was also acknowledged by the students that there is not always an absence of learning in situations of insufficient supervision and that learning can still occur in some circumstances. Talia shared her experience:

*There was a weekend where there was just a qualified [registered MRT] and me and he had to go down to theatre and we had a huge A&E [Accident and Emergency] list and all of a sudden I had to be put into his shoes where I had to for example, tell the orderlies what to do and when to take a patient back. But if I was ever stuck I would just call him [the MRT]... So it wasn't like I was completely left in the dark, I had support. But it was really good because I got really confident.*

**Talia, Student, FG**

Talia's excerpt demonstrates that she was reassured by knowing that supervision was available if necessary. She was able to progress with her learning and gain confidence and independence. The situation in which Talia was placed was likely to cause less anxiety than Bella's experience (previously described) as she knew she could access supervision, whereas Bella was not given that option. Hence, Talia had some control over the situation. The value of direct supervision has been emphasised (Al-Kadri et al., 2011; Kilminster et al., 2007), however, a suitable physical distance needs to be established between an MRT and student to ensure a student is not under or over supervised.

At this point, the tensions for students that have been discussed are associated with learning in the clinical setting. The final tension to be explored is the relevance of the learning material and activities that students are expected to engage with, in the academic setting.

### ***Relevance of Learning and the Links Between Knowledge Acquired in the Academic and Clinical Settings***

Students revealed a conflict related to what they were required to learn in the academic setting and the knowledge they needed for practice. They indicated that they engaged with subject matter (courses) in the academic setting that directly related to practice (for example, the Radiographic Imaging 2 course). Students found it more difficult to engage with material that they perceived as having less practice relevance (for example, Imaging Science 2). They revealed that they utilised a more surface approach to learning material that they deemed to be less

relevant to practice. Students have discussed how they perceive the relevance of material in the following excerpts:

*A lot of surface learning... Especially the physics kind of stuff like you know I don't see it being applied to clinical, so all I do is basically learn it to pass assignments and exams.*

**Chris, Student, FG**

*Things that don't really apply to clinical – you don't really retain it in the end. I don't think after this I would remember much of physics, maybe the really important stuff that's happening to the patient and the tube [x-ray tube] but nothing like the other things we learn.*

**Talia, Student, FG**

*A lot of the physics is just not relevant. We had this assignment last year about capacitors. Each section of the assignment needed to be related back to the clinical setting... As an MRT you're not going to look at your images and conclude a capacitor has blown.*

**Cam, Student, FG**

In the above excerpts, students indicated that if the material they are required to learn lacks relevance, that is, if they are unable to apply it to the clinical setting, then they may employ more of a surface approach to learning. As Eraut (1994) points out “knowledge which does not get used in practice is rapidly consigned to cold storage” (p.120). A deeper approach to learning is when the student understands the relevance and application to the clinical setting (Marton & Säljö, 1976; Titchen & Higgs, 1999). Evidence of this relationship and the importance of knowledge acquisition for decision making has been provided by Cam in the following excerpt:

*I think pathology is one of the papers that you need to know so that when you do get into a situation that you do have to pass your own images you know what you actually need to be looking for, so you're not just going oh yeah, I've got all the ribs on, I can see the lungs, I need to be looking for pathology.*

**Cam, Student, FG**

It was evident in observing the Radiographic Imaging 2 course that students were keen to disclose their stories about their experiences in the clinical area, providing evidence of students making connections between knowledge and learning in the academic setting and practice. It is likely this enabled students to develop a deeper approach to learning. However, employing a surface approach to learning may not

be solely a consequence of the level of relevance of the material. It could also be influenced by other factors such as teaching and assessment methods, insufficient time and an inability to understand some content at a deeper level (Biggs & Tang, 2007).

Simon, a clinical tutor, provides a different perspective of the links between academic learning and practice and has highlighted that what students learn in the academic setting is not always appropriate for the clinical setting:

*One of the problems... [the academic institution] has, is that they have to teach students a general based theory and that's not always applicable to the individual department [clinical learning setting].*  
**Simon, Clinical Tutor, INT**

Simon has demonstrated the *habitus* of the educational setting and clinical practice are distinctive and not always harmonised, hence tensions are generated. *Habitus* is structured by present and past circumstances and helps to shape current and future experiences (Maton, 2008). Differences in *habitus* between the settings creates confusion for the students as revealed by the data. They become frustrated if they are unable to make the connections between theory and practice. There is the potential for students to become bored or lose interest in the academic components of the programme if they do not perceive that they are relevant. The relevance of their academic learning to practice and their ability to be able to make links influences their approach to learning. If students do not perceive material as being relevant and disregard it, this could have future consequences. For example, material that does not have current relevance may be building a foundation for learning at a later stage in the programme or after graduation. The importance and significance of material that students do not think is relevant at a particular point in the programme needs to be emphasised by lecturers so that students do not dismiss it. Further, students may perceive that material is not relevant as teachers may not be articulating connections between theory and practice or explicitly building on prior knowledge. In view of medical education, Egan and Jaye (2009) point out that “clinical practice *becomes* the curriculum” (p. 12). If MRT students perceive that material not related to clinical practice is less relevant, then there is a possibility that clinical practice is also orchestrating the curriculum, to some extent, for the students.



Indeed, the tensions for students could potentially impede their learning. The disparities between teaching provided by clinical tutors and MRTs, issues with supervision in the clinical setting and the perceived limited relevance of some aspects of learning for students were the prime sources of tension. In addition to students experiencing tensions in the clinical learning setting, MRTs clearly articulated the challenges they were confronted with in their role as a teacher/supervisor for medical imaging students.

### **Tensions for MRTs**

MRTs revealed some challenges associated with their role in the supervisory process including gaps in their knowledge; anxiety created when comparing their teaching with the clinical tutors; and not knowing the students.

### ***Knowledge Gaps***

MRTs disclosed that they have gaps in their knowledge that affects their ability to teach students. They perceived students had a sound knowledge base and their knowledge was current. Also, they pointed out that there is an increased theoretical component in the degree programme compared with the previous diploma programme that many MRTs would have completed prior to 1995. An MRT revealed the consequence of gaps in her knowledge when teaching students:

*I personally probably don't know every little bit of anatomy that they have just studied, I know the basics but then they'll ask you some questions and I'll go 'oh my God'. And I do feel a little bit inferior because I don't know every little thing that they're asking...*

***Gina, MRT, INT***

Further, Gina differentiated between her radiography training and current medical imaging education, pointing out that the programme she completed consisted of more clinical and less theoretical time:

*Another challenge is that they [the students] do get quite a bit of clinical time but I think that compared with when I trained thirty years ago I had more clinical time and less theory. I don't have nearly the same theory knowledge than a lot of them have.*

***Gina, MRT, INT***

Although the MRT in the excerpt above has acquired a significant amount of experience, because her academic knowledge was acquired when she completed a diploma programme many years earlier, she has a sense of feeling inadequate when teaching students. In a study of clinical supervision skills for radiographers, Williams and Webb (1994) identified a lack of preparedness for their role of supervising students undertaking a degree programme, that had replaced a previous diploma programme. Hence, MRTs who graduated several years ago and have considerable experience may have significant practice knowledge but less current theoretical knowledge (hence, reduced *cultural capital*). The sense of inadequacy created by the perceived weakness in their *cultural capital* might be diluted by their acquired *social capital* (working relationships and affiliations) and *symbolic capital* (qualification). A further tension for MRTs in their teaching role was the differences in teaching between MRTs and clinical tutors.

### ***Disparity Between Guidance Provided by MRTs and Clinical Tutors, and Individual MRTs***

#### **• Challenges**

MRTs also highlighted the mismatch between the clinical tutors' expectations for clinical assessment and MRTs' teaching practice. Mia, an MRT gave her view in relation to this incongruence:

*When they come to do their practicals, they know they will be failed if they do something that we probably do. The way I deal with it is I say "now this is the way that I do it, the end result maybe the same". However, it may not be necessarily acceptable from the tutor's point of view when they are doing their practicals [assessments].*

***Mia, MRT, FG***

In the above excerpt, Mia has indicated that students could fail an assessment on an aspect of practice that they have learned from an MRT. MRTs are monitored by their peers and managers/team leaders; therefore, it is unlikely that their practice is unsafe. If a student performs an examination for an assessment in a similar way to a clinical tutor who is assessing him/her, then there is a greater chance they will pass. Hence, this suggests that the clinical tutor assessing a student requires the student to demonstrate aspects of practice that are different from that encompassed in the practice of MRTs.

MRTs indicated that students are challenged by variations in supervision as MRTs approach their practice and supervision role differently. Students develop their professional capabilities by working alongside a variety of MRTs as highlighted by an MRT in the following account:

*There is a huge group of MRTs... and all of us have got different working styles so you get different teaching styles because we all do things differently and we work differently... Take a standard examination like a chest or lumbar spine. Different people approach the situation according to the situation and their experience.... It's challenging for the student.*

**Pippa, MRT, FG**

In addition to students being challenged by the differences in teaching between MRTs and clinical tutors, they also needed to contend with the differences in teaching between individual MRTs. Student MRTs develop their own approach to practice as a result of working with numerous MRTs. Phronetic reasoning or wisdom (Polkinghorne, 2004) will be influenced by MRTs' experience, previous teaching and the fact they are individuals. Hence, students will be learning alongside MRTs with different reasoning processes, which may be difficult for them to understand as they develop their own individual practice.

A key challenge for a clinical tutor in the practice setting is the confusion that students experience due to being given incorrect information. Simon, a clinical tutor, outlines the problems he perceives students encounter because of the mismatch between what is being taught by clinical tutors and some MRTs:

*Other staff can play a big role with regard to a student in the department. They can completely bamboozle a student by giving them information that is incorrect, wrong, misguided, with the best intentions...*

**Simon, Clinical Tutor, INT**

Simon has made a strong claim that MRTs may give students incorrect information. This suggests a *power interplay*, raising the question of whether the clinical tutors want to be seen to be the group that holds the knowledge. Simon's claim suggests a distinction in *cultural power* between MRTs and clinical tutors. *Cultural power* emerges from history and is maintained through a continuous interplay between *habitus* and *capital* within a *field*. If clinical tutors hold similar beliefs to Simon,

then *cultural power* will be perpetuated and sustained. The power interplay between MRTs and clinical tutors is likely to be detrimental to stakeholder relationships, particularly between the education and practice settings as this situation cultivates an ongoing tension that will ultimately affect the students. Clinical tutors also possess *economic capital* as they are paid a higher salary than the MRTs. Hence, a higher value is placed on their practice than that of clinical tutors. The distinction between teaching delivered by MRTs and clinical tutors reproduces the power relations and therefore protects the clinical tutors' position.

There are implications associated with the tensions created by the differences in teaching between MRTs and clinical tutors. It is possible MRTs could avoid teaching students due to being anxious about not teaching them 'correctly'. For example, during observation in the clinical setting, an MRT was asked a question by a student and the MRT's response was, "why are you asking me". The MRT's reply suggested that questions should be directed at clinical tutors.

- ***Powerlessness of MRTs***

The *position in the field* occupied by clinical tutors and MRTs might represent *symbolic violence*. MRTs experience a tension by perceiving they are not fully equipped to teach the students. It is likely that they feel powerless to be able to acquire both *cultural* and *symbolic capital* to enhance their *position in the field*. Clinical tutors have greater *cultural* and *symbolic capital* than MRTs and therefore have a stronger *position in the field*. However, power relations are maintained and most probably taken for granted, as MRTs have not sought to improve their position. This situation has constrained the opportunities for open dialogue in an attempt to address the need for support in MRTs' supervisory/teaching role, to be able to improve their position and feel more valued. That is, *symbolic power* is legitimised by the MRTs. Furthermore, it seems that the power relations are also legitimised by the clinical tutors as they have not attempted to provide the support to help MRTs improve their teaching and supervisory role (Swartz, 1997).

- ***Restricting the Facilitation of Learning***

It was important to the students that they were taught by a clinical tutor, however; this means that they are being exposed to the practice of a selected group. An MRT has made reference to the clinical tutors' prescriptive approach to teaching:

*...because there seems to be a lot of rigidity in the way students are taught things. And then they come into a big department and everybody's got different ways of doing things and it creates a lot of confusion.*

***Mia, MRT, FG***

From the MRTs' point of view, clinical tutors have a more prescriptive, rigid approach to teaching, which means students are potentially learning particular ways of doing things, suggesting a more narrow approach to practice. This is incongruent to the primary aim of the degree programme, which identifies the need to:

*...provide society with accomplished graduates capable of continuing effectiveness and adaptability while involved within the practice of medical imaging. This will be achieved through an educational programme which provides stimulation, relevance and challenge in a climate which fosters independent capability and adaptability to change (Yielder & Yielder, 1994, p. 16).*

Adaptability is an important capability that students need to develop, particularly in view of the continuous advancement of technology in radiology. Adaptability and independence could be fostered if students were not taught in a prescriptive way. Whilst it is acknowledged that it is likely novice students would relish some prescription in their teaching, students learning needs to be facilitated in a way that allows them freedom to develop as unique and independent practitioners.

- ***Goals and Expectations for Learning***

In addition to the tension created between teaching by MRTs and clinical tutors, MRTs indicated that their teaching was compromised by the lack of clarity with regard to students' goals and expectations. If MRTs are unclear about the goals and expectations for students, they may find it difficult to assist students to make the connections between theory and practice. To enable MRTs to carry out their role as a teacher, simple resources, including expectations and competencies to be

achieved, assessment requirements and an outline of course and topics in the degree (*cultural capital*) are required. Cohesiveness of clinical education could be enhanced by improved communication between the academic and practice settings and ensuring the necessary resources are available to support MRTs' teaching. It is not known why MRTs do not have these resources. Possibly the education provider has assumed that learning can occur seamlessly in the practice setting without this information. Since MRTs appear to be in a position of acceptance and taken-for-grantedness, it may be that they have not challenged the reasons for the absence of this information. It is unlikely that this information has been withheld by the education provider as this would not be in the best interests of the students. However, if for any reason it has been withheld, this could suggest *symbolic violence*, that is, the provider has used its *symbolic power* to deny resources to those teaching and supervising students.

Knowledge of clear expectations for the students may assist MRTs to understand the direction for the student. The MRTs in the following passages discussed the need to establish expectations and goals:

*It would be useful to have a better understanding of where the student is at. Perhaps, just having time to sit down with them [the student] in fluoroscopy [a radiology room in which examinations involving the introduction of dye under x-ray control are performed] for example, and ask them, "How much experience have you had in fluoro.?" "Like these are the cases today, what do you need to learn? What are your goals?"*

**Pippa, Student, FG**

*It would be helpful to be given more information about where the student is at.*

**Gina, Student, INT**

*I think in the learning environment it would good to have some assistance related to what the expectations are.*

**Mia, Student, FG**

To be able to support MRTs in their role, they need a clear understanding of goals and expectations for the students. In the absence of this information, in essence, MRTs are taking students on a journey in the without a map. A consequence of this could be lost learning time as students may be encouraged to be involved in

learning opportunities that are inappropriate for their level. A further tension articulated by MRTs was the challenge of not knowing the students.

### ***Not Knowing the Students***

Not knowing the students created problems for MRTs. Approximately 30 MRT students are located within the DHB in which this study was located; therefore, it is a challenge for MRTs to get to know the students. The process of supervision is complicated by MRTs not knowing students due to students being frequently rostered to different areas, as reported by the following MRT:

*I prefer students to ask questions than for me to try and remember what I should be telling them. And because they change around so much you can't remember which student you've talked to about things, and they come back the second time and they say 'you haven't told me this before'. That's a real problem.*

**Brad, MRT, FG**

If MRTs do not know the students, this can impact on a students' learning. Time is needed for MRTs and students to get to know one another. When a relationship is formed between a student and an MRT, it is likely that learning will progress as the MRT will have knowledge of the student's capability and the student will feel more comfortable about being involved in examinations.

The data have revealed tensions for students and MRTs that can influence learning and teaching, respectively. In the clinical setting, in particular, support is required for students' learning and MRTs' teaching to reduce the tensions and to enhance the facilitation of student learning. The manner of teaching employed by MRTs, and how students approach learning, influence both teaching and learning encounters.

### **MRTs Perceptions of Approaches to Teaching and Learning**

MRTs articulated their views about how they approached their teaching and how students learned. The key approach to teaching that was identified was demonstration followed by students having an opportunity for 'doing'. MRTs maintained students learned by having the opportunity to perform examinations and by learning from mistakes.

## ***Demonstration and 'Doing'***

The data identified various teaching approaches employed by MRTs:

*Well it's much more effective to demonstrate it [a radiographic examination], to show them and then try to tell them how to do it and let them do it.*

***Brad, MRT, FG***

*The first thing I would do would be to check what knowledge they had, so I'd ask them what views had to be done, and then if I was happy that they knew the views to be done I would say "Have you done this x-ray before?" And if they hadn't, then I would show them the first time and get them to watch. The next time I would get them to do it and closely watch. If they had already done one I would say to them, "Well, you position and before you expose just check with me". Try not to be too hands on but be aware that if they are a first year [student] that they could be very much in the new learning phase so hover quite closely. I'm often quite torn with a first year, when we are concentrating on positioning I am thinking, will I worry right now about the exposure. Of course they need to learn about the exposure but sometimes I might end up setting the exposure for them if they are so busy setting the position.... It's easier for them to concentrate on one thing at a time when they are very new.*

***Gina, MRT, INT***

*They need to do things themselves, initially obviously providing guidelines, show them how it's done, let them do one with close supervision and then try and step back and let them take things over. Don't jump in all the time, that just destroys their confidence, let them do as much as they can and give them feedback at the time.*

***Simon, Clinical Tutor, INT***

MRTs have emphasised the importance of demonstrating radiographic examinations to students and then encouraging them to perform an examination similar to the one they have observed. MRTs have suggested that they gauge the level of supervision that students require. In the excerpts above, there is a strong sense of 'doing' without any indication of encouraging understanding, stimulating inquiry, problem solving or reflection, which aligns with the findings of other studies related to supervision and learning for medical imaging students (Baird, 1996; Thompson, 1999; Williams & Webb, 1994). It is concerning that MRTs' teaching still seems to focus on task-based activities, nearly two decades after this problem was initially highlighted. As participants described their approaches to teaching and supervision, only one (a clinical tutor) highlighted the importance of questioning for understanding:



*It's just a part of what I do, if you don't ask questions then you don't know if they have understood things. Otherwise, you just accept that something has happened because they knew what they were doing or they have just fluked it and it's something that has happened without any conscious input on their side. So I think you have to question everything and by doing that you get feedback from them and you are able to gauge their level of understanding.*

**Simon, Clinical Tutor, INT**

Although the use of strategies to enhance understanding and deeper learning were not explicitly revealed by MRTs, during data collection, the use of questioning in the classroom was evident during periods of observation. To encourage a deep approach to learning, a teacher can attempt to elicit an active response from students by questioning and presenting problems and students posing questions they want answered (Biggs & Tang, 2007). Further, a deep-learning approach can be fostered by assisting students to seek meaning and by demonstrating the connections between knowledge bases (Titchen & Higgs, 1999).

### ***Learning from Making Mistakes***

MRTs also reported on the significance of students learning from mistakes:

*They also learn from making mistakes.*

**Neil, MRT, FG**

*If they do make a mistake though it is important they learn from it.*

**Mia, MRT, FG**

*I think it's the best learning, they won't do it again.*

**Belinda, MRT, FG**

*Personally I learn from doing things wrong and I think it is probably the best way to learn things, by not getting them right every time.... If they make errors, we can then investigate their understanding to a better degree because they need to correct those errors. If they know how to correct them we have a better idea of their understanding.*

**Simon, Clinical Tutor, INT**

There was a strong suggestion by MRTs that learning from making mistakes is an acceptable aspect of learning. Learning by trial and error is one way of learning but it could also be potentially unsafe for patients, and leave students feeling anxious and guilt-ridden. Students will make mistakes and their memory of the mistakes will probably mean the same mistakes are not repeated. If students do make mistakes, they need to be supported. As students become a part of a

community of practice, it is their legitimacy that allows errors they make to become learning opportunities. The intensity of their mistakes can be reduced by being a legitimate member of the community (Egan & Jaye, 2009).

### **Summary: *Phase One***

*Phase One* explored MRT students' experiences of learning and how those experiences were supported and negotiated. Data were collected by conducting focus groups, interviews and observations in the academic and clinical settings. Issues associated with student learning in both the academic and clinical setting were highlighted in the initial phase of the study; however, issues concerning support in the clinical setting were distinctly predominant. Key tensions revealed by students, MRTS and clinical tutors have been summarised in Table 6. Although some tensions were expected, others were unexpected. For example, it appeared that current students were being driven by assessment. Although this finding was not unexpected, the extent to which their day-to-day learning was influenced by assessment was remarkable. Further, it was anticipated that there could be minor issues associated with the supervision provided by MRTs. However, the fact that MRTs identified they were afraid to teach as their teaching may not have been conducive with successful completion of clinical assessment, was an unpredictable finding.

The practice that was most valued by students was that of the clinical tutors as they needed to be guided by them to achieve one of their key goals, that is, to successfully complete assessment. Rather than embracing the experience and practice knowledge of MRTs (who students spend most of their time with), a divide has been created between the MRTs and clinical tutors. This significant marked divide between MRTs and clinical tutors, and the disparities in teaching between the two groups were unpredictable and important findings as these frictions appeared to impede student learning and effective teaching by MRTs. In turn, these issues subsequently increased tensions for students, MRTs and clinical tutors (refer Table 6).

The tensions for students and MRTs have provided evidence of a marked discord within the process of teaching and supervision. Hence, support for students and

MRTs in this process was crucial to improve the facilitation of learning for MRT students. At this point, I considered ways in which students could be supported in their learning and MRTs could be supported in their teaching.

### A Way Forward

In response to the tensions and the need for support, a form of a learning partnership seemed an appropriate way of enhancing support for MRTs and students. This idea was formulated into the design, implementation and evaluation of a learning partnership in *Phase Two* of the study. The data collected in *Phase One* have offered some important insights for the development of the initiative.

**Table 6. Tensions for Students, MRTs and Clinical Tutors**

<b>Tensions for students</b>	<ul style="list-style-type: none"> <li>• Disparity between guidance provided by MRTs and clinical tutors</li> <li>• Not being able to access clinical tutors to acquire the knowledge they perceive they need primarily for assessment</li> <li>• Ineffective supervision <ul style="list-style-type: none"> <li>• Learning alongside 'difficult' MRTs</li> <li>• 'Under' or 'over' supervised</li> </ul> </li> <li>• Relevance of learning and links between knowledge acquired in the academic and clinical settings</li> </ul>
<b>Tensions for MRTs</b>	<ul style="list-style-type: none"> <li>• Knowledge gaps</li> <li>• Disparity between guidance provided by MRTs and clinical tutors, and individual MRTs <ul style="list-style-type: none"> <li>• MRTs perceive teaching by clinical tutors is 'rigid'</li> <li>• MRTs afraid they may be teaching incorrectly</li> <li>• Assessment interrupts learning</li> </ul> </li> <li>• Not knowing the students</li> <li>• Insufficient clarity of the goals and expectations for students</li> </ul>
<b>Tensions for clinical tutors</b>	<ul style="list-style-type: none"> <li>• MRTs not teaching at the same level as clinical tutors, however, they recognized the need for support for MRTs in their teaching role</li> </ul>

*Phase Two* was informed by aspects of the data that emerged from *Phase One*. A key broad finding was the need to improve the process of supervision and teaching for students in the clinical setting. The actions that were required included; support for MRTs in their teaching role so that they are not 'afraid' to teach; clarity of goals and expectations for student learning (for both MRTs and students); the need for MRTs to know the students, addressing the current *ad hoc* nature of supervision; and managing the teaching disparities between MRTs and clinical

tutors. A key aim of the initiative was to 'hand back power' to the MRTs by involving them in a development to support their teaching.

## CHAPTER SEVEN: PHASE TWO RESEARCH ACTIONS

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### Introduction

The previous chapter (Chapter Six) has detailed the actions and analysis for *Phase One* of this study, which included the *look* and *think* stages of the first action research cycle (Cycle One). This chapter describes the actions for *Phase Two*, which incorporates the *act* and *evaluation* stages for Cycle One and the *look*, *think*, *act* and *evaluation* stages for Cycle Two and Cycle Three (Figure 4). Additionally, a mini or spin-off cycle (Cardno, 2003) that emerged from Cycle One will also be discussed. The phases and cycles of the study were represented diagrammatically in Chapter Five. A reminder of these phases and cycles is included in Figure 5. Further, Table 4 (p. 89) provides a timeline for the research actions and data collection for *Phase One* and *Phase Two*.

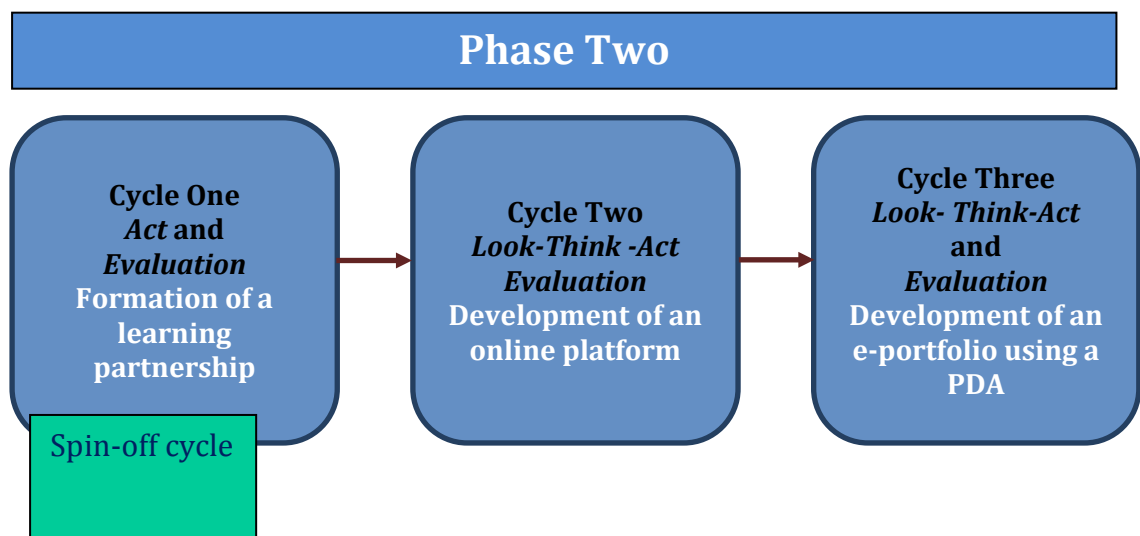


Figure 4. Phase Two

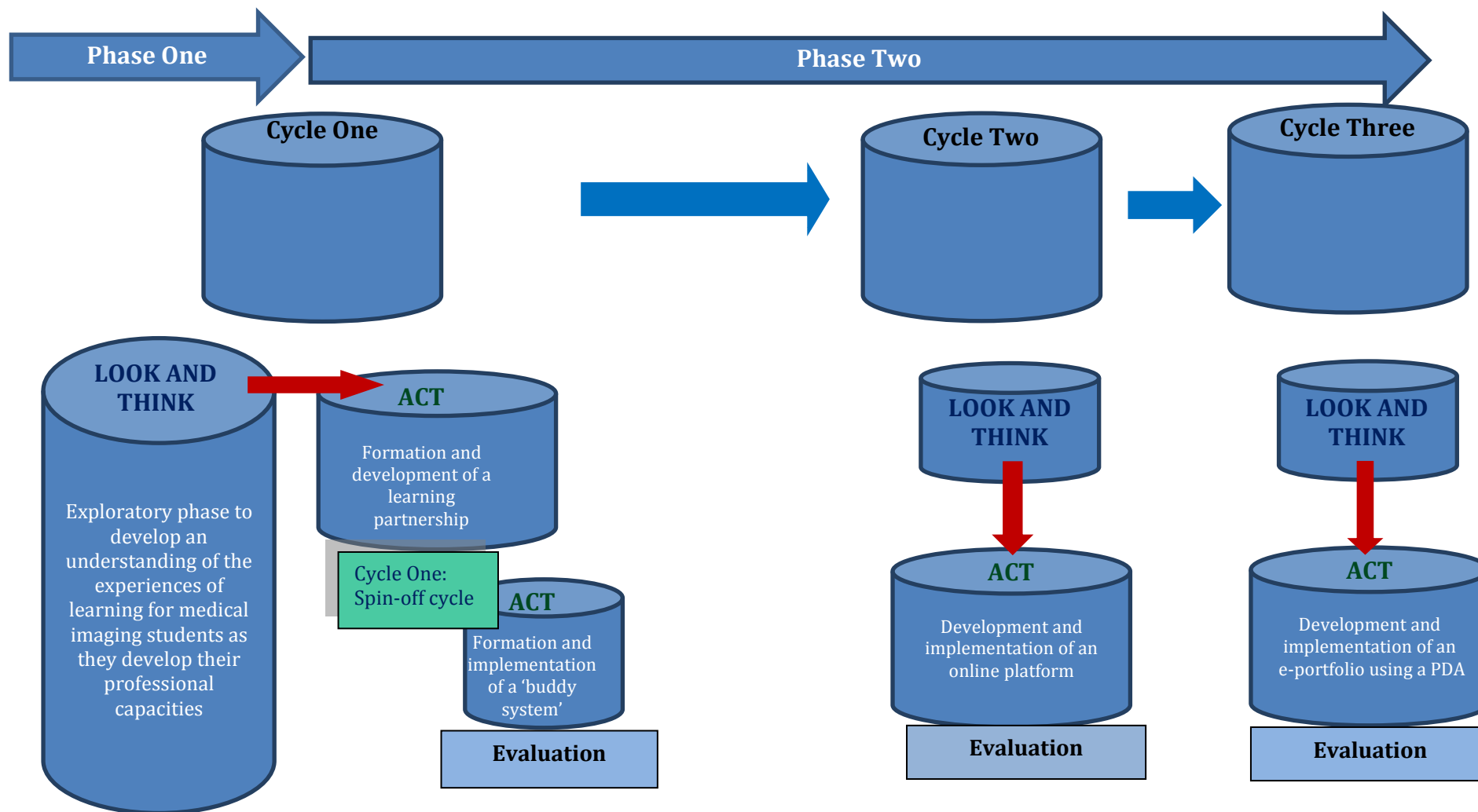
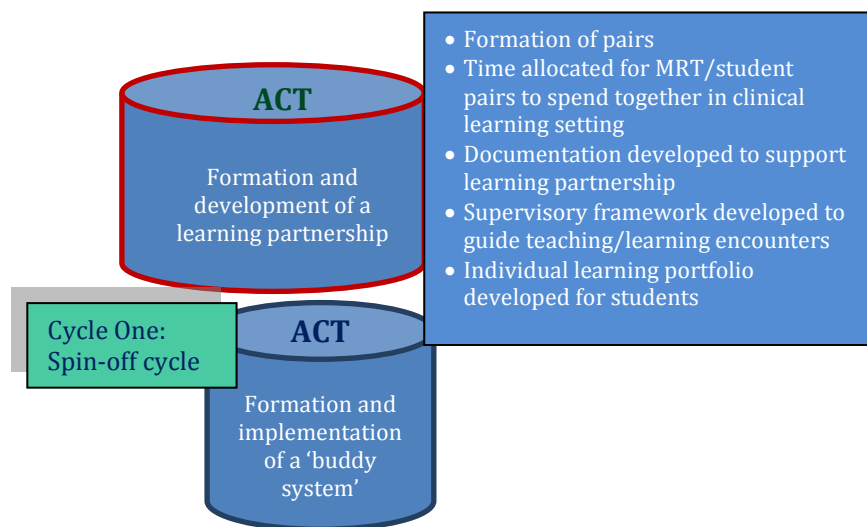


Figure 5. Action Research Phases and Cycles

## Cycle One: The Act Stage

The *act* stage of Cycle One (Figure 6) comprised the formation and development of a learning partnership initiative. During the developmental period of the initiative, a small, mini or spin-off cycle emerged, which involved the formation of a 'buddy system'. Two key MRT participants realised the benefits of the learning partnership for students and MRTs soon after its implementation. Therefore, they decided to set up an informal 'buddy system' in the areas within the radiology department for which they were responsible. The 'buddy' system was a different arrangement to the learning partnership. It involved coupling a range of MRTs with students who were rostered to the same area (on a daily basis). In contrast, within the learning partnership arrangement, students were paired with one MRT. In addition, the learning partnership was a more formal arrangement with clear expectations of the both the MRTs and students. A discussion follows of the formation and development of the learning partnership and 'buddy system'.



**Figure 6. The Act Stage, Cycle One: Formation and Development of a Learning Partnership**

Four MRTs and four Year One students were part of the development and implementation of the learning partnership in *Phase Two* of the study. Numerous action research meetings were held over the duration of the action research study. It was during these meetings that decisions were made by the participants and researcher about the activities for each subsequent stage of the action research process. During the initial part of the *act* stage of Cycle One, separate meetings were held with MRTs and students, followed by a combined meeting with all participants.

### **Support for the Learning Partnership**

In the exploratory phase of this study, MRTs and students acknowledged the need for support in the clinical setting for learning and teaching, respectively. I had considered the development of a learning partnership between MRTs and Year One students to provide the support these groups needed. I aimed to present the concept of the learning partnership at the first meetings with the MRT and student participant groups. The issues highlighted at the inaugural meetings with the student and MRT groups, and the developmental considerations and actions taken, are explicated below.

### **Inaugural Meeting with MRT Participants**

I met with four MRT participants. I gave them an overview of what I was hoping to achieve, that is, the formation and development of learning partnerships between Year One medical imaging students and registered MRTs. I explained to the MRT group that an action research approach would be employed in the study. Further, I outlined the features of action research and emphasised the significance and importance of the participants' involvement and contribution to the study. The participants enthusiastically agreed to be a key part of the research team.

### ***Issues Highlighted by MRTs***

Several issues associated with teaching and learning for medical imaging students were identified during the initial meeting with the MRT participants. From their experience of teaching and supervising Year One students, the group convincingly conveyed that students' learning was delayed due to the time it takes for them to adjust to a new, unfamiliar environment. One participant described students as being 'lost souls' for several weeks when they enter the clinical learning setting. An earlier study that I conducted (Thompson, 1999), which explored the supervision of learning for MRT students, established that it takes approximately six months for students to gain a sense of 'fitting in' to their clinical learning setting. In view of the fact that a significant period of adjustment was identified, the MRT participant group suggested that Year One students needed additional support to reduce or avoid lost learning time. They emphasised the need for students to be able to develop a sense of belonging, as the setting in which they were placed was extensive in size and frequently busy, with a significant number of staff. MRTs promoted the value of



students being assigned to registered MRTs to enable improved support in a frequently unpredictable setting.

In addition, the MRT participant group identified that they needed guidance for their supervision and teaching role. They claimed that their knowledge needed to be refreshed to enhance their teaching and to enable effective responses to students' questions. Although a degree qualification became available in New Zealand in 1995, many staff MRTs hold a diploma qualification in medical imaging as that was the only qualification available prior to this date. From my experience of teaching on the previous diploma and the current degree programmes, there are noticeable differences in the pedagogy and learning approaches between degree and diploma education. Degree-level education is designed to promote a more in-depth curriculum and education process, which includes teaching and assessment methods that encourage students to think critically and learn differently as they develop independent practice in complex clinical settings. Yelder (1996) highlighted key issues associated with the previous diploma programme (National Diploma in Medical Diagnostic Imaging). The diploma programme did not encompass a process for critical review and contained a rigid curriculum and examination system with a syllabus that was content driven (Yelder, 1996). Therefore, the currency and depth of knowledge for those who hold a diploma qualification or who completed a degree qualification some time ago, may be different and/or limited compared with the knowledge students acquire in the existing degree programme.

With the introduction of the Health Practitioners Competence Assurance Act (2003) and the subsequent mandatory continuing professional development (CPD) requirements, MRTs' currency of knowledge could have been enhanced through CPD activities. However, from my experience, CPD activities frequently focus on other aspects of radiographic practice, rather than educational practices. The MRT group expressed concern that although they were required by their employer to supervise students (usually specified in the MRTs' position description), they were often unsure if they were fulfilling their role effectively. They had not been given support or guidance with regard to their supervisory and teaching role.

Understanding students' goals and expectations was a further issue raised by MRTs. Similar to the findings in *Phase One* data, they emphasised that students needed to take greater responsibility for their learning, including establishing well-defined goals. MRTs suggested that students appeared to lack direction and their goals were unclear. Further, MRTs identified that they needed to enhance their own understanding of the expectations for learning for students at various levels within the programme.

### **Inaugural Meeting with Student Participants**

A meeting was held with the Year One student participants recruited for *Phase Two* of the study, four weeks after the initial meeting with MRTs. During this meeting, issues related to supervision were explored, some of which were raised during the initial exploratory phase of the study. The concept of forming a learning partnership between the students and MRTs was presented to the students. The students were receptive to the notion. During this initial meeting, several issues were highlighted that were important to consider in the development of the learning partnership.

### ***The Issues Highlighted by the Students***

The student group expressed concern about familiarisation with their clinical learning setting. They reported that it was 'big' and that they 'still get lost' even though they had attended their designated clinical site for four months (two days/week) at this point. Further, they conveyed that it was sometimes uncomfortable needing to seek out an MRT who they could 'attach' themselves to during the time spent in different areas in the radiology department. They felt uneasy, as they needed to learn alongside MRTs whom they often had not previously met. Further, they were overwhelmed by the large staff and indicated that they continuously came across 'new faces'. For students, being in a busy department meant that they were frequently involved in radiographic examinations that were completed rapidly, before moving onto the next examination. Students often did not have opportunities to ask questions and engage in dialogue with MRTs, as the priority for MRTs was to address the workload. Further, they were challenged by the fact that various MRTs 'did things differently' which created confusion for the students.

In addition to key findings in the exploratory phase, the issues raised by both the MRT and student participants in the initial meetings have informed the development of the learning partnership and have been summarised in Table 7.

**Table 7. Issues Raised at the Inaugural Meetings with Student and MRT Participants**

<b>Issues highlighted by MRT participants</b>	<b>Issues highlighted by student participants</b>
Students experienced 'lost' learning time during the familiarisation period. Hence, support was needed for the students when they initially entered the clinical setting.	Concerns related to adjustment to their clinical learning setting
MRTs emphasised the need for guidance for their supervisory and teaching role	Difficulty associated with needing to seek out MRTs to guide their learning
MRTs needed to develop an understanding of the goals and expectations for students' learning	Busyness of the setting hindered students' ability to ask questions
	Students became confused by various MRTs 'doing things differently'

The issues highlighted by the students and MRTs suggested students needed greater support and guidance to reduce 'lost' learning time. Further, if students were partnered with MRTs they may find it easier to adjust to their new environment and would not need to be constantly seeking out MRTs to guide their learning. In addition, if a partnership between a student and MRT were formed and some protected time was secured so they could spend time together, the confusion created for students as a result of learning from many MRTs may be reduced. If students have an opportunity to form partnerships with MRTs they may feel more comfortable about asking questions during their learning. The students were not the only group that the need for support was identified; MRTs also highlighted they needed support to improve their role in the facilitation of student learning.

## **Implementing the Learning Partnership**

Following the initial meetings with the MRT and student groups, additional meetings were held to discuss the developmental and implementation stages of the

learning partnership: separate meetings with the MRT and student groups, respectively, and a combined meeting with both groups. Two key actions occurred during the meetings. Firstly, the MRT meeting involved the development and refinement of documentation to support the learning partnership, including a *supervisory framework* (Figure 7). Secondly, components to be included in an *individual learning portfolio* (ILP) for the students were discussed and developed at a meeting with the student participant group. The *supervisory framework* was also critiqued at this meeting with the student participants. At a combined meeting with both MRT and student participants, the *supervisory framework* was amended to ensure it met the needs to support MRTs' teaching and students' learning.

### **Supervisory Framework**

As a result of issues related to supervision highlighted in *Phase One*, and by students and MRT participants in the inaugural meetings in *Phase Two*, in conjunction with the students and MRTs, I developed a *supervisory framework* to support students' learning and MRTs' teaching. The development of the framework was guided mostly by my observations of teaching and learning encounters in *Phase One* which identified that MRTs' approach to supervision and teaching appeared to be *ad hoc*. The intent of the framework was to provide some direction and consistency in the supervision process for MRTs overseeing the radiographic examinations performed by students. A key dimension of the process was questioning by MRTs to encourage image critique and to check image criteria had been met. This dimension was included to establish students' understanding of image criteria and their subsequent decision making to determine if the radiographic images they had produced were acceptable.

MRT & student discuss request to establish	Observation of case by MRT	Questioning by MRT to foster student's decision making	Aftercare
<ul style="list-style-type: none"> <li>• Student's experience with similar examinations: building on knowledge or prior experience</li> <li>• Patient's history (including viewing previous images)</li> <li>• Projections required</li> <li>• Mobility of patient</li> <li>• Level of supervision required</li> </ul>	<ul style="list-style-type: none"> <li>• Student's rapport with patient (instructions and general conversation)</li> <li>• Appropriate introduction/s and consent, checked for pregnancy</li> <li>• Efficiency: prepared room; set exposure factors accurately</li> <li>• Careful and accurate patient positioning</li> <li>• Confident and professional</li> <li>• Radiation protection principle, ALARA (radiation dose is as low as reasonably achievable) adhered to</li> </ul>	<p><b>Image Criteria</b></p> <ul style="list-style-type: none"> <li>• Understanding of any <b>additional views</b> required to aid contribution to diagnosis</li> <li>• Understanding of <b>repeat views</b> required and how to execute them</li> </ul> <p>Discussion of key points to assist to make the connection to similar future examinations</p> <div style="border: 2px solid red; padding: 5px;"> <p><b>Questions to establish if criteria have been met</b></p> <p><b>Students should be encouraged to articulate:</b></p> <ul style="list-style-type: none"> <li>• <b>C</b>orrect patient demographic details, exposure indices, placement of marker</li> <li>• <b>A</b>rea of interest included in the image</li> <li>• <b>P</b>ositioning is satisfactory/not satisfactory (justified by student)</li> <li>• <b>A</b>natomical features of area in question are identified</li> <li>• <b>P</b>athology appropriately identified for level of experience</li> <li>• <b>A</b>LARA principles adhered to</li> </ul> <p>Do the images sufficiently contribute toward diagnosis?</p> </div>	<ul style="list-style-type: none"> <li>• Arrangements have been made to return inpatients to ward</li> <li>• Outpatients have been farewelled appropriately</li> <li>• Completed images have been archived</li> </ul>

**Figure 7: Supervisory Framework:  
Mastering a Radiographic Examination through a Student/MRT Learning Partnership**

MRTs welcomed the inclusion of the supervisory framework, particularly because it provided them a way of structuring their teaching. It encouraged MRTs to provide feedback for an entire radiographic examination, from its commencement to the time the patient was farewelled from the radiology department. Until MRTs became familiar with the framework they carried a 'paper copy' of the framework with them when working with their student partner. They used dimensions in the framework as triggers for questions they asked students. Importantly, they reported that prior to using the framework they had used their personal method of image critique, which they did not always articulate to students.

An approach to image critique, similar to that contained within the supervisory framework (Figure 7), had been used by the students during clinical learning prior to this study. Therefore, they were used to applying the criteria. MRTs indicated that initially they found it challenging to articulate a critique of their images using the criteria. However, at an early action research meeting an MRT mentioned that *"Susan [a student] helped me along as she had previously used a similar way to critique her images that she had been taught at \_\_\_\_\_[the education provider]"* (Janet, MRT). Overall, the supervisory framework provided a foundation for the student and MRT to guide their teaching/learning encounters.

### **Additional Documentation to Support the Learning Partnership**

Prior to the second meeting with MRT participants, in addition to the *supervisory framework*, I sent them other documentation to peruse (refer to examples of these components in CD titled 'Evidence of Actions' inserted in back cover)

The documentation included:

- (i) An outline of the courses and topics and structure of the BHSc (MI) programme
- (ii) A questionnaire for an MRT to complete that provides information about their background for their student partner
- (iii) *Record of a student engaging with a case template* (for completion by the MRT).

### ***An Outline of the Courses, Topics, and Structure of the BHSc (MI) Programme***

An outline of the courses and topics that students complete in each year of the BHSc (MI) programme and some information about the structure of the clinical and academic components were included in the information pack sent to MRTs. This information was incorporated in response to MRTs indicating that they had a limited understanding of the goals and expectations for students' learning.

### ***Background Questionnaire for MRTs***

A questionnaire was included for the MRTs to complete. MRTs agreed to share the information with their student partners. The purpose of the questionnaire was to offer the student background information about the MRT who they were partnered with. The information included: duration of employment; areas of experience; level of support that had been provided to perform their supervisory role; issues related to supervision, and the approach/es the MRT utilised for supervision and teaching of students.

The information collected via the background questionnaire was beneficial for the MRT's student partner. It was particularly useful that the student was made aware of the MRT's teaching approach as he/she had some idea of how teaching would proceed. In addition, documentation of the MRT's teaching approach meant that it could be established later in this study if their approach changed by being part of the learning partnership.

There were some common responses documented by the MRT participants within the background questionnaire in relation to their teaching approach. For example, they all indicated that they conversed with the student at the beginning of a radiographic examination to establish how much supervision was required. If direct supervision was unnecessary, the distance between the student and supervisor was established in relation to the degree of supervision required. For example, if the student appeared confident to perform an examination unassisted, the MRT would inform the student of how to locate him/her if the student required assistance and/or to check the images taken at the end of the examination. With the exception of one MRT participant (who described employing questioning techniques) the descriptions of their teaching approaches suggested they did not

employ strategies to promote learners to develop a deeper understanding. For example, questioning techniques to guide reflection and decision-making were not evident. However, strategies to promote a deeper level of understanding were evidenced in the learning partnership (refer to Impact of Partnership on MRTs, p. 158). Further, the group did not describe a structured approach to their teaching which was apparent in the learning partnership, following the development of a supervisory framework.

### ***Record of a Student Engaging with a Case Template***

Duplicate copies of a *Record of a student engaging in a case* template were included to enable the MRT to document feedback for the student when observing and/or assisting him/her to perform a radiographic examination. The information to be collected incorporated:

- the degree of difficulty of the case performed by the student
- questioning to establish the student's previous experience with similar cases, understanding of patient history and images required, and the level of supervision required
- observation of the student's approach to the case, comments related to the need to intervene, questioning associated with image evaluation

### **Individual Learning Portfolio Developed with Student Participants**

In addition to developing documentation for the MRTs, documentation was also developed for the students. I presented potential components to be included in an *individual learning portfolio* (ILP) for students, at a second meeting with student participants. The key purpose of the portfolio was to provide a way for students to collect, store and develop the central dimensions associated with their learning in the clinical setting. At this point, the portfolio contained three elements:

- (i) A background questionnaire
- (ii) *Record of engaging with a case* template (to be completed by the student)
- (iii) A framework indicating how students anticipated they would approach a radiographic examination



(Examples of these components are included in a CD titled 'Evidence of Actions' inserted in back cover)

### ***Background Questionnaire for Students***

Completion of the background questionnaire enabled students to document some information about their background. Students agreed to share the information with their MRT partners. It was anticipated that this information could be shared with the student's MRT partner to assist him/her to become acquainted with the student. Information collected through the questionnaire included: the student's previous academic background and/or employment; reasons that the student applied for the programme; anxieties prior to commencing the programme, any current anxieties, and the student's strengths and weaknesses.

The MRTs indicated they found the information about their student partners contained within the background questionnaire to be useful. They felt they were made aware of the student's previous experience, motivation for applying for the programme, and anxieties. The MRTs explained that being aware of students' anxieties (documented on questionnaire) was particularly helpful as they had an idea of the type of support students needed. For example, a common anxiety for the student participants was adjusting to the unfamiliar hospital environment, therefore, assisting to orientate the student was important.

### ***Record of Engaging in a Case Template***

A third component of the portfolio comprised a *Record of engaging in a case* template which students were expected to complete when rostered to a particular area within, or associated with, the radiology department. They were required to document their goals for the time spent in the area, the learning support provided, the outcomes achieved and the area/s that needed additional learning.

The documentation that was included to assist to develop and support the learning partnership for MRTs and students has been summarised in Table 8.

**Table 8. Documentation to Support the Learning Partnership**

<b>Documentation for MRTs</b>	<b>Documentation for students</b>
<i>Supervisory framework</i> (MRTs were given opportunities to comment on the framework)	<i>Supervisory framework</i> (students were given opportunities to comment on the framework)
An outline of the structure, courses, topics and clinical assessment within the BHSc (MI) programme	Components for an individual learning portfolio (IPL) including:
A questionnaire to provide information about the MRT's background	A questionnaire to provide information about the student's background
<i>Record of student engaging with a case template</i> (to be completed by the MRT)	<i>Record of engaging with a case template</i> (to be completed by the student)
	A framework developed by a student to indicate how he/she anticipates they would approach a radiographic examination

### ***Learning Style Questionnaires***

At the same combined meeting, participants completed two learning style questionnaires; the VARK (visual, aural, read-write, kinaesthetic) preferences questionnaire (Fleming, 1995) and the Paragon Learning Styles Inventory (Paragon Learning Style Inventory, n.d.) [refer to CD titled 'Evidence of Actions' inserted in back cover]. This gave MRTs and students the opportunity to be aware of their learning styles. It was thought to be beneficial for mentors (MRTs) to be aware of their mentee's (student's) learning style (Anderson, 2011; Gopee, 2008) as they could tailor their teaching accordingly, making the achievement of meeting objectives more effectual. Nursing students in Riley and Fearing's (2009) study completed a VARK questionnaire prior to engaging in a mentoring arrangement to enable their mentor to be aware of the student's learning style preference. On viewing the outcomes of the VARK inventory, many mentors employed strategies for teaching to align with their mentee's learning preference. Hence, it was appropriate for MRTs and students in this study to establish their learning style preference to make each partner aware of the other's preference (Riley & Fearing, 2009). Initially it was intended that student and MRT partnerships would be formed on the basis of similar learning style preferences. However, the group pointed out that this would be difficult to instigate if the initiative was adopted.

The participants completed the questionnaires and discussed the outcomes with their partner. They referred to the information on the website for the Paragon Learning Inventory (n.d.) and VARK questionnaire (Fleming, 1995) to explore their results. The MRTs and students in partnership identified that it was beneficial to be acquainted with their partner's preferences to assist to understand their respective teaching and learning approaches. The questionnaire results are included in Tables 9 and 10.

Learning preferences within the VARK questionnaire include, kinaesthetic, aural, read-write and visual (Fleming, 1995). Responses from the VARK questionnaire demonstrated that all MRT and student participants had two key preferences. A kinaesthetic preference was apparent for all participants. The preferences with the next highest scores (in descending order) were visual, read/write and aural. Three MRT/student partnerships shared the same two preferences (kinaesthetic/visual (x2) and read-write/kinaesthetic (x1)). The fourth partnership shared a kinaesthetic preference, however, the other preference was read-write for the student and aural for the MRT. It was interesting that the results for MRTs/students in partnership were similar. However, it is not possible to conclude that the similarities contributed to the success of the learning partnerships. However, it may be useful to collect data in future implementation of the learning partnership to identify how partnerships are influenced by the learning preferences of the partners.

A variety of responses were obtained with the Paragon Learning Inventory (Paragon Learning Style Inventory, n.d.) which provided information about learning style and cognitive preference. Two partnerships identified that both partners were extrovert. The remaining partnerships comprised a combination of individuals identified as introvert or extrovert. The remaining categories within the partnerships were variable. However, one partnership demonstrated a similarity in the sensate and perceiver categories. When compared to the VARK questionnaire, the group found the completion of the Paragon Learning Style Inventory to be of less benefit to the MRT/student partnerships. They reported the results of the VARK questionnaire offered them a 'more practical' summation of their learning preferences.

**Table 9. Results of VARK Learning Preferences**

<b>Partnership 1</b>	<b>MRT</b>	A,K	<b>A = Aural</b> <b>K = Kinaesthetic</b> <b>R = Read/write</b> <b>V = Visual</b>
	<b>Student</b>	R,K	
<b>Partnership 2</b>	<b>MRT</b>	R,K	
	<b>Student</b>	R,K	
<b>Partnership 3</b>	<b>MRT</b>	V,K	
	<b>Student</b>	V,K	
<b>Partnership 4</b>	<b>MRT</b>	V,K	
	<b>Student</b>	V, K	

**Table 10. Paragon Learning Inventory: Learning Style and Cognitive Preferences**

<b>Partnership 1</b>	<b>MRT</b>	ENFP	<b>E/I = Extrovert/ Introvert</b> <b>S/N = Sensate/ Intuitive</b> <b>T/F = Thinker/ Feeler</b> <b>J/P = Judger/Perceiver</b>
	<b>Student</b>	ESTJ	
<b>Partnership 2</b>	<b>MRT</b>	ENFP	
	<b>Student</b>	ESFJ	
<b>Partnership 3</b>	<b>MRT</b>	ESFJ	
	<b>Student</b>	ISFP	
<b>Partnership 4</b>	<b>MRT</b>	ESTP	
	<b>Student</b>	ISFP	

**Minor Adjustments to the Learning Partnership*****Suggestion for the Incorporation of an Online Platform***

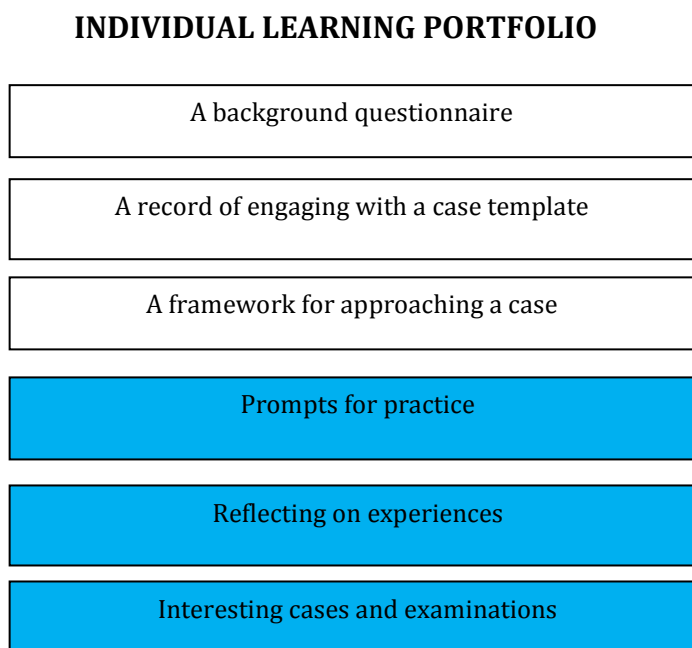
The suggestion of incorporating an online platform to augment the partnership was made by MRT and student participants at the first combined meeting of participants. An online platform would enable student and MRT partners to engage in private conversations to discuss and explore aspects of practice, outside their scheduled face-to-face encounters. I signified that in the forthcoming weeks I would explore the introduction of an online platform with the intention of embedding it within the framework for the learning partnership.

***Amendments to the Individual Learning Portfolio***

Components of the *individual learning portfolio* were confirmed at the third meeting with student participants. Figure 8 shows the contents of the amended portfolio.

Three additional components were added to the learning portfolio (highlighted in Figure 8). The *Prompts for practice* component was an alphabeticalised section in

which the students could include useful pointers and reminders for radiographic examinations that they could refer to prior to undertaking similar examinations.

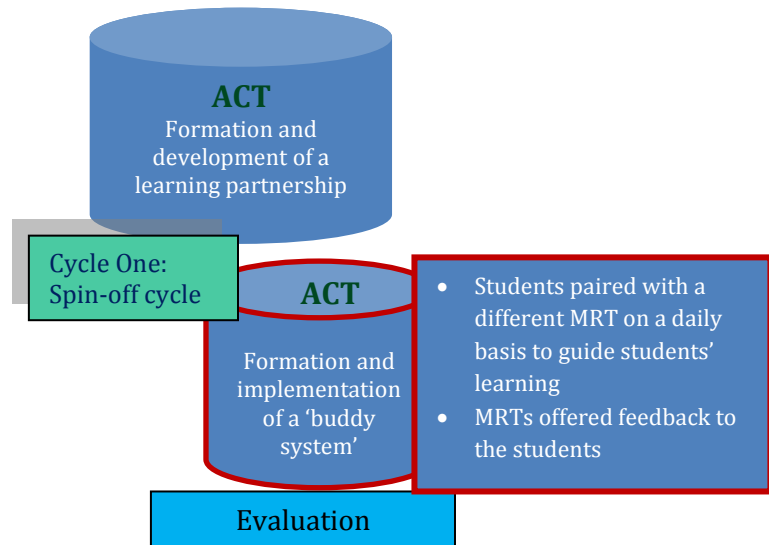


**Figure 8. Finalised Portfolio Contents**

The *Reflecting on experiences* component provided a means for students to document reflections on their experiences to assist them to make meaning of their experiences. Several authors (Baird, 2008; Sim & Radloff, 2009; Williams & Webb, 1994) have emphasised the importance of fostering reflection within medical imaging education. Students were provided with triggers to guide them (refer to the separate supporting CD titled 'Evidence of Actions' inserted in the back cover of this document). The purpose of the final portfolio component, titled *interesting cases/examinations* provided an opportunity for students to record interesting cases, in particular those with evidence of pathology.

### **Implementing the 'Buddy System': A Mini or Spin-off Cycle**

The development, implementation and evaluation of a buddy system (Figure 9) was considered as a spin-off or mini-cycle (Cardno, 2003) within the first cycle of action research. At the first combined meeting of student and MRT participants, which involved discussion and reflection on the implementation of the learning partnership, it was suggested by the MRT participants that a tangential strategy should be trialled as an extension of the learning partnership development.



**Figure 9. Spin-off Cycle**

The development of the 'buddy system' was influenced by MRT participants who were trying to find other ways of enhancing support for students in the clinical environment to improve their learning experiences.

The 'buddy system' required a student to learn alongside an MRT for the entire day. Unlike the learning partnership (consisting of the same student/MRT pair), in the buddy arrangement the partnerships would change on a daily basis. Within the 'buddy system' MRTs were encouraged to establish the level of supervision students required, observe the students and provide them with feedback. MRTs and students in the group agreed that the introduction of a 'buddy system' was a valuable idea as it provided some structure to the *ad hoc* approach to supervision that students experienced prior to this study. Outside of this study, students in the medical imaging programme were not formally aligned with MRT partners. From observations in the clinical setting during *Phase One* of the study, I noticed that an MRT rarely 'took a student under their wing', it was mostly left to a student to align him/herself with an MRT. The suggestion for establishing a 'buddy system' emerged from the participants in this study and was an inspiring development in Cycle One.

## **Evaluating Action: Learning Partnership and ‘Buddy System’ (Cycle One)**

The impact of the learning partnership and the ‘buddy system’ on three stakeholder groups (students, MRTs and the education provider) has been outlined below.

### **Impact on the Students**

#### ***Learning Partnership***

The completion of documentation associated with the various components of the *individual learning portfolio* (a record for engaging with a case, a framework for approaching a case, prompts for practice, reflecting on experiences) [refer Figure 8, to page 154] commenced soon after the partnerships were formed. At this stage, (prior to the development of the online platform) documentation associated with these components was paper-based.

The development of a learning partnership resulted in many benefits for the students. Students and MRTs revealed that the students’ confidence increased due to knowing their MRT partner. They developed the confidence to ask questions, involve themselves in examinations and take risks, which the participants asserted progressed their learning. However, students indicated that they needed to spend more face-to-face time with their MRT partners in the clinical learning setting. They perceived that the face-to-face contact time that had been suggested by the participants was insufficient.

The key aim in the second phase of this study was to develop a partnership that provided support for both students and MRTs. However, the support throughout the development was clearly primarily focussed on the students. The support was provided by the MRTs.

#### ***‘Buddy System’***

Several benefits of the ‘buddy system’ were highlighted by the students. Firstly, as students were partnered with MRTs, there was no need to seek out MRTs to assist them. Subsequently, they maintained the workflow was more efficient and time was saved. Secondly, the student participants claimed that the relationship formed

with their MRT partner enhanced their confidence to involve themselves in examinations, confront challenges and to question in a way that did not make them feel incompetent. Conversely, confidence was not developed if students were assigned to an MRT who did not like supervising students. Students reported that being 'buddied' with an MRT who had limited or no time for them was frustrating.

## **Impact on the MRTs**

### ***Learning Partnership***

MRTs eagerly completed the paper-based *Record of a student engaging with a case* template to provide feedback to their student partners. They relished the face-to-face time they spent with their student partners. However, similar to the students, the MRTs indicated that the time allocated was insufficient and emphasised they needed more time with each other for the partnership to 'gain ground'.

When it became evident that the MRT participants appeared to be focussing the design and implementation of the initiative on the students, I made various attempts at meetings to suggest ways that the MRTs could be better supported. I constantly reminded MRTs that they could contact me if they required additional information or resources to carry out their role. For example, if MRTs specified that they required some theoretical material to refresh their knowledge to support their teaching, I indicated that I would provide the information. MRTs did not request information. However, it became evident at early action research meetings that they would frequently specify areas in which their knowledge was not current. Either discussion occurred about these areas or a group member directed the MRT to some appropriate reading. Also, the students offered to provide notes to the MRTs from lectures and tutorials in some instances. It was evident that for this group it was unnecessary to include a more formalised approach (for example, providing the information for MRTs) as areas of concern for MRTs were raised and discussed during action research meetings. It may have been the small group size and having the opportunity to get to know each other that allowed MRTs to express the need for clarification or explanation with ease. If the learning partnership arrangement was introduced for a larger population of MRTs and students in the future, discussion would need to occur with MRT groups about the most appropriate ways to assist to refresh MRTs' knowledge.



Although the learning partnership focussed on support for the students, the MRTs indicated that they were supported by each other during meetings in the design and implementation stages of the initiative. The meetings provided opportunities to discuss the supervision of students, teaching, learning and other aspects of practice. MRTs disclosed that the meetings were motivating and encouraged them to 'think about their practice'.

Despite the fact the initiative provided support primarily to the students, it was most apparent that aspects of the learning partnership enhanced MRTs' practice as a consequence of the relationship they had developed with their designated student. For example, MRTs valued the opportunity to develop a relationship with a student and to get to know them, as students outside of this study were usually transient in the clinical setting. Further, knowing the student enabled MRTs to have a more positive contribution to their learning. MRTs also valued what they learned from the students, thereby illuminating the benefits of being in a relationship. The outcomes of the partnership, therefore, focussed less on direct support for MRTs and more on the enhancement of MRTs' practice.

MRTs exhibited changes in their teaching approach as a result of being situated in a learning partnership. For example, they focussed on employing the supervisory framework to structure their approach to supervision and to foster effective questioning. MRTs identified that the use of effective questioning strategies assisted to foster students' decision-making capabilities. For example, MRTs questioned students about their reasoning with regard to decisions made about the acceptability of their images. Questioning strategies were not described by MRTs when they documented their teaching approach in the background questionnaire prior to the implementation of the learning partnership.

Further, MRTs indicated that documentation such as an outline of the courses and topics and structure of the BHSc (MI) programme had been useful to help them develop an understanding of the goals and expectations of the programme.

### ***'Buddy System'***

Although the implementation of a 'buddy system' provided valuable support for the students, the relationship was not unidirectional. MRT participants highlighted the benefits of being a part of the 'buddy system'. The students contributed to the MRTs' learning as their knowledge was current. MRTs also revealed that their knowledge was refreshed as a result of needing to explain aspects of practice to students in response to students needing clarification and understanding.

Nonetheless, there were some drawbacks of the 'buddy system' as revealed by the MRT participants. Interestingly, although student participants had highlighted that the system saved time, MRT participants reported that there was insufficient time for explanations to students when they were busy. Moreover, MRT participants revealed that they were concerned about being partnered with students who did not have a positive attitude towards learning. However, the benefits of the 'buddy system' outweighed the drawbacks of the initiative. MRTs emphasised the value of being part of this arrangement. Nonetheless, it was most evident that additional support was required to enable MRTs to be able to effectively perform their role as a 'buddy'. In particular, MRTs suggested they needed guidance for supervising students and online material to update their knowledge.

### **Impact on Education Provider**

#### ***Learning Partnership***

Although it was not a key intention of this study to demonstrate the direct impact of the initiative on the education provider, potential benefits were evident. Being aligned with MRT partners enabled the students to involve themselves more readily in examinations, be open to challenge and take risks. Their subsequent learning experiences were likely to be more valuable. As students were in a learning relationship with MRTs, it meant they were probably less reliant on clinical tutors for learning support. The learning partnership gave MRTs the opportunity to make a greater contribution to students' learning, which may assist to foster links between education and practice.

### ***'Buddy System'***

The buddy system also revealed potential benefits for the education provider. Being connected with an MRT for a day meant that students did not have the added

stress of needing to find an MRT to enable their learning. This resulted in increased support and less interruption to the students' learning. It is likely that opportunities that foster continuity of students' learning would be of value to the education provider. In addition, encouraging MRTs to increase their involvement in teaching and supervision of medical imaging students is likely to be beneficial to the education provider.

### **Cycle One: My Reflections**

During the *look* stage of first action research cycle (*Phase One*), in which I gathered data to build a picture of experiences of learning for MRT students, there were several issues associated with teaching and learning for students that surprised me. For example, I had no idea of the divide between clinical tutors and MRTs. Although I would expect that students would hold clinical tutors in high regard, I was astounded that MRTs appeared to place clinical tutors on a pedestal. I was employed as a clinical tutor 10 years ago and, unless there has been a change in perception, I was not aware clinical tutors were viewed in this way by MRTs. This lack of awareness may have been because of my clinical tutor role. It appears that the key reasons clinical tutors are perceived in this way is that they have a gate-keeping role and they 'have the facts at hand', as they are likely to continuously update their knowledge of anatomy and the technical and professional dimensions of practice. They need this knowledge for the purpose of teaching and assessment. Although there were other disclosures in the data, such as no significant changes in the process for teaching and supervision since I was a student, the apparent division between MRTs and clinical tutors was most alarming for me, particularly in view of the fact that the majority of teaching and supervision is undertaken by MRTs.

At the beginning of the action research process, in particular, the first action research meeting, I was somewhat concerned at the hesitance of the MRT participants to engage in robust discussion about teaching and learning for medical imaging students. I had anticipated that the MRT group would have been forthright in their discussion. I thought that this would be an opportunity for them to share their experiences of teaching and supervising medical imaging students. I expected that they would be very clear about how they carried out their role as

supervisor/teacher and the challenges they experienced. Perhaps I had an ambitious expectation that the MRTs would highlight definite ideas for the development of a learning partnership framework. I was surprised at their reluctance to express their ideas.

There are a number of reasons why they may have been reluctant to contribute in the initial meetings. Firstly, the MRT participants may have needed more time to think about the notion of the development of a learning partnership. Secondly, their disinclination could potentially have been related to their limited knowledge about teaching and learning. Within the group, they may have perceived me to be the 'most knowledgeable' on education for medical imaging students. Did this possible perception create a power differential that made them hesitant to contribute? Were they afraid they might not use the 'right' terminology and jargon in these discussions?

Although I spend time (albeit limited) in the clinical setting, my world is now different to MRTs employed within a clinical setting. An understanding of pedagogy for medical imaging, which has become a part of my life, was understandably foreign to the participants. As mentioned earlier, there is an expectation of employers in clinical sites that MRTs will teach and supervise students. However, how can MRTs be expected to perform this role to their best of their ability when they have not been supported with fundamental knowledge and guidance about teaching and learning? Thirdly, although the MRTs were all located in the same setting, the radiology department has approximately 40 full-time equivalent staff members; therefore, the MRTs might not have had the opportunity to get to know each other previously. Hence, to enable a more comprehensive discussion, time was probably necessary to enable the group to form relationships and trust each other. It appeared initially that the MRT participant group were happy to travel the journey with me, but they were keen for me to take the lead.

Prior to the next meetings, I worried about the MRTs' reluctance to discuss their experiences and offer their views. I was concerned about how this would affect the development of an initiative to support students' learning. I needed them to be a

central part of this development as the initiative was about improving the support for the facilitation of learning. I planned to assess the level of contribution at the next meeting and decided that I would need to try another approach if it continued to be minimal. Although not ideal, I thought about breaking the group into pairs, hoping it would be easier for individuals to share their views in this setting. However, this was unnecessary. It was definitely reassuring for me that the MRT participants' contributions markedly increased during the following meetings.

In contrast to the MRT group, the students enthusiastically presented their views about teaching and learning and suggested ways in which they could be improved. The students' openness may have been due to them contributing to an initiative that was likely to improve their situation and assist them to succeed. I was assured that the confidence the students developed as a result of being a part of a learning partnership and/or 'buddy system' meant that their learning experience was improved (I would argue, markedly improved) in comparison with what normally occurs. In particular, the learning partnership meant that MRTs' attention was drawn to the ways in which students engaged with their learning. It is possible that this made students feel more important as their individuality in learning was taken into account. Students were excited by the support for learning offered by these arrangements. They often called into my office to express the value of the support arrangements. I sensed that they felt privileged as they were provided with support for their learning that was not available for students outside of this study.

The MRTs were also enthused by the 'new way of doing things', particularly when they started to notice the progress of their student partner. Maybe it was the change that evoked enthusiasm, as MRTs have been involved in a less structured approach to supervision for as long as I have been involved in medical imaging (as a student, MRT and educator). MRTs probably felt empowered by having a more recognisable role in the process of supervision and teaching for medical imaging students. Their enthusiasm gave me some assurance that the learning partnerships were 'working'.

Although I was confident that an action research method was most appropriate for my study, I experienced some anxiety with regard to the slight uncertainty of the method in that each cycle determines the next. At the outset of the study, I had not envisaged that the introduction of technology in Cycles Two and Three would become a central part of the study. Nonetheless, Cycle One evolved into the beginning of a new cycle, in which an online learning platform was developed.

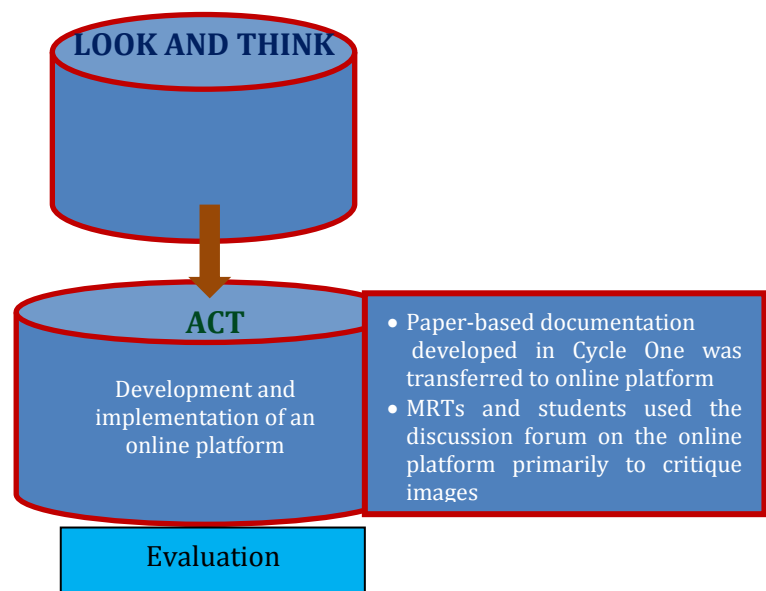
### **Cycle Two: *Look and Think* Stages. Development and Implementation of an Online Platform.**

Students and MRTs realised soon after the learning partnership had been implemented that the face-to-face time the student and MRT were spending in partnership was inadequate. Sally, an MRT, expressed at an action research meeting, *"I think that's one of the frustrating things, that there hasn't actually been that much time spent together. I think if that could be increased then it has to be of more benefit"* (Sally, MRT, second combined meeting with student and MRT participants). The students' roster was the main impediment to spending time together. Although their roster had been amended to enable the partners to spend time with each other, it was deemed insufficient. The MRTs in the partnerships mostly remained in one area of the radiology department, whereas the students needed to rotate to various areas to gain the necessary experience. The participants emphasised the need to introduce an online platform to provide another means by which they could communicate with each other. The students stressed the value of being able to discuss the images they had taken with their MRT partner beyond their face-to-face encounters. Hence, a decision was made to develop an online platform and for the documentation developed in Cycle One to be transferred to the platform. The online platform was developed, implemented and evaluated in Cycle Two of the study (Figure 10). The platform was designed to provide a repository for documentation for the learning partnership and to enable students to upload images for discussion with their MRT partner.

Prior to selecting a suitable platform, I met with an e-learning advisor responsible for online learning at the tertiary institution that the student participants were enrolled at. I outlined the intention for Cycle Two of my study and what I hoped to achieve. The advisor suggested two suitable e-learning platforms for this study:

Moodle and Blackboard. A decision was made to employ Moodle, particularly because the institution was transitioning from Blackboard to Moodle within the next two years. In addition, the MRT participants had used Moodle in a limited way within the District Health Board in which they were employed. The e-learning advisor set up a framework to incorporate functions to support the learning partnerships.

At this point, it was necessary to arrange to meet with a Picture Archiving Communications Systems (PACS) advisor at the clinical site that the study was located. PACS advisors are responsible for supporting MRTs, radiologists and other health professionals in an environment of digital imaging technology.



**Figure 10. Cycle Two: Development and Implementation of an Online Platform**

I needed to explore how students could upload images to Moodle without including the patient's demographic data. I had anticipated that students would collect and store images providing evidence of best practice, and unacceptable images they had needed to repeat due to inadequate technical aspects. I envisaged that discussions between the student and MRT in partnership about these images would be most valuable to encourage students to articulate the factors that influenced their decision-making with regard to images being judged as acceptable.

The key reason that I needed to meet with the PACS advisor was because unacceptable images were not usually archived. Therefore, it was necessary to find a way that the images could be saved for subsequent discussion. The PACS advisor suggested that a designated folder could be created for students to store their images (with demographic data removed). Both unacceptable images and images providing evidence of best practice could then be uploaded to Moodle.

## **Cycle Two: *Act* Stage: Implementing an Online Platform**

The initial, paper-based documentation developed for the learning partnership, such as an outline of the courses and topics and structure of the BHSc (MI), participants' background questionnaires, a *supervisory framework*, and *Record of student engaging with a case* template (examples been included in the separate supporting CD titled 'Evidence of Actions' inserted in the back cover of this document) was loaded onto Moodle.

The key way in which the Moodle site was used in this study was the discussion forum. It had been set up to ensure that any discussion that took place was only viewed by the MRT and student in partnership. However, as the researcher, I was also able to view all discussions.

The first posting of documentation (background questionnaire) on Moodle was made one week after the platform was established. This posting was closely followed by the first images being uploaded for discussion. Students posted images of cases they had been involved in and posed questions to their MRT partner about the case/s in question. They presented cases that were unusual, challenging and provided example/s of their best practice. (Examples of these discussions are included in the CD titled 'Evidence of Actions' inserted in back cover of this document).

A minor amendment was made to some documentation two weeks following the introduction of the online platform. MRTs and students disclosed that printing the templates for the *Record of engaging with a case* template (completed by the student) and *Record of a student engaging with a case* template (completed by the MRT in partnership) was time consuming. The participants also indicated there



was some overlap between the templates; therefore, it was decided at the second combined meeting of MRT and student participants that the templates could be combined (refer to supporting CD titled 'Evidence of Actions' inserted in the back cover of this document). To date, the students had used one part of the *Record of engaging with a case*, template that is, the setting of goals section. They indicated that it had been unnecessary to complete the remainder of the template as they preferred to discuss the cases they were involved in with their MRT partner using the headings included in the template. They claimed that a discussion rather than documentation saved time.

Sixty-five postings were made during the following 10 months. Thirty-four postings were made by students, 28 by MRT partners and three postings by me as the researcher. It was unnecessary for me to intervene in the process, as the postings were instigated by the student participants who then awaited a reply. The responses were frequently comprehensive, with a student describing the responses from her MRT partner as "essays" (*Sarah, student, second combined meeting with student and MRT participants*). One student participant made four postings of images and questions for discussion, but did not receive any response from her MRT partner.

### **Evaluating Action: Evaluation of the Online Platform (Cycle Two)**

MRTs (with one exception) were committed to utilising the online platform. The platform was used occasionally by students commenting on aspects of practice; however, the majority of postings involved students uploading images of radiographic examinations they had been involved in.

### **Impact on Students**

Although students received responses for most questions posed to their MRT partners, one student's partner provided in-depth responses related to the images that the student had uploaded but did not respond to the two technical questions that the student had presented. It is possible that the MRT was comfortable about replying to queries related to performing radiographic examinations and critiquing images, but less comfortable about responses requiring technical/scientific knowledge.

The online discussion forum was unsuccessful for one of the four student/MRT pairings. The student in the partnership posted images (four times) and waited for a response. Several attempts were made by the student to engage the MRT; however, the MRT did not participate. I carefully approached the MRT to establish reasons for non-participation. The MRT indicated that the key reason for not engaging was a lack of time due to shift work. The MRT attempted to participate in the learning partnership in other ways such as attending the initial action research meetings and by offering support to the student with the provision of textbooks. The student became frustrated by the lack of engagement by the MRT and another MRT participant offered to partner her.

### **Impact on MRTs**

Although the MRTs were committed to responding to students' questions, they found the process to be time consuming. They mostly responded during work time, however, one MRT utilised time in the evening to respond to her student partner. Despite the fact communicating online took time, MRTs were energised by tapping into existing knowledge and exploring new knowledge.

Although MRTs experienced some minor difficulties using Moodle, such as knowing how to reply to a post and attach a document, the students did not have any technical difficulties. The MRTs' challenges were addressed at meetings and the problems were resolved. Interestingly, it was mostly the student group who assisted the MRTs to resolve the problems.

### **Impact on Education Provider**

A partnership enabling discussion between students and MRTs which has been beneficial to the students, is likely to be of value to the education provider. From the perspective of the education provider, any ways in which the students are better supported in the clinical setting is likely to progress their learning. In addition, discussion between students and MRTs may lead to closer links, between the education and practice settings.

## **Cycle Two: My Reflections**

The initial idea of developing an online platform made me feel anxious. Although I have developed numerous online courses in the academic setting, this one was different, particularly because of the intended use and the requirement for the student and MRT in partnership to communicate. It is evident from my involvement in academic online courses that students are more likely to engage in discussion if there is a mark allocated to their contributions. There was no 'carrot' for participants to engage, so I needed to trust that they would embrace the opportunity. I had no control over whether the interactions would occur. I was reassured that the online platform was well utilised by students and MRTs. It was student-led, as expected, and the frequency of postings was remarkable. Although I sensed that the students were genuinely engaged with the online platform, I wondered if the noticeable number of postings occurred because the students felt obligated to post as they were participants in the study.

My key concern in relation to the online platform was the need for students to post images to the site, in particular reject images. My knowledge about digital technology in a radiology department was adequate but I definitely needed some help to be shown how to progress. I sought help from an MRT in the radiology department in which the study was located who was experienced in digital technology. I had not met this MRT previously and I certainly needed her to give me some of her time. Fortunately, she was willing and able to meet my needs. Without this help, it would have been difficult to proceed. Cycle Two evolved into a new cycle in which a PDA was introduced to enable students to collect evidence of their learning and store information to support their learning.

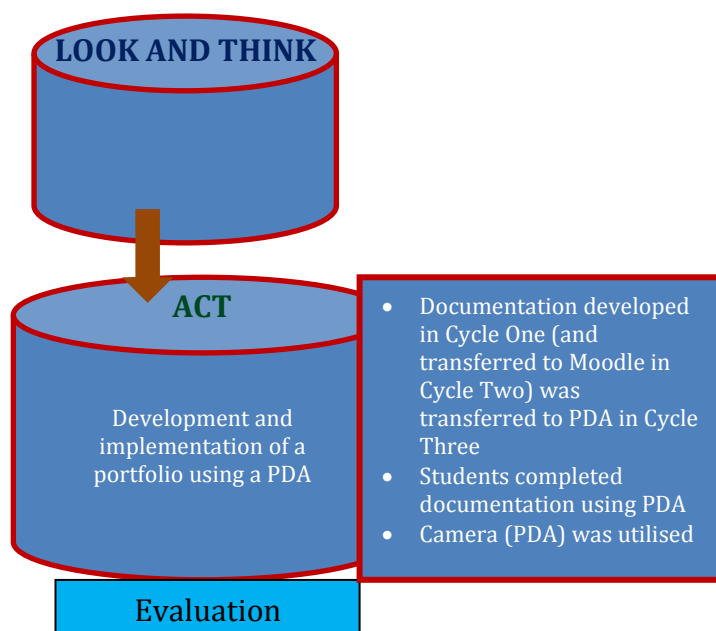
## **Cycle Three: *Look and Think* Stages. Introduction of PDAs.**

At a fifth meeting with students, the potential of using a portable electronic device to store the data they had been collecting to provide evidence of their learning was discussed. Students frequently downloaded documentation from Moodle that required completion. They found this to be time consuming. Although the students had created their own ways of collating the documentation it was agreed that electronic storage would be the most efficient way of collecting and collating the students' evidence of learning. Students indicated that ideally the device

should be one that they could take to the control panel where exposure factors are set for radiographic examinations. Hence, a device that they could carry with ease seemed to be a suitable suggestion. It was intended that an e-portfolio would be developed (Figure 11). The portfolio would be managed by the students and viewed by their MRT partners to keep them updated about the students' progress. Over the next few weeks, I investigated suitable electronic devices and I was able to access some PDAs within the faculty in which the students were enrolled. A PDA or mobile, pocket-sized handheld computer is a device with a display screen, which is accessed using a small pencil-like device. The PDAs the students used for this study enabled them to access the internet and record and store information. The device also incorporated a camera.

### Cycle Three: *Act* Stage

The PDAs were disseminated when I met with three of the student participants; (the fourth student was on leave and one of the other participants agreed to pass on a PDA to this student) the following week. The students spent a few weeks familiarising themselves with the PDAs.

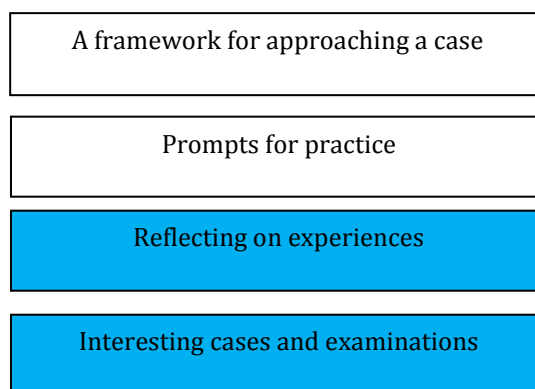


**Figure 11. Cycle Three: The Development and Implementation of a Portfolio using a PDA**

During this familiarisation period, I sent them documents, that had been previously developed during Cycle One (and transferred to the Moodle site in Cycle Two) to load onto the PDA device (Figure 12). The documents included: A

*Framework for approaching a case* (how students anticipated they would approach a radiographic examination) and *Prompts for practice*.

It was evident when I met with the students two months after they commenced using the PDAs that they had a sound understanding of the functions the PDA offered. They had commenced recording *Prompts for practice* for particular examinations and had developed a *Framework for approaching a case* (examples are included in the supporting CD titled 'Evidence of Actions' inserted in the back cover of this document). In addition to the two documents specified above, it was decided by the group to embed some remaining documents (highlighted in Figure 12) that had been previously developed for the paper-based portfolio (refer to page 154).



**Figure 12. Final Documents for PDA**

The remaining two components of the original portfolio (the background questionnaire and the *Record of engaging with a case* template) were not transferred to the PDA. It was unnecessary to transfer the background questionnaire as it had been completed in a paper-based format during Cycle One. However, it is intended that it will remain a key component of the portfolio if it is introduced in the future. The *Record of engaging with a case* template was not included as it had not been well utilised by the students. They indicated that they preferred to receive verbal feedback from their MRT partners. This template will need to be carefully considered and amended if it is included in the future, as it is potentially a valuable means of providing documented feedback for students. However, students were encouraged to continue to document learning goals each day in the practice area.

It was established during the next meeting (sixth meeting with students) that the students would continue to use the PDAs and we would meet again in two months. They would focus on using the camera, documenting goals, use the *Prompts for practice* section and record reflective accounts in the *Reflecting on experiences* section of the portfolio.

During the previous eight weeks the students had mostly used the *Prompts for practice* section. They had attempted to use the camera to take photographs of their peers (all participants in the study) to remind them of positioning of patients for various radiographic positions, and equipment positioning and functions. It was not appropriate or permitted to take photos of patients or any staff members.

Students had utilised the *interesting cases/examinations* section embedded in the PDA. The *Reflecting on experiences* section had been utilised to a lesser extent than the other sections (*A framework for approaching a case; Prompts for practice; and Interesting cases and examinations*). However, students emphasised the value of the *Reflecting on experiences* section and indicated they could provide an excellent record of areas of practice they had grappled with or mastered. Students utilised the PDAs for five months.

As mentioned above, the *Reflecting on experiences* section had not been well utilised, however, three key themes were identified in the documented reflections. Firstly, students acknowledged their transition to independence, that is, performing examinations without an MRT needing to intervene. They described the pleasure associated with mastering radiographic examinations.

Secondly, students reflected on the need to develop a routine for examinations that they were less familiar with to ensure that important facets were not omitted (for example, a radiographic projection as a part of a required series of images) and to avoid unnecessary mistakes. They reported that they observed their MRT partner's routinised approach which they then tried to follow. Further, they documented that their partners also helped them through non-routine radiographic examinations and reflected on adaptations to these examinations.

A third key theme highlighted was the 'anxiety' associated with learning. The reflective accounts identified that students were critical of their practice. For example, they appeared to document mistakes they made and frequently discussed sub-optimal images they had produced, rather than highlighting the things they did well. Students made judgments about their practice and compared their perceived capability to their peers. However, students indicated that they felt less concerned if they made a mistake, as the relationship with their partner meant that it was unlikely they would be reprimanded.

The documented accounts (albeit limited) described and 'unpacked' important aspects of learning for the students. Students indicated that it was time-consuming to record their accounts, however, they realised the value of the accounts in relation to their learning. Hence, if the *Reflecting on experiences* section became a component of the PDA (or other mobile electronic device) in the future, consideration will need to be given to how students can be encouraged to utilise this section.

## **Evaluating Action: Evaluation of the Introduction of a Portfolio Utilising a PDA (Cycle Three)**

### **Impact on Students**

The students clearly indicated the value of using a PDA to provide evidence of documenting aspects of their experiences of learning in clinical practice. It provided opportunities for them to capture their progress of learning and reflect on their experiences. They posited that having all of their documentation recorded in the same place was much more effective than using various templates to record aspects of their evidence of learning. Although they promoted the value of being able to include photographs for reference in the PDA, they indicated that the quality of the camera needed to be improved.

The students highlighted that the compact size of the PDA meant it was suitable to carry with them. The students were competent at using the technology. Arguably, the student participants were under 23 years of age so it was most likely that their ability to use new technology would be related to their age. That is, the group

probably would have been exposed to and utilised computer technology during their previous education.

The device in its current form has been useful but improvements and additions would be necessary for use in the future. The students suggested that the following components should be included if a PDA or a similar electronic device was implemented in the future to enable the development of an electronic portfolio:

- (1) *A framework for approaching a case*
- (2) *Prompts for practice*
- (3) Reflective accounts (*reflecting on experiences*)
- (4) *Interesting cases and examinations*
- (5) A device that is capable of recording tutorials and conversation with MRTs
- (6) Log book (at this time this was a hard-copy document)
- (7) Assessment requirements
- (8) A device with a camera of higher quality than the current PDA
- (9) The need for robust security for storing confidential information.

### **Impact on MRTs**

The value of the PDAs for the MRTs was limited. It was anticipated that an MRT could view the student's recordings, which would enable them to check a student's progress and experience. However, the students had decided that the verbal feedback they received from their partner was more appropriate. If the students selected to document any verbal feedback, they would record it in their reflective diary. Kate, an MRT, offers her perspective of the advantages and disadvantages of using a PDA:

*It became apparent that students loved this new addition and were proud to have the access to it to manage their learning. As an MRT though I felt unsure about it. I preferred to explain concepts to the student using an 'old fashioned' pen and paper approach. I struggled to be comfortable with drawing using the PDA, especially when both the MRT and student were trying to view on such a small monitor. I felt slightly, that when the PDA was brought in we stopped recording cases [Record of Student Engaging with a Case] altogether rather than trying to record them in an alternative manner on the PDA. I think this was because it was troublesome to fill out the form on the PDA. However, I could see how this*



*advancement saved the student from having countless pieces of paper and documents of their progress.*  
(Kate, MRT, email correspondence, July 2010)

### **Impact on Education Provider**

It is anticipated that the education provider would benefit from students utilising a similar device to a PDA in the future. All documentation associated with students' clinical learning could be stored on the PDA. If the completion of an e-portfolio was specified as a requirement for students' clinical learning, it would provide assessors and MRTs (if appropriate) ease of access to evidence of students' learning. There are, however, potential issues associated with the use of a PDA. If it is established that it is not appropriate for the cost of the PDA to be carried by the student, then it will be the education provider's responsibility. In addition, although students would likely sign a declaration indicating they would not take inappropriate photographs or audio-recordings, the implications of the risk of students doing this would need to be considered by the education provider. Further, a strategy would need to be devised to manage situations such as a student's PDA being lost or stolen or if a student lost data due to an inadequate backup.

### **Cycle Three: My Reflections**

At the time the data were collected for this study, more sophisticated devices (such as tablets and iPads) were new to the market and expensive. I decided to employ PDAs to enable students to collect evidence of their clinical progress as they were more affordable than the sophisticated devices and they were available within the faculty in which I was employed. In addition, the literature articulates the benefits of employing PDAs (Ho et al., 2009; Johansson et al., 2012; Luanrattana et al., 2012; Ng, 2010; Strayer et al., 2008). Although students highlighted the benefits of using the device, there were also problems associated with its use. During the last three years, I have used an iPad, which I believe offers more benefits than the PDA. It is less cumbersome to use and information can be easily accessed. Also, it is ideal for viewing radiographic images. Further, students would be able to access the online platform without the need to access a computer elsewhere. All of their activities; online discussion and the e-portfolio could be accessed through one device.

My initial intention prior to undertaking Cycle Three was that the PDA would provide additional support for the learning partnership, as I thought the students and MRTs could view components of evidence of students' learning together. Retrospectively, this was probably an unrealistic aim as the screen size was not conducive to viewing by two people. In addition to the small screen size, some of the information students were documenting on their PDA was personal (for example, *Reflecting on experiences*) and therefore, they may have been reluctant to share it. Even though the students had previously enjoyed sharing other information with their MRT partner, particularly via the online platform, there was no need or advantage to sharing the information stored on the PDA with their partner. Therefore, although an initial intention was to introduce the PDA to augment the learning partnership this did not occur. If the learning partnership initiative was implemented in the future, the PDA would not need to be considered as a dimension of the learning partnership unless the e-portfolio included requirements that involved MRTs (for example, the completion of formative assessment).

## **Summary**

The aim of *Phase Two* of the study was to develop, implement and evaluate an initiative to support students' learning and MRTs' teaching. The actions within this study, including the *act* and *evaluation* stages of the first action research cycle and the *look-think-act* and *evaluation* stages for the two remaining cycles have been reported in this chapter. In addition, I have offered my personal reflections of the action research process at the end of each cycle. The cycles evolved from action research meetings in which participants planned, implemented, discussed and reflected on the various dimensions of an initiative to support the facilitation of learning for medical imaging students. Given that the need for support for students and MRTs was a principal finding in *Phase One* of the study, I proposed a broad concept of a learning partnership to the participants in the study. With the enthusiastic support of the participants, the development commenced. The impact of the changes fostering improvement on students, MRTs and the education provider, has been explored.

Hence, a learning partnership framework, with the development of an online platform and the use of a PDA has clearly provided additional support for students' learning. To a lesser extent, it has supported MRTs' teaching. Nonetheless, it has enhanced MRTs' practice and offered them a 'new lease of life' with regard to their role in the facilitation of students' learning. With some minor adjustments to this framework, future implementation could certainly improve students' learning and progress MRTs' role in the clinical education of medical imaging students. Enhancing the value of the MRTs' role in education and improving the experience of learning for students will have benefits for the profession as a whole. The following chapter (Chapter Seven) offers an analysis of the data that has been collected during the process of the development and implementation of a learning partnership framework discussed in this chapter.

## CHAPTER EIGHT: PHASE TWO ANALYSIS

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### Introduction

The following chapter presents an analysis of the data that has been drawn from meetings and email correspondence with participants during *Phase Two* of this action research study. Two overarching key themes have emerged from the analysis: the centrality of the learning relationship and the teaching and learning nexus.

### Centrality of the Learning Relationship

Forming effective relationships with others is central to the learning process. It is argued by Rogers (1983) that the relationship between the facilitator and learner is more important than other influences on learning such as the teacher and the curriculum. To enable learning within the clinical setting, MRT students need to form relationships with MRTs, patients, support staff, clinical tutors, peers and other health professionals. However, the relationships formed with patients, MRTs and clinical tutors would be most typical.

MRTs guide and facilitate student's learning. They assist in selecting learning opportunities for students and it is through the MRT/student relationship that a student experiences the real world of practice, learning alongside registered professionals. Students may need some direction in selecting appropriate learning opportunities if they do not have the experience and ability to be able to identify suitable situations. For example, ambulant patients who require routine extremity examinations would be suitable learning opportunities for novice students. A student could be guided towards performing an examination (or a part of) following a demonstration by an MRT. On the other hand, a more complex examination (for example, in the resuscitation room), would be unsuitable for a novice student. However, in this instance, the student could be guided by an MRT to an appropriate position within the room to observe. In addition to assisting students to select learning opportunities, MRTs need to provide a level of supervision that is appropriate for the student's level of knowledge and capability, and ensures safety for the patient and the student. A significant proportion of

clinical tutors' time is allocated to the delivery of tutorials and assessment, therefore, they are involved in undertaking radiographic examinations with students to a lesser extent. Thus, although the allocation of time to teaching activities differs, both MRTs and clinical tutors are involved in the facilitation of students' learning.

In this study, a learning partnership enabled a student and MRT to form a close relationship. This relationship was different to the relationships that students formed with MRTs outside of this study. It was a more formalised process with a definite recognition and expectation of the other party in the relationship. With the implementation of the learning partnership, several dimensions surfaced within the key theme of the centrality of the learning relationship, including belongingness, knowing the other and enhancement of MRTs' practice.

### **Belongingness**

Central to a student's adjustment to a new unfamiliar clinical setting was the need to move from an 'outsider' position to gain a sense of belonging. In the early developmental stages of the learning initiative, when decisions were being made about the formation of a partnership, MRT participants drew attention to students appearing misplaced when they commenced in the clinical learning setting. At an initial meeting, an MRT relayed her concerns about new students entering the clinical setting:

*They are like lost souls. They don't know how to involve themselves so they sit around on the edges and no one seems to want to take responsibility for them. They wander around looking terrified like you are going to chew them up. But they try to look interested. They know they are being watched, it's like starting a new job. They are worried about putting a foot out of line and they don't know anything.*

*(Sally, MRT, initial MRT meeting, May 2009)*

This excerpt has revealed the powerlessness of the newcomers and has suggested that students appear reserved, frightened and submissive in the unfamiliar setting. They attempt to make an impression by trying to show interest. Further, due to being unknown to the staff in the setting, it is unlikely they have durable connections with others in the *field* and consequently they position themselves on

the periphery. Those already established in the *field* have current and historical connections, which are anchored in *capital*. Within the clinical *field* of medical imaging, the way in which individuals and groups are situated is described by Bourdieu (1998) as *distinction*. The *position* of agents in the *field* is determined by the amount and weight of *capital* they possess. Unlike MRTs who have acquired *symbolic* (registered professional), *cultural* (knowledge) and *social* (networks and affiliations) *capital*, this is yet to be accumulated for novice students. The acquisition of *capital* evokes power, and the different *position* MRTs and students occupy in the *field* as a result of accumulated *capital*, has probably influenced the students' appearance of discomfort as reported by Sally in the previous excerpt. Without *capital* students are not able to 'do' or interact with others in a similar way to MRTs who are established in the *field*. As students develop their professional capacities, gain experience and *capital* they will be able to communicate and interact more readily with MRTs, increasing their contributions in clinical practice.

An MRT student's *habitus* will develop as he/she becomes a part of a group, gaining a sense of belonging. Novice students will have a different *habitus* to MRTs. How a student interacts with those in the clinical *field* will be dependent on their *habitus*, that is, the way one thinks, speaks and presents oneself based on previous experience (Maton, 2008). A sense of belonging helps students to feel safe and comfortable. At the time when they feel welcomed, they become significant participants in the community and are able to engage in the learning opportunities afforded (Skøien, Vågstøl, & Raaheim, 2009). Their motivation increases enhancing their engagement (Levett-Jones & Lathlean, 2008). Learning and socialisation cultivates an individual's *habitus* (Rhynas, 2005) and the individual *habitus* of newcomers will be founded on what they bring to the *field*. Therefore, an MRT student will enter a *field* with an intact *habitus* that will then develop and be cultivated by interactions with others as they learn and become socialised.

- ***Developing Rapport and Belongingness***

It is likely a sense of belonging was enhanced by the development of rapport between the students and MRTs. MRTs highlighted their experience of being in partnership:

*I've seen benefits already [learning partnership commenced 8 months prior] in that they have become a much more positive part of the whole staff, rather than feeling separate and therefore they access your knowledge. They are more open in coming forward. And this rapport comes a lot earlier on than later. Because often it takes until the third year until a lot of students are comfortable to have that type of rapport.*

***(Janet, MRT, meeting March 2010)***

*Quite often, in a large department we don't see the individual traits of students and develop close ties until much further in their training and this [the learning partnership] accelerated that relationship development.*

***(Sally, MRT, email correspondence, June 2010)***

MRTs declared that students in partnership developed a rapport at an earlier stage than students who were not part of the study, who typically do not develop that level of rapport until the third and final year of the programme. This bond meant that students became part of a team earlier and were able to approach MRTs with ease to access their knowledge and expertise. Developing rapport and a sense of belonging enabled students to feel at ease with their learning. In turn, they developed confidence to engage in learning opportunities to assist them to develop their professional capacities. Janet highlighted that students' learning progressed more rapidly due to their increased confidence as an outcome of the formation the partnership:

*To be able to help to boost that confidence is great. I have heard other staff members say, that the students in this group are 6 to 8 months ahead of where they should be because of the partnership.*

***(Janet, MRT, meeting, March 2010)***

As students developed confidence, their learning consequently progressed. Effective role models can assist to foster confidence and competence; however, if only limited supervision is offered this may be inhibited (Donaldson & Carter, 2005). With confidence and competence, MRT students in this study were likely to acquire *capital* more rapidly than those who were not a part of it. Additionally,

students are likely to develop a stronger sense of self-efficacy, as confidence develops when they are interacting with others (Kim & Baylor, 2006).

Developing rapport also provided a way for students to communicate safely as suggested by Kate, an MRT in the following excerpt:

*We have opened up a way for students to communicate their queries in a safe environment with an MRT whom they have hopefully built a good rapport.*

*(Kate, MRT, email correspondence, July 2010)*

It is not surprising that it takes time for the new student to feel 'at home' as their professional *habitus* develops; however, the question is raised, 'How are reserved, lost students supported through their initiation to the world of practice?'

- ***Anchor for Learning***

The learning partnership and the buddy system enabled the students to secure a more legitimate *position in the field* by securing a point of attachment. There was an experienced practitioner to whom they 'belonged'. There was someone to ask, someone who would tell them what to do, and someone who may watch out for them and give them guidance. Despite the fact that students remain in the same location for the majority of their clinical learning, gaining a sense of belonging took time to attain due to the size and diversity of the setting. The learning partnership, however, provided novice students with a means to adjust to the clinical setting as expressed by the following MRTs:

*It [the learning partnership] gives the student an 'anchor' in the department and I think that is important as it is daunting to be a new student in a large department. The inexperienced students need us more than the final year students as the new ones are 'green'. We work intimately with them but hardly know them [outside the learning partnership].*

*(Sally, MRT, email correspondence, June 2010)*

*The mentoring method works well as it gives the student a reference point for practice in the workplace.*

*(Janet, MRT, email correspondence, June 2010)*

Constancy and having a reference point was an important finding in a study in which nursing students' clinical learning was supported by a preceptorship model



(Newton et al., 2012). Students were able to develop a relationship with the clinical teacher, enabling the teacher to have an understanding of their needs. An anchor keeps the floating vessel from drifting into dangerous waters; it keeps it tethered to the place it needs to be. A 'green' student is one who does not yet know what to do, one who could easily go off track, get lost or become unsafe. The mentor, as anchor or as reference point, keeps a student in check.

- ***Belongingness and Doxa***

A sense of belonging enables students to understand the *doxa* within the field. That is, students learn to understand the values and discourses and the "pre-reflexive, shared but unquestioned opinions and perceptions...."(Deer, 2008, p. 120). *Doxa* refers to the taken-for-granted beliefs or opinions that are closely connected to *field* and *habitus*. Janet, an MRT, noticed how the student in partnership learned aspects of *doxa*:

*It was great being a part of this programme as it was rewarding in seeing my student progress so positively and seeing her absorb the idiosyncrasies of the department and of being an MRT.*

*(Janet, MRT, email correspondence, June 2010)*

With time, students will learn the *doxa* within the *field*; however, with limited *symbolic* (status), *social* (affiliations) and *cultural capital* from a professional perspective, it is unlikely that students would question the 'taken-for-granted', particularly in view of the fact that *doxa* is the point of view of the dominant group. Not being in a position to question may encourage submissive behaviour and restrain a student's inquiry. Indeed, the influence of *doxa* may discourage the students from thinking critically and flexibly in a changeable clinical environment, which is a key aim of the undergraduate degree programme (Yielder & Yielder, 1994). In the previous excerpt, an MRT has referred to the student encompassing the idiosyncrasies of the department, which are likely to contribute to the development of the student's cultural knowledge (Eraut, 2004a). Cultural knowledge, that is, knowledge contained within a setting is developed through interactions with others.

Embracing the *doxa* within the *field* is enhanced by role modelling. Role modelling provided by MRTs within the learning partnership enabled students to recognise

the *cultural capital* that MRTs possess. Sally, an MRT, identifies aspects of her practice that are likely to encourage role modelling:

*If the right MRT/student combination is achieved, both benefit as the student receives some continuity in practical learning and the MRT can demonstrate a good work ethic, patient care, interaction with the rest of the team and how to resolve difficulties in 'out of the ordinary' challenging patient examinations.*

*(Sally, MRT, email correspondence, June 2010)*

Sally, the MRT in the previous excerpt has indicated types of behaviours and interactions that may be 'modelled' by a learner and has made reference to non-routine examinations. An MRT's impulses may be called on for challenging patient examinations that are non-routine and that cannot be supported by habits which are out-dated or in conflict (Dewey, 1922). A combination of habit and impulse is required for observation, memory and judgement. Therefore, as students learn, they will also need to observe and attempt to make sense of MRTs' reasoning and decision-making associated with complexities of less routine examinations. In addition, Dewey asserts intelligence is the process one may use in response to a problem. Our conduct is guided by the intersection of habits, impulses and intelligence. As MRT students observe 'challenging' examinations, they may try to understand an MRT's 'process of intelligence' when faced with challenges that require some adaptation to their practice.

Polkinghorne (2004) also offers an explanation for how MRTs may manage non-routine situations. Students may attempt to make sense of the MRT's practical wisdom or *phronesis*, needed to make judgements in practice (Polkinghorne, 2004). Phronetic reasoning allows insight into what is needed in a particular situation (Polkinghorne, 2004), for example, in non-routine situations and/or when dealing with a distressed patient.

Role models who are professional, competent and concerned about a student's learning are sought after by students (Gstøl & Skøien, 2011; Kim & Baylor, 2006). Being able to emulate role models would likely assist students to build their own *cultural capital* (knowledge), which in turn will position them on the pathway for their future professional requirements. The acquisition of *capital* evokes power;

therefore, the power interplay between MRTs and students will change as students' increased *capital* enables them to enhance their position in the *field*. Role modelling will not only influence an individual's *cultural capital*, but also *cultural capital* of the profession through reproduced behaviours, strengthening the group *habitus* of the profession. In addition, a sense of belonging was likely to be enhanced by knowing the other in the partnership.

### **Knowing the Other**

The formation of a relationship within the partnership meant that the student and MRT became known to each other. Several benefits were evident by being known to the other, however, tensions were also revealed. Within a learning partnership, Sally, an MRT, has highlighted the value of being known to the other:

*It has also been good to actually get to know the four students well, at a deeper level. I mean we get so many through and quite often, it's just a person, you've never had more than a passing conversation with them. And I think from that point of view it is nice because yes they are students but they are kind of ours, you know. Not that they are special but they are just that little bit different... because we do get so many of them through and they are just a name sometimes. Yes, you know a little bit about them but you haven't quite grasped their personalities and strengths and weaknesses. And this has allowed us to do that. So that's been good.*  
(Sally, MRT, meeting, March 2010)

The value of a relationship and knowing the student has been suggested, and is similar to authors (Graham, et al., 2011; Newton, et al., 2012) who have espoused the worth of a one-to-one relationship for learning. Knowing a particular student enables both an ease of relationship, and an understanding of how much they already know. Further, any areas of weakness can be handled with sensitivity. Knowing the students will help to promote quality learning experiences so that each experience can feed into the next and enable growth (Dewey, 1938). Teaching that is specifically tailored to the student can occur. The contribution of an MRT in the partnership emphasises *illusio* within the field. Bourdieu recognises *illusio* as being a part of the game and believing that it is worth playing the game and investing in it (Bourdieu, 1998). The consequence of being able to form a meaningful relationship with a student in the learning partnership is that the MRT

can invest (take ownership and responsibility) in the student's learning. The worth of this investment matters as the student may be the MRT's future colleague.

Hence, in the absence of a learning partnership, the MRTs and students do not have the opportunity to become closely acquainted and, as the MRT suggested in the previous excerpt, students may be viewed as bystanders. Within the learning partnership, MRTs have an opportunity to become better acquainted with students compared with what 'normally' occurs. That is, students who were not part of this study would be rostered to a particular area in the radiology department for two days each week and the following week they would be placed in a different area, most likely with a different group of registered MRTs. Students engaged in the learning partnership initiative were also placed in various areas in a radiology department with different groups of MRTs. However, there are salient points that make the learning partnership different to what 'normally' occurs. Firstly, protected time was scheduled, so the student in partnership could learn alongside their MRT partner with whom they developed a bond. It was neither practical nor appropriate for the student and their MRT partner to be working together constantly. Students also needed to gain experience in areas that were different to where their MRT partner was most often based. Also, MRTs were frequently rostered to shift work. Secondly, the online platform provided the opportunity for the MRT and student to communicate with each other regularly, which was particularly beneficial during the times they were not engaged in face-to-face contact. Hence, the one-to-one encounters and online conversations with their MRT partners fostered self-regulation for the students as they monitored their performance and capability against a standard, that is, the MRT's practice (Bandura, 1986; Mann, 2004).

- ***Providing a Robust Foundation for Learning***

Students also highlighted the benefits of the development of a relationship with an MRT in the learning partnership and expressed that being aligned with an MRT assists to reduce uncertainty, provide clarification and support, give opportunities to question and encourage involvement. Learning in a milieu such as this provides a robust foundation for learning as the following students have disclosed:

*It means we get involved, especially in the early stages of the first year when you are still very unsure about how things work and what we should be doing at our level. It is also better because you know you have someone to talk to when you are confused or unsure about a technique and you knew they were really willing to help.*

**(Gabby, student, email correspondence, June 2010)**

*I think we have been able to form better/stronger relationships with the MRT we were partnered with. We have been given access to someone who we can approach with questions and insights which we wouldn't normally do.*

**(Susan, student, email correspondence, June 2010)**

The students disclosed that knowing the MRT gave them confidence to engage in discussion and ask questions that they might not have otherwise asked at the risk of feeling inept. Nouwen (1975) emphasises the importance of ensuring the milieu is conducive for students to ask questions to increase their contributions in a learning partnership. Being able to question is an important part of learning; therefore, the effect of not having the confidence to ask questions could mean that students miss learning opportunities. Dialogue is central to learning and Rooney and Boud (2009) assert that it is needed to make sense of formal and structured concepts that are difficult to understand (p.4):

*Learning relationships are dialogic, that is, learning occurs through person-to-person interchange not through formal or structured products. Indeed, dialogue is often used in order to make sense of the formal and the structured which may not be readily accessed by those unfamiliar with it.*

Hence, students need freedom, confidence, a sense of trust and a dialogic relationship to enable them to ask questions. *Social capital* is hard to accumulate when the relationship is not open to questions, or where the student does not feel valued by the MRT. In a learning partnership or buddy system, where the student knows from the beginning that his/her partner is keen to teach, the possibilities for receiving and investment of *social* and *cultural capital* are greatly increased. The student can be more relaxed. The MRT's *habitus* is supportive and therefore the student feels accepted and the legitimacy of their *position in the field* is enhanced. Learning has a much greater potential to thrive. Within such a milieu, experiences are likely to contribute to a student's progression. However, if students are exposed to 'mis-educative' experiences, their growth may be hindered (Dewey, 1938).

Gabby showed how the connection with an MRT within the learning partnership enabled her to focus on her learning:

*I feel really good about the relationship I formed with my MRT and other MRTs who were involved in the process.... Also, sometimes you need someone to push you otherwise you do hang back and this was the most significant part of all of this for me, that I had someone to push me but was also willing to support me. I was able to concentrate on my learning.*

**(Gabby, student, email correspondence, June 2010)**

For Gabby, her learning was accelerated by being encouraged to become involved. She has suggested that she was not ‘thrown in’ to a situation but rather encouraged with support. Eraut (2007) asserts that learners are encompassed in a triangular relationship of challenge, support and confidence. Hence, in the example above, since the MRT knew the student (who had a tendency to stand back), he/she could challenge her with the appropriate support and feedback, subsequently increasing the student’s confidence.

When an MRT knows a student’s capabilities it enables the student to be given some responsibility. Taking on responsibility can be empowering for learners and has been shown to be connected to trust and risk for one group of physiotherapy students (Clouder, 2009). Another study of physiotherapy students demonstrated that they experienced a positive learning environment when they sensed “trust and security” and there was a “balance between support and challenge” (Vågstøl & Skøien, 2011, p. 77). There will be an element of risk when an MRT hands over responsibility to a student so the student can become more autonomous, for example, the student may not be able to complete the examination and may need to ask for help. However, the support provided by the MRT will mean that the potential risk is checked. The student will perceive that the MRT trusts him/her when responsibility is handed over. Ideally, time in the clinical learning setting should be spent in the most effective and efficient way, with the student’s prime focus on learning. A study in clinical nursing education, conducted by Gillespie (2002), demonstrated that students were able to focus on learning in connected relationships, similar to Gabby in the previous excerpt, in which she has disclosed that the learning partnership enabled her to concentrate on her learning.

- ***Tailoring Learning and Increasing Contribution***

Knowing the student meant learning could be tailored to the student. Knowing a student's history, capability, strengths and weaknesses enabled the MRT in partnership to have some understanding of the student's *habitus*, which "captures how we carry within us our history, how we bring this history to our present circumstances, and how we then make choices to act in certain ways and not others" (Maton, 2008, p. 52). If MRTs have an enhanced understanding of a student's *habitus*, they are able to offer an individualised teaching approach to the student. Consequently, the learning partnership provides a way of acknowledging and focussing an individual's learning.

A close relational distance was formed between a novice student and an MRT. The limited distance between the MRT and student was necessary so the MRT could guide the student who was inexperienced. The MRT has the *cultural, social* and *symbolic capital* that the student lacks at this early stage of clinical involvement. As a student gains competence, the physical distance between the MRT and student increases, as explained by Kate, an MRT, in the following excerpt:

*Initially we worked closely and as she gained confidence and competence I increased my distance from her when she did examinations. I thought if I stood too close, when I knew she was capable she might ask for help prior to problem solving and making decisions.*

***(Kate, MRT, meeting, March 2010)***

The distance between MRTs and students and their relative *position in the field* also reflects the students' acquired *social* and *cultural capital*. As a student gains autonomy and becomes less dependent on an MRT for guidance, he/she have accumulates *social capital* through the affiliations formed. *Cultural capital* would have been increased for students by acquiring knowledge and professional competence in their journey towards becoming more autonomous. Such learning comes from watching, doing under guidance and being given advice about how to improve. Consequently, as students gain *social* and *cultural capital*, the relationship between the MRTs and students is likely to be one in which there is more balance in the *capital (social and cultural)* held by each party. There is a redistribution of *capital* in the *field*, which readjusts the power interplay between

MRTs and students. Lizzie, a student, explained the respect she earned when her level of competence and consequent contribution increased:

*They (MRTs) have a bit more respect for us as well. We are not just these people who hang around standing there not knowing what to do. We can contribute.*

*(Lizzie, student, meeting, March 2010)*

As students progressed, they were in a position to contribute more equally in radiographic examinations. Interestingly, it has been suggested by the student in the previous excerpt that students become valued and respected by MRTs when they have changed their *position in the field*, that is, their *position* becomes more legitimate when they have gained some knowledge and therefore accumulated *cultural capital*. Physiotherapy students' confidence and self-esteem was strengthened in Skøien et al.'s (2009) study with the students developing a sense of feeling respected by physiotherapists guiding them. Mutual respect and trust were also important to physiotherapy students in Gstøl and Skøien's (2011) study, signifying the importance of students feeling secure in their learning environment. Limited respect for students as they learn is likely to affect them. If they do not feel worthy, they may feel hesitant and lack confidence to engage in learning opportunities. Therefore, learning could be delayed. A lack of respect highlights the power interplay between MRTs and students and is suggestive of *symbolic violence* in that the dominated (students) accept their condition as legitimate.

Students identified that the opportunity to know their partner in the 'buddy system' meant they were able to 'get on' with their learning:

*Work flow was faster with a buddy as you didn't need to find someone to work with as it was pre-arranged.*

*(Sally, email correspondence, February 2010)*

A ready-made partnership saves time and reduces stress for those involved. The student does not have to find and interrupt someone who has no interest in his/her learning. The work occurs faster, keeping patients content and the radiology department running smoothly.



Further, the buddy system meant students did not need to find an MRT to check their images:

*You don't need to worry about finding someone to check your images as you have an MRT close by.*

*(Sally, student, email correspondence, February 2010)*

Asking for a 'check' is no doubt stressful for the student, both in terms of interrupting an MRT they do not know, and possibly receiving criticism on the quality of their work. With a buddy, 'worry' is removed.

- ***Tensions of a Relationship for Learning***

Nonetheless, although MRTs and students were positive about the implementation of the learning partnership and 'buddy system' initiative, tensions were also evident. The majority of learning partnerships worked well, however, one relationship did not develop. An MRT participant who was already involved in a partnership offered to take on the affected student in addition to her original student. Susan, the affected student has given her account of the reasons for the partnership not being successful:

*My first partnership didn't work out so well – I think the qualified [registered MRT] didn't quite understand what the partnership meant. It was hard for us to work together as my MRT partner often did shift work and was on midnights [night shift] or days off when I was at the hospital.*

*(Susan, student, email correspondence, June 2010)*

The student has suggested that her partner's shift work demands and lack of understanding of what was involved in the partnership were the reasons for the partnership being unsuccessful.

Tensions were also identified by the students and MRTs who experienced the 'buddy system':

***Students***

*If you didn't get along with the person that you were buddied with you would have a miserable time.*

*There are MRTs who don't like working with students.*

**MRTs**

*If you don't like the student then it's going to be a bad day for you and the student.*

*Personality clashes make it difficult.*

*It's difficult to teach students if they are not willing to learn.*

*When it gets very busy it is hard to explain and teach whilst doing x-rays so it feels you are not teaching much.*

***(Email correspondence: buddy system, February 2010)***

The potential tensions of a 'buddy system' identified by students and MRTs were primarily related to unsuitable pairings of MRTs and students, MRTs not willing to teach, students not willing to learn and the busyness of the context. Bleakley (2002) asserts that medical students would seek to find a role model who they admire and respect. This would be impractical in a buddy arrangement or learning partnership for MRT students as a significant number of students would need to find a partner. Also, it will take time for the novice students to work out who are the 'good' role models.

If an MRT chooses not to invest time in a student, he/she could potentially be exerting *symbolic power*. The MRT is in a position to decide how much they will invest in the student; indeed, they may choose to ignore the student. Using *symbolic power* against another implies *symbolic violence*, which could impact in a negative way on the student's learning.

When the context is busy it makes teaching difficult for MRTs. The priority for MRTs is to complete their work. Hence, as suggested by Bourdieu (Swartz, 1997) a struggle can occur in a *field* between those in dominant (MRTs) and inferior (students) positions. Students struggle for MRTs' time, which cannot be freely given in busy times. Furthermore, the relationships formed between students and MRTs were not one-directional; MRTs also gained value from being a partner.

**Enhancement of MRTs' Practice**

The value of being in a learning relationship has been conveyed by the MRTs. They were energised by the augmentation of their knowledge and the desire to provide

evidence of best practice. They learned from working with students and by accessing information to support their responses to students' inquiries.

- ***Learning for MRTs***

Reciprocity in learning relationships is mostly common practice (Rooney & Boud, 2009). In the learning partnerships in this study, MRTs and students learned from each other. For example, Sally, an MRT, reported on being able to keep up with technology by being in partnership with a student:

*If students have been taught new technology then you will also learn about it if you constantly work with a student.*

*(Sally, MRT, meeting, February 2010)*

MRTs were encouraged to continue to learn by being made aware they knew more than they realised through their discussions with students. MRTs benefited from being able to refresh their knowledge and gained confidence as teachers of the students. Further, students learning alongside MRTs are in a position to challenge aspects of current practice, which could lead to improved modification in a practitioner's behaviour (Rolfe & Sanson-Fisher, 2002). Promoting conversations in learning settings has been emphasised by Brown et al., (1989) who suggest that the sharing of ideas within a culture provides access to knowledge for learners. Therefore, conversations and narratives are considered to be central to learning and have benefited both students and MRTs in their learning. The following excerpts demonstrate the excitement of MRTs in realising their knowledge:

*I had interpretation books [to assist with the interpretation of diagnostic images] open as I was typing but I actually surprised myself by how much I knew without referring to them so it was very rewarding for me..... So you know I also got something out of it which was great. And what I didn't know I refreshed by going through the literature which for me was a good thing.*

*(Sally, MRT, meeting, October 2009)*

*I'm so impressed with what we know....You go oh I didn't realise I knew that. And you know, you type it [response to student's query] out and it looks reasonably good you and you think – that's quite impressive.*

*(Kate, MRT, meeting, March, 2010)*

The data reveals the personal *cultural capital* the MRT participants brought to the study. The MRT group had initially undermined the degree of *cultural capital* they possessed. They may have incorrectly presupposed that since it was some years they were engaged in academic study that they would not be able to access their knowledge with ease. The learning partnership encouraged MRTs to re-visit, unpack and, in particular, expand on previously-learned academic knowledge. Although MRTs were excited by realising they had retained some previous knowledge, they emphasised at the action research meetings that there were also some marked gaps in their knowledge. Discussion in the meetings provided MRTs with an opportunity to ‘fill the gaps in their knowledge’.

It is interesting to note that it was by being part of a partnership that encouraged MRTs to refresh their knowledge through their explanations to students. Kate, an MRT, suggests that taking time to offer more in-depth explanations is not ‘usual’ practice:

*It's really good when you're explaining something, you have to break it down into sections, and start from the beginning and work it through. We don't necessarily take time to do that all the time, when you go back to the basics like the anode heel effect [a radiographic concept], actually explaining it is also good for us to understand it.*

*(Kate, MRT, meeting, October 2009)*

However, when MRTs do have opportunities to explain concepts and ideas in depth, they can foster their self-reflection through their teaching of students (Ezzat & Maly, 2012).

- ***Influence of ‘Others’***

Being a part of a learning partnership encouraged MRTs to ensure they demonstrated best practice, highlighting accountability in their role as an MRT. Sally, an MRT, has highlighted the influence of practising alongside a student in the following excerpts:

*Also I think it pushes you to be a better MRT. I mean if you have got somebody working with you, you don't want to produce anything substandard... You do it to the best of your ability.*

*(Sally, MRT, meeting, March 2010)*

Credibility is important for this MRT. She is committed to her teaching role and is aiming to demonstrate best practice. MRTs' practice was also influenced by the relationships they developed with other MRTs in the study. They were motivated in their attempt to keep up with each other. A sense of competition developed as demonstrated by Sally in the following excerpt:

*I think what we have been blessed with is that we have got four different people [MRTs in the study]...so you have different types of MRTs which is really good because .....[MRT] outstrips me with her knowledge all the time and it makes me go and work harder to try and find out.... it makes me go and try to be a better MRT.*

**(Sally, MRT, meeting, October 2009)**

The need for MRTs to improve their *position in the field* has been highlighted in the previous excerpt. MRTs were motivated by each other and in particular by an MRT in the group who had a reputation for her marked level of knowledge. The consequence of MRTs being recognised as having a greater level of knowledge may be two-fold. It may create tension for MRTs who perceive themselves as having less knowledge or it could also motivate them to increase their knowledge as reported by Sally above.

A further benefit for MRTs being in relationship with each other was the opportunity for discussion about practice. The benefits have been reported by the following MRTs:

*The programme [learning partnership] allowed us [MRTs] to get together and it was good to catch up and see that we were on the same page.*

**(Janet, MRT, email correspondence, June 2010)**

*Within the initiative I felt supported by the regular meetings in which to discuss difficulties and give and receive feedback about progress. The feedback and the meetings kept me motivated to continue and to be as productive in the partnership as I could be. I also felt supported in the fact that I had regular contact in the clinical environment with other supervising MRTs so that we could informally discuss any issues or exchange ideas about certain questions that the students had asked.*

**(Kate, MRT, email correspondence, July, 2010)**

*It was great to meet with colleagues and to listen to their ideas about teaching and ways of doing things and incorporating some of those ideas into my own practice.*

**(Sally, MRT, email correspondence, June 2010)**

The action research meetings provided opportunities for MRTs to discuss practice issues including approaches to teaching. The meetings provided support for MRTs to enable them to carry out their role as teacher/supervisor. Hence, learning from being in a relationship with a student and conversations with their MRT colleagues as the learning partnership initiative progressed is likely to have increased the MRTs' self-efficacy (Kim & Baylor, 2006).

A sense of belonging, knowing the other and the enhancement of MRTs' practice have shown to be important features of the learning partnership. A robust relationship provided a secure platform for students to advance their learning. The formation of relationships has reduced their uncertainty for learning. The partnership has not only benefited students' learning; it has also enhanced MRTs' practice. In addition, the benefits of the partnership for MRTs were not solely a consequence of the relationship formed between the student and MRT. The value of the development of relationships with other MRTs by being part of the learning partnership was disclosed by MRTs.

## **Teaching and Learning Nexus**

The data revealed four key areas aligned with the teaching and learning nexus: setting goals, the emergence of a cognitive apprenticeship, the interface between education and practice and the impact of technology.

### **Setting Goals**

An important element of the learning partnership was the opportunity for the development of goals. Students were able to individually document their goals (*Record of engaging with a case*) and set goals with the MRT in partnership. The following students revealed the significance of setting and achieving goals in the partnership to support their learning:

*I think that consciously setting goals at the start of each day has helped me as I know what I want to achieve each day... The initiative [learning partnership] encouraged me to set more goals for myself and having the support of ..... [MRT partner] in the partnership helped me to overcome the barriers I had with achieving them as she was able to point things out that I couldn't see myself.*

**(Susan, student, email correspondence, July 2010)**

*I would find a patient on the work list and then discuss the case with my MRT. It was often helpful if at the start they [MRT] asked me what I wanted to do in the exam and what you want them to do so you are achieving the learning outcomes you hope to achieve.*

***(Gabby, student, email correspondence, June 2010)***

In the first excerpt, the student had an opportunity to set goals and received the support to achieve them. Although goal setting is important for students' learning, novice students in particular may be unclear about the goals they need to achieve. Their MRT partner can assist to provide clarification. Dialogue related to achieving learning goals will also help to establish an appropriate level of supervision. If the level of supervision provided is deficient, a student may be exposed to risk. Conversely, if a student is 'over-supervised' he/she may miss a valuable learning opportunity.

In the second excerpt, an initial stage of negotiation prior to performing a radiographic examination was an important part of the partnership. The MRT was made aware of the student's goals and the student indicated their intended level of involvement. Negotiation was important for students to achieve their goals and they emphasised the value of clarification in relation to taking responsibility for particular aspects of an examination. Educators are in a position to facilitate growth of an individual as they can help select experiences that can develop into future experiences Dewey (1938).

Establishing learning opportunities in an attempt to achieve goals has been explicated by the following MRT:

*On first getting together, before undertaking any examinations, we made a specific effort to sit in a quiet space in the department and discuss the stage that the student felt that they were at. This way I could then proceed to establish with her what the appropriate learning opportunities would be. Some learning opportunities were made when the department was particularly quiet and we could go into an empty x-ray room and practice different skills. Others were pursued actively with patient encounters in practical situations. Having discussed the stage of learning we could then choose the appropriate age of the patients we were looking for. We also needed the support of the other MRTs to allow us to choose our patients off the list. Establishing learning opportunities was really done by good, honest communication in the partnership.*

***(Kate, MRT, email correspondence, July, 2010)***

MRTs in partnership are in a prime position to help select experiences for growth of the student. In the previous excerpt, Kate, an MRT has revealed that learning opportunities did not always include patients and were negotiated through sound communication between the student and MRT in partnership. Further, she acknowledged the need for negotiation with departmental staff to enable the student and herself to select suitable patient cases for learning. The MRT might have used both technically-based and judgement-based practice to establish what was needed to achieve specific goals. Technically-based practice would have dealt with the specifics of how the procedure was executed. Judgement-based practice would have involved the MRT making a judgement based on her experience, knowledge and training. Therefore, in judgment-based practice, the MRT is the instigator for change, taking the student's needs into account (Polkinghorne, 2004).

Goals of development are tied to the skills and values considered important to a community (Rogoff, 1990). Within the clinical learning setting, the goals of individuals will be influenced by the values and skills considered important to MRTs and clinical tutors employed by the education provider. Billett (1996) maintains that the learning experiences learners encompass "should be conceptualised as goal-directed activity shaped by the context and requirements of the particular community of practice in which those activities occur" (p. 43). Goal-directed activities guide students toward acquiring knowledge and skills. Therefore, it is likely that the experiences medical imaging students engage in will be goal-directed activities orchestrated by the community of practice of MRTs and clinical tutors. However, tension might occur if the goals for the community of practice are incongruent with the goals of the education provider.

Accordingly, the goals set for students and their experiences could also be influenced by the *symbolic capital* that MRTs in partnership possess. *Symbolic capital* generates a sense of duty and inferiority in the students who look up to MRTs who have the power (*capital*). Within the partnership, the setting of goals provided an important beginning point for MRTs facilitating and supporting students' learning. The setting of goals was a part of the cognitive apprenticeship framework that the MRTs revealed they were utilising in the partnership.



## **Emergence of a Cognitive Apprenticeship**

As MRTs within the partnership explained their approaches to facilitating students' learning, a cognitive apprenticeship arrangement became apparent. The following interactions highlighted students' accounts that evoke the stages of modelling, coaching, scaffolding, articulation and reflection in a cognitive apprenticeship framework (Collins, et al., 1989):

*Before each examination, [MRT partner] and I decided what parts of the examination she would do and what parts I would do, so there was no confusion.... If I needed lots of help she was right there otherwise she would stand back and let me get on with it. Also, I could focus more on my parts of the examination. My role obviously differed depending on the case we were presented with and my level of ability.*

***(Rachael, student, email correspondence, July 2010)***

*[MRT partner] and I used Moodle [virtual learning platform] to discuss a few cases but also had discussions when we were working together as this seemed more her style of hands on learning. When I worked in MSK [designated area for musculoskeletal examinations within a radiology department] we would discuss the patient history and referral and then she would ask what I felt comfortable doing and how much I wanted her to do. This meant when the patient came into the room we knew exactly who was doing what in the examination. She continued to ask me questions and encouraged me to think of alternatives and to solve problems.*

***(Lizzie, student, email correspondence, July 2010)***

Different stages within a cognitive apprenticeship have been identified in the excerpts above in relation to the students' abilities. The MRTs reported that they consistently established a student's previous experience to determine the level of supervision required. Knowing a student's capabilities, strengths and weaknesses meant that an MRT could determine their appropriate level of input in radiographic examinations. An MRT could stage his/her involvement depending on the student's needs. Once the supervisory level had been established, they initially demonstrated (modelling) a technique to a student (if necessary), then involved the student, and gradually distanced him/herself, continuing to provide the necessary level of support (coaching and scaffolding). In turn, this approach enabled the student to eventually perform an examination independently (exploration). During the process, a sense of feeling at ease within the partnership meant that students were able to articulate their knowledge and reasoning processes (articulation). Various forms of questioning were employed during the

process. Further, they were able to reflect on their performance in relation to that of an expert (reflection). This meant that dialogue, problem-solving and reflection were enhanced. Robust dialogue is central to a cognitive apprenticeship in which the externalisation of dialogue is gradually internalised by the learner (Collins et al., 1989). The depth of learning is likely to be increased through problem-solving, dialogue and reflection. A cognitive apprenticeship framework fosters intersubjectivity, or a shared understanding between a student and MRT within the partnership (Rogoff, 1990).

The application of a cognitive apprenticeship framework has been disclosed by Kate, an MRT, in the following excerpt:

*One of the first learning outcomes for my student was to be more successful in communicating with the patient. Therefore we initially focused on this being the student's only involvement in the examination so that she could remove the stresses about radiographic positioning and exposures etc. We practiced before bringing the patient in. When the patient was brought into the room I observed her making the introductions and asking all of the appropriate questions and gaining consent. I gave her verbal and nonverbal signs of encouragement. At this stage, as expected, I then stepped in and she observed me positioning the patient and undertaking the rest of the procedure. This process was repeated several times with staged increases in involvement from the student with prior negotiation and practice.*

*The student primarily guided the level of involvement with some careful and tactful additions of responsibility from me when I felt she was underestimating her abilities. This was interesting as she was particularly nervous so I didn't want to push her too far with the procedure. Yet I felt the more I let her guide her level of involvement the more quickly she gained confidence and she quickly planned more ambitious goals and took on more responsibility.*

***(Kate, MRT, email correspondence, July 2010)***

The facilitation of learning has involved initial observation (modelling) by the student, followed by increasing levels of involvement. Hence, the next stage was likely to be coaching, in which student performed an examination that they had previously observed under the guidance of their MRT partner. In this stage, the relational distance between the student and MRT would be minimal. As the student became more competent with an examination, scaffolding occurred in which the student performed an examination and the MRT provided support as necessary. As a student's level of competence continued to increase, the student

would then perform the examination with their MRT partner positioned at a greater distance from the student.

This approach to the facilitation of learning is a consequence of the close connection between the MRT and the student. This arrangement is different to what normally happens. MRTs do not have the chance to work alongside novice students in a partnership arrangement so it is likely that a traditional apprenticeship, which focuses on skill development, will be more prominent in the facilitation of students' learning. It is probable that limited time spent with students and without having the opportunity of 'knowing' them would not enable the same opportunities for the problem-solving, questioning and reflection, that is characteristic of a cognitive apprenticeship framework.

The learning partnership was enabled by encouraging goal setting and MRTs employing a cognitive apprenticeship arrangement, that included stages of modelling, coaching, scaffolding, articulation, reflection and exploration. The facilitation of students' learning enabled the students to emulate role models, which meant they could improve their professional knowledge and in turn their *cultural capital*, necessary to attain professional requirements. However, the learning partnership did not alleviate all the pressures associated with teaching and learning for MRTs and students respectively, tensions were created by the interface between practice and reality.

### **Interface Between Education and Practice Reality**

Similar to the findings in *Phase One*, tensions between education and practice were revealed by both students and MRT participants. During action research meetings, students reported they experienced confusion due to the differences between what was taught and valued in the education setting compared with the practice setting, and exposure to variance in MRTs' practice. Students in the learning partnerships were united with a single MRT. Although they were not always working alongside their MRT, they had developed a trusting relationship that enabled them to ask questions, some which were related to the misalignment of learning in the education and practice settings. Gabby described her experience of being informed by different groups:

*Different MRTs have different views of what is acceptable and what is not. This can often clash with (a) what the clinical tutors teach us, (b) what we learn at ..... [the education provider]. As a result, we get left unsure of what is definitely correct and as a result you do things differently depending on who you are working with. Yet if you were alone you would still be left unsure of what is actually expected. I have been able to discuss some of these differences with my MRT partner.*

***(Gabby, student, email correspondence, June 2010)***

The confusion for this student has resulted from being exposed to differences in knowledge and approaches to practice, therefore making the expectations unclear. Janet, an MRT, emphasised the variations in practice as individual MRTs develop their unique practice:

*In time each MRT builds up their own varied technique to produce diagnostically accurate images.*

***(Janet, MRT, email correspondence, June, 2010)***

However, learning different ways of doing things appears to be confusing for novice students and the learning partnership provides a way of reducing perplexity for students. As students develop their own practice, they need to observe the practice of a variety of MRTs and establish what works for them. It is unlikely that novice students will be able to analyse aspects of others' practice, which they could incorporate into their own practice; this will come with experience. During the face-to-face time a student and MRT spend together in the learning partnership, a student can initially try to make sense of a single MRT's approach to practice. Further, the online platform, which provides an additional vehicle for communication in the partnership, gives students the opportunity to explore with their MRT partner any confusion caused by observing differences in MRTs' practice. Reducing confusion for students will make it possible for them to perform radiographic examinations with increased confidence, competence and autonomy.

The following MRT highlighted the interface between practice and reality:

*Students work out very early in their education that what is done in the clinical setting and what is taught in the educational institute is very different. As long as what the staff MRT is teaching the student is not incorrect, I do not see this as a problem.*

***(Janet, MRT, email correspondence, June 2010)***

In the previous excerpt, Janet does not perceive that misalignment between what is taught in the education setting and what happens in practice is a problem as she has suggested that students will develop their individual practice. Nonetheless, the MRT has signified that the misalignment is not a problem if the MRTs are teaching 'what is correct'. This does raise the question, however, of who decides the correct practice.

A similar tension was revealed by Sally, an MRT:

*Sometimes what I am writing [on Moodle] differs to what they [the students] have been told by the education provider.*  
(Sally, MRT, meeting, October, 2009)

It is evident there are differences in what is taught in the education setting and what occurs in practice, however, there are also differences in practise amongst MRTs in a clinical setting. A disconnect created by such differences is likely to create tension for the MRTs and students. MRTs may become anxious that they do not teach the students aspects of practice in the way they are taught in the academic setting. Tension for the students may be related to the misalignment between what is taught in the academic and clinical settings. However, who decides what is the right way of doing things? Rather than perpetuating a potential disconnect between what is taught in the different learning contexts, it seems more beneficial to acknowledge the differences in each context and develop an understanding of why there are differences. As the learning partnership developed, different types of technology were integrated with the intention of supporting the partnership.

### **Impact of Technology**

The action research process engaged technology: an online learning management system (Moodle) and PDAs. The utilisation of Moodle was in response to MRTs signifying early in the study that they needed a means of communicating with the student other than face-to-face encounters, since it was not practical for the student and MRT to be paired for the majority of the student's clinical learning. The second type of technology employed in this study was a PDA in response to students suggesting that it would be beneficial to store evidence of their clinical

learning in an electronic format. Technology within the learning partnership provided support and fostered self-direction; however, insufficient time to engage with Moodle created tension.

- ***Supporting Learning with Technology***

Students found the addition of a PDA to record their evidence of clinical learning to be a beneficial and supportive device as reported in the following citations:

*I think we should get them [acquire PDAs for long term use]. They are really good, and being able to draw on the screen is really good because it explains it so well... I use it instead of carrying a notebook.*

***(Susan, student, meeting, March 2009)***

*Taking photos. Even if we took a series of photos, like at the moment shoulders - now I know - but before I kept getting confused between the four pathology views, like now I can just look at the photos like 1-2 -3 -4 and see the names of the projections and easily remember.*

***(Rachael, student, meeting, March 2009)***

The PDA provided students with a way of documenting their record of clinical learning in a portfolio arrangement. Further, having the opportunity to take photographs enabled the students to capture the 'seeing' of things that are difficult to put into words. Outside of this study, students' evidence of learning was documented on a hard-copy format and their record of learning consisted mostly of assessment forms. The electronic recording within this study encompasses a series of documents including; *Prompts for practice, reflective accounts and a record of interesting cases and examinations*. One of the prime benefits of incorporating technology was that it provided students with a way of monitoring their progress as seen in the following excerpts:

*It [the learning partnership] has shown me how much I have learnt over the past year. The questions I was asking months ago on Moodle seem so much simpler now.*

***(Lizzie, student, email correspondence, July 2010)***

*I looked back at some of the first postings I made on Moodle a while ago and I thought to myself why did I ask that? This made me realise how much I have learnt over the year.*

***(Susan, student, email correspondence, June 2010)***

Looking back and evaluating the degree of progress, as the students have revealed above, enables students to build confidence. Having a documented record of progress reminds students of the significant amount of learning they have experienced.

- ***Fostering Self Direction***

Incorporating a learning management system (Moodle) into the learning partnership encouraged the students to become self-directed in their learning. Students call for the support of others to guide them in their learning but self-directed learning should also be encouraged to foster independence. It is important that students can show others that they have the ability to be self-directed (Knowles, 1990). That is, students need to learn to take initiative and responsibility for their learning and to select and manage learning opportunities. In a student's journey, skills that are cultivated through self-directed learning, are likely to be transferable toward becoming a registered professional. For example, taking initiative and responsibility, and managing a patient load independently, are skills required for a registered MRT. Kate, an MRT, demonstrated how technology within a learning partnership supports the development of independence:

*The student is expected to be driving the process (interaction on Moodle and with partner) and is therefore challenged to be self-directed and autonomous with their learning at an early stage, rather than to wait for the course material to be 'delivered' in the academic environment. In identifying their clinical learning needs and seeking appropriate support, they learn skills which can carry them throughout their professional career.*

*(Kate, MRT, email correspondence, July 2010)*

- ***Clarifying Expectations***

Documentation on Moodle has improved MRTs' clarity of the expectations and requirements for students, providing MRTs with information about the degree programme, the courses studied in each year and an overview of the clinical assessment the students are required to complete. Janet, an MRT, explained the benefit of having some knowledge of the degree programme in which the students are enrolled:

*Also, I now have a much better idea of the expectations of students, particularly Year One students as they are the ones we have*

*partnered with. The information placed on Moodle about the Degree and what the students study etc has been like a revelation. I have worked with students for many years but in the last few months I have learnt so much about their pathway for study.*

**(Janet, MRT, meeting, March 2010)**

The undergraduate degree programme for Medical Imaging commenced in 1995; however, there are still many MRTs who hold a diploma qualification in medical imaging so they may have a limited idea of the curriculum for the degree programme. A limited understanding of the theoretical content and competence requirements provided a challenge for diagnostic and therapeutic radiographers who were mentors for assistant radiographers in Colhart et al.'s (2010) study. Lack of clarity for MRTs with regard to the expectations for students might have a marked effect on the supervisory process as MRTs could be unsure about the types of learning opportunities that students should engage with. This may result in no learning or ineffective learning. Ineffective learning could lead to students spending allocated time in the clinical learning setting with limited progress. This situation is a reminder that the outcome of time assigned to clinical learning does not necessarily result in productive learning. Clinical learning needs to be facilitated to make the most of the indispensable time the students are required to spend in a clinical setting. In the previous excerpt, the MRT has clearly found the information posted on Moodle beneficial. This raises the question of who is responsible for ensuring that clinical staff supervising and teaching are informed about the curriculum and expectations for students?

Further, if MRTs are unclear about the expectations for students there is the potential risk of students and patients being compromised. A student could be asked to perform an examination with an inadequate level of supervision and therefore experience some difficulty. A consequence of a situation such as this may be that the examination takes longer and/or an MRT may intervene to complete the examination, thereby, interrupting the continuity of care for patients and learning for students. Although the introduction of technology was beneficial in supporting the learning partnership, some limitations were expressed by the participants.



- ***Insufficient Time***

The participants' experiences of using Moodle were mostly favourable; however, the MRT participants in particular were affected by interruptions in the workplace, as demonstrated in the following excerpts:

*Being in the role as a clinical specialist [position of responsibility], I had limited time. I would get onto Moodle, but would get called away and called away again so I found that it was difficult. I found when we actually got together face-to-face it was better because I just didn't have the time in my role to be focusing on it so I don't think it really is a role [MRT partner] that an MRT in a position of responsibility should be taking on.*

***(Janet, MRT, meeting, March, 2010)***

*I found it alright that I dealt with it [Moodle] at home. I didn't try and do it through my work time, and I would just have the computer open... it was on from like 6 o'clock until midnight, ... so I did it around everything else, I didn't try and do it here [at work]... I can see how it would be hard to do it in a work environment when you are constantly being interrupted and the phones are going, you couldn't give yourself the time.*

***(Sally, MRT, meeting, March 2010)***

*I don't have the internet at home, I don't want to think about it, I don't want to open a book that is what I love about the job - work and then home.*

***(Janet, MRT, meeting, March 2010)***

Tensions were experienced by MRTs about being interrupted when responding to students' postings on Moodle, hence they were subjected to a *field of forces* as various people were competing for their time. A *field of forces* is characterised by tensions when people and groups interact (Mahar et al., 1990). An MRT participant has indicated that being a partner in a learning partnership may not be suitable for an MRT in a position of responsibility. The experience and professional knowledge of those in such positions means various individuals in the *field* demand their time due to the *symbolic, cultural* and *social capital* they hold.

In a previous excerpt, Sally has indicated that she accessed Moodle at home rather than work to avoid being interrupted, which is an inappropriate expectation of MRTs. Hence, there is a potential impact of students invading MRTs' time outside working hours. Although this particular MRT has been an enthusiastic partner within a learning partnership, she may have been prepared to access Moodle at home because she was a participant in the study. This may not be the case if she

was a part of a learning partnership in a more permanent arrangement in the future. Further, another MRT in a previous excerpt, has identified that accessing Moodle at home is not an option for her as she does not have an internet connection and is not prepared to be working outside her specified working hours. It would be more realistic if the MRT partner could access Moodle during working hours. It would be difficult to promote the learning partnership initiative if MRTs were required to be involved outside their specified working hours.

The students' perspective about when they contact MRTs via Moodle may be different to the perspective of their MRT partners. Interestingly, a student has suggested that she did not feel uncomfortable about contacting her partner via Moodle at any time:

*Moodle is a really good way to communicate with your partner because it is easy but also professional, and you don't really feel awkward about contacting them at any time.*

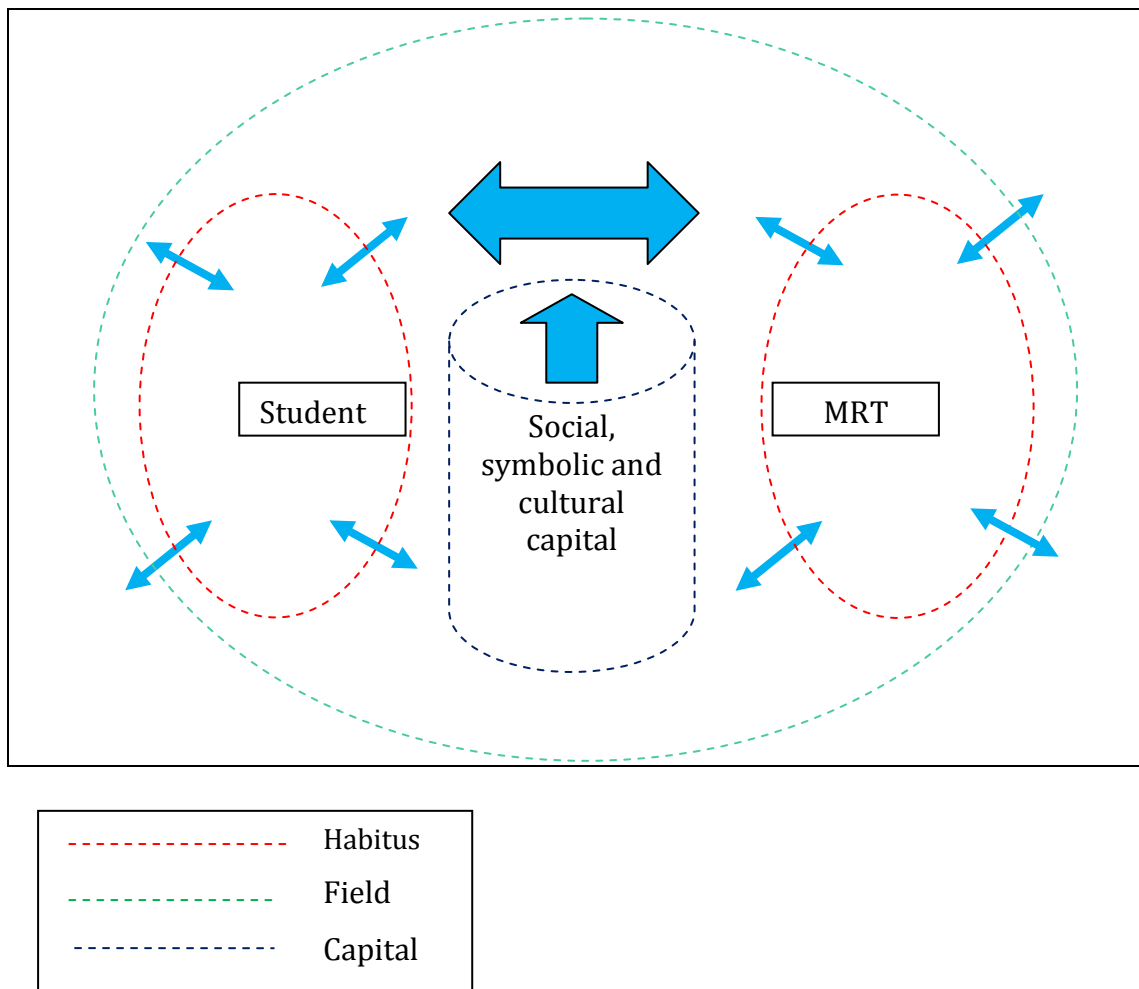
***(Rachael, student, email correspondence, July 2010)***

The concept of time for a student may be somewhat different to that of an MRT. It is usual for students to be studying and accessing the internet in the evening at a time when MRTs have finished work and are focussing on other facets of their life. Hence, the students' perspective may be that communicating with their MRT partner in the evening is non-invasive. If students expect they could contact their MRT partner at any time online then it is possible they will anticipate a response before the following day. This is not a practical or fair expectation.

The inclusion of two types of technology into the learning partnership initiative was mostly constructive for the students. The students benefited from recording their progress on a PDA and having a record of learning on Moodle in the form of questions and responses to their uploaded images. Since the students orchestrated the postings on Moodle, it encouraged them to become self-directed in their learning. The introduction of technology was also favourable for the MRTs who found their online interactions with the students to be productive and beneficial. Also, the documentation loaded on Moodle supported their role as a teacher. However, they did experience a tension of time as they found the required online involvement to be time-consuming.

## Summary

This chapter has explored two overarching themes that emerged from the findings in *Phase Two*: the centrality of the learning relationship and the teaching and learning nexus. The notions of *field*, *capital* and *habitus* have been used to explore the key themes. A dynamic interplay (Figure 13) occurs between *field*, *capital* and *habitus*, with each dimension influencing the other. Central to this dynamic interplay is different types of power interplay (Jones, 2000) and the consequent power evoked from the continuous interplay between the *habitus* and *field* as *capital* was contested. The dotted lines in Figure 13 represent that the *field*, *habitus* and *capital* are not fixed. Individuals bring their own *habitus* to the *field*. The *habitus* is shaped by the *capital* in the *field*. As students acquired *capital*, by gaining confidence and competence and developing their professional capacities, their *habitus* changed. They gained both *social capital* (networks and connections with others) and *cultural capital* (acquisition of knowledge), increased autonomy and an understanding of the *doxa* in the *field*. As *capital* is gained, the interplay of power changes as represented by the blue arrows in Figure 13. The interplay influenced the relationships between MRTs and students. The learning partnership enabled students and MRTs to develop a sound relationship with their MRT partner and their learning progressed as MRTs helped students to gain *social* and *cultural capital*. In addition, time within the partnership enabled students to form social affiliations and therefore acquire *social capital*.



**Figure 13: The Dynamic Interplay of *Field*, *Capital* and *Habitus***

## CHAPTER NINE: ANALYSIS OF KNOWLEDGE NEEDED FOR PRACTICE

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### **Introduction**

A significant theme of 'knowledge' emerged from the data for both phases of this study. This chapter includes a discussion of how knowledge influences teaching and learning for MRT students. The differences in the types of knowledge that MRTs, clinical tutors and MRT students value, their vested interests, and the associated tensions are explored. Finally, an attempt will be made to answer the question, "Who decides the standards for best practice and who holds the power"?

### **Vested Interests: Knowledge Needed for Practice**

#### ***Students***

The data has revealed that MRTs, clinical tutors and students have different priorities and vested interests in relation to the knowledge they need for practice. Each group placed different values on the types of knowledge that they perceived were needed for practice. For students, their priority was learning and their interest lay with acquiring knowledge to enable them to meet competency requirements. Clinical assessment for the undergraduate medical imaging programme closely reflects the Medical Radiation Technologists Board (MRTB) competencies or standards for practice (MRTB, 2011), which provide a baseline to assess graduates' fitness to practice. Clinical assessment is integral to establishing if the required competencies have been met. Hence, students acquire knowledge to achieve their foremost goal, to pass assessment in the academic and clinical settings. Assessment in the academic setting is mostly written and encompasses assignments, examinations, presentations, laboratory tests and portfolio development. In contrast, assessment in the clinical setting primarily involves observed performance of practice. Competency-based assessment is the core clinical assessment method, which entails a clinical tutor observing a variety of radiographic examinations followed by an oral component in which students are questioned on the cases they have performed, together with other patient examination scenarios that are presented to them.

Clinical learning time for students is valuable. In addition to learning the professional capacities for MRT practice during this time (which is specified by the education provider), students are required to meet assessment requirements. It can be a stressful time for students as they need to access a range of radiographic examinations offering different learning opportunities. In this study, students were eager to access clinical tutors who they perceived had the 'knowledge they needed' in preparation for assessment. Clinical tutors are in a position to give or withhold their guidance, which can have implications for students' learning. Students are not allocated a specified time with clinical tutors, rather the arrangement of student and tutor time is organised in an *ad hoc* manner and students spend variable amounts of time with the tutors. Hence, students who have not spent sufficient time with a tutor prior to assessment are likely to be disadvantaged.

In addition, students do not have full control over accessing learning opportunities. Although they are considered to be supernumerary in the practice setting, at times they are also required to manage the workload. The interruption of the supernumerary status is probably influenced by students being paid by the clinical site, and their role being designated as 'work experience', which takes place during a break at the end of each year of the programme. In addition, students are paid for the after-hours shift work that they undertake to gain experience of the acute service provided by a radiology department. Because the students receive payment, managers in radiology departments have the authority to place students in designated areas to meet the needs of the department. Therefore, the priority for managers is likely to be that the work is completed. Students' learning may be interrupted if they are placed in areas that do not provide the opportunity for new or extended learning experiences.

### ***MRTs***

MRTs have a vested interest in gaining knowledge that enables them to engage in their day-to-day practice. It is the knowledge that 'works' for them. MRTs do not exclusively orchestrate the knowledge they require for practice; rather it is driven by the requirements of the system. MRTs need to manage a demanding workload as they work towards producing quality images to contribute to patients'

diagnoses. Therefore, teaching MRT students is not a priority for MRTs, as Gina suggests in the following excerpt:

*Clinical tutors have the luxury of spending time with the students. It's harder for us [MRTs] as it's busy, especially in a chest room [radiography room for chest radiography] when at times you feel like you're in a bit of a factory. I know there's times when I've been rushed off my feet in a chest room and the patient says to you, "oh it is very busy" and you think oh my goodness am I pushing them through and are they feeling like sheep going through the yards. And then I think I must really spend more time, slow down a bit, give them a bit more time, but that is a challenge. However, the main thing is, we need to get through the work and not keep patients waiting.*

**Gina, MRT, INT.**

Gina points out that it is not practical for an MRT to perform a similar role to a clinical tutor. The priorities for MRTs are to contend with the workload to provide an efficient service for patients.

### ***Clinical Tutors***

The role of a clinical tutor is to facilitate clinical learning for MRT students; therefore, their primary focus is different to that of the MRTs. Clinical tutors are not factored into the workforce requirement within a clinical learning site, hence unlike MRTs, the management of patient throughput is not their key priority. The interest of the clinical tutors is knowledge that 'sets the bar' or standards for practice. Simon, a clinical tutor, gives his view of the role of a clinical tutor in the following excerpt:

*They [students] need to see that there are clear guidelines, there are clear rules, what is expected of a professional, what it means to be a professional, that there are regulations to follow, there are standards to apply. A lot of them will have no idea of what these standards are and it needs to be laid down early on in their training that this is expected, this is not expected, this is acceptable, this is not acceptable. We have to show them by example that these are the standards we expect and want them to maintain, and we have to come down on them if they are not maintaining those standards. That is part of the assessment process that they go through in the three years.*

**Simon, Clinical Tutor, INT.**

In this excerpt, above Simon has emphasised that students need to learn the rules, standards and 'oughts' of practice. In addition, he has revealed that students are 'managed' by clinical tutors to ensure standards are maintained and the clinical tutors "come down on them" [*students*] if they are not maintained, suggesting that the students are reprimanded. Bourdieu (Bourdieu & Wacquant, 1992) would see this as *symbolic violence*, that is, using symbolic power against another. A clinical tutor's position of authority allows them to evoke *symbolic power* through their gate-keeping role as they make decisions about a student's progress. This may mean students will learn to conform and behave in a particular way to ensure they meet acceptable standards and pass assessment requirements. In addition, if the violence evoked is misrecognised, the students may not perceive they are victims of *symbolic violence*. Bourdieu and Wacquant (1992) explain "symbolic violence, to put it as tersely and simply as possible, is the violence which is exercised upon a social agent with his or her complicity" (p. 167). For MRT students it is likely they will conform as it is in their best interests to have a sound relationship with their clinical tutors: firstly because they need to learn from them and secondly, clinical tutors make decisions about their progress.

In the clinical setting, students, MRTs and clinical tutors have different interests, needs and priorities for the types of knowledge they use in practice. The types of knowledge that students, MRTs and clinical tutors prioritise is related to their goals in the practice setting. The differences in priorities for MRTs and clinical tutors does not mean that the types of knowledge each group prioritises is superior or inferior to the other; rather, it is the knowledge needed to achieve their goals. Although each group differently prioritises the types of knowledge, it is evident that propositional, professional craft (process) and personal knowledge are all needed for practice.

### **Types of Knowledge Prioritised and Valued by Students, MRTs and Clinical Tutors**

If students, MRTs and clinical tutors have different interests, needs and priorities for the types of knowledge they use in practice, what types of knowledge do they value? Eraut (1994) proposes three types of knowledge essential for professional education: propositional, process and personal knowledge. Propositional



knowledge is most closely associated with the academic arena and comprises concepts and theories related to the discipline. Process knowledge is knowledge associated with processes used in professional action and propositional knowledge is drawn upon when conducting processes. Higgs, Titchen and Neville (2001) offer a similar categorisation of knowledge to that of Eraut's; however, they use the term 'professional craft knowledge', which is acquired through professional experience and is therefore similar to process knowledge. Further, Polkinghorne (2004) introduces the term 'practical knowledge' which is based on inferences and can either be "codified into a set of formal rules, or it can be maintained in memory as a set of informal experiences" (p. 72). Practice that involves activity is goal directed and practitioners use practical knowledge informed by 'rules' and/or experience to accomplish goals.

Personal knowledge is acquired through experience and social interaction, with some aspects of personal knowledge categorized as propositional or process knowledge (Eraut, 1994). The part of personal knowledge that is not categorized remains as impressions and it is not fully understood how the impression level of knowledge, gained as a result of experience, contributes to professional activity. Polkinghorne (2004) refers to personal knowledge in a similar way to Eraut (1994) and suggests that practitioners will also access informal experiences, which are personal or based on those written or verbally communicated by others. For example, MRTs frequently have conversations about challenges they face, such as not being able to apply the usual 'codified rules' to non-routine examinations. With regards to personal knowledge, consideration of the individual within the social context must also be acknowledged as an individual's personal life histories contributes to what he/she brings to a learning situation (Billett, 2002). MRTs and clinical tutors will possess a greater amount of personal knowledge than students, as it is knowledge that is acquired through experience and social interaction. Further, patients' personal knowledge will be developed through their experiences and interactions of undergoing medical imaging procedures.

Each domain of knowledge influences the other, for example, propositional knowledge cannot be thought of as an independent sphere of knowledge as it is constructed through experience (Taylor, 1997). Various tensions are created

between the different types of knowledge in professional education and propositional (formal), process (procedural) and personal knowledge are not equally valued. Greater value has been afforded to propositional knowledge in professional education (Titchen & Higgs, 1999).

In a study with the intention of classifying radiographic knowledge, Castle (2000) has used a four-quadrant model (hard pure: natural sciences and mathematics; hard applied: science-based professions; soft pure: humanities and social sciences; soft applied: social professions) to show that radiography lecturers identified that radiographic knowledge spanned 'hard applied' and 'soft pure' aligning with mechanical engineering and sociology, respectively. In view of the different interests, needs and priorities for MRTs and clinical tutors identified in this study, it would be useful to conduct a study similar to Castle's (2000) with MRTs in practice to establish if they perceive radiographic knowledge in a similar way to MRT lecturers.

It was evident that clinical tutors and students prioritise propositional knowledge whereas MRTs prioritise professional craft knowledge (refer to Table 11). Gina, an MRT, differentiated between the students' focus on propositional knowledge and professional craft (process knowledge) needed for practice in non-routine situations:

*I think the challenges are that they [students] have so much theory which is good and then they come to the practical situation and patients are not always ideal, they are often challenging patients and they are wanting to put their neat little theory into practise and sometimes can be a little bit thrown by having to make adaptations to various situations.*

**Gina, MRT, INT.**

**Table 11. The Impact of Knowledge**

(Eraut, 1994; Higgs, et al., 2001)

	<b>Students</b>	<b>MRTs</b>	<b>Clinical tutors</b>
<b>Priorities in the practice setting</b>	<ul style="list-style-type: none"> <li>• Priority is learning</li> </ul>	<ul style="list-style-type: none"> <li>• Priority is attending to the patient workflow</li> </ul>	<ul style="list-style-type: none"> <li>• Priority is teaching students</li> </ul>
<b>Knowledge needed for practice</b>	<ul style="list-style-type: none"> <li>• Knowledge that will allow students to meet required professional competencies (determined through the process of clinical assessment)</li> <li>• Knowledge to achieve their goals</li> <li>• Knowledge associated with the 'oughts'</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge that enables MRTs to perform their day-to-day work</li> <li>• Knowledge that 'works'</li> <li>• Knowledge associated with the 'is'</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge that 'sets the bar'</li> <li>• Knowledge associated with the 'oughts'</li> </ul>
<b>Types of knowledge valued</b>	<ul style="list-style-type: none"> <li>• <b>Propositional knowledge</b> is prioritised</li> <li>• <b>Personal knowledge</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Professional craft knowledge</b> (process knowledge) is prioritised</li> <li>• <b>Personal knowledge</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Propositional knowledge</b> is prioritised</li> <li>• <b>Personal knowledge</b></li> </ul>
<b>Influences and Tensions</b>	<ul style="list-style-type: none"> <li>• Clinical teaching is undertaken by MRTs and clinical tutors who: <ul style="list-style-type: none"> <li>- value knowledge differently</li> <li>- perceive the knowledge needed for practice differently</li> </ul> </li> <li>• Students are eager to work alongside clinical tutors as they perceive them to have the knowledge they need, particularly for assessment</li> <li>• Students need to acquire knowledge within the demands of the specified clinical learning time</li> </ul>	<ul style="list-style-type: none"> <li>• MRTs do not perceive they have similar propositional knowledge to clinical tutors which impacts on their teaching</li> </ul>	<ul style="list-style-type: none"> <li>• Clinical tutors perceive the MRTs do not have the type of knowledge needed to teach students</li> </ul>

Rather than the focus for MRTs being on knowledge elements such as theories and concepts which are more closely related to the academic domain, MRTs appear to rely primarily on “how-to” knowledge that has emerged from their backgrounds (Polkinghorne, 2004, p. 155). It will be through experience that students’ propositional knowledge will be embedded into practice activity, as Eraut (1994) points out that professional action is underpinned by propositional knowledge. As students’ professional craft knowledge develops over time, they will be better equipped to manage non-routine situations.

The acquisition of knowledge for decision making was important for students in this study. One student demonstrated the challenge of applying propositional knowledge to a process of decision making to establish the acceptability of images:

*I think for me one of the biggest things you learn in the clinical setting that you don’t learn anywhere else, is image critique [to establish if images are acceptable] and just the drill of going through and being able to articulate all your knowledge in front of your image. I try to apply what I have learned at [education provider]. Often when I’m encouraged to do it, it’s like drawing blood from a stone, like I kind of know how to do it but it’s so difficult.*

**Cam, student, FG**

In the excerpt above, the student reports on the difficulties that he experienced when acquiring knowledge to guide his decision making. He relies on propositional knowledge (acquired in the education setting) to develop professional craft knowledge. He referred to a recognised sequence (the drill) of critiquing his images; however, he found the process difficult. The difficulty may be associated with limited support in this area from MRTs, as reported by Gina, an MRT:

*A properly trained tutor would spend a good five minutes after the examination dissecting the examination and images and I know that’s probably the better way but I don’t often find it that practical to do in our situation as the patients come first.*

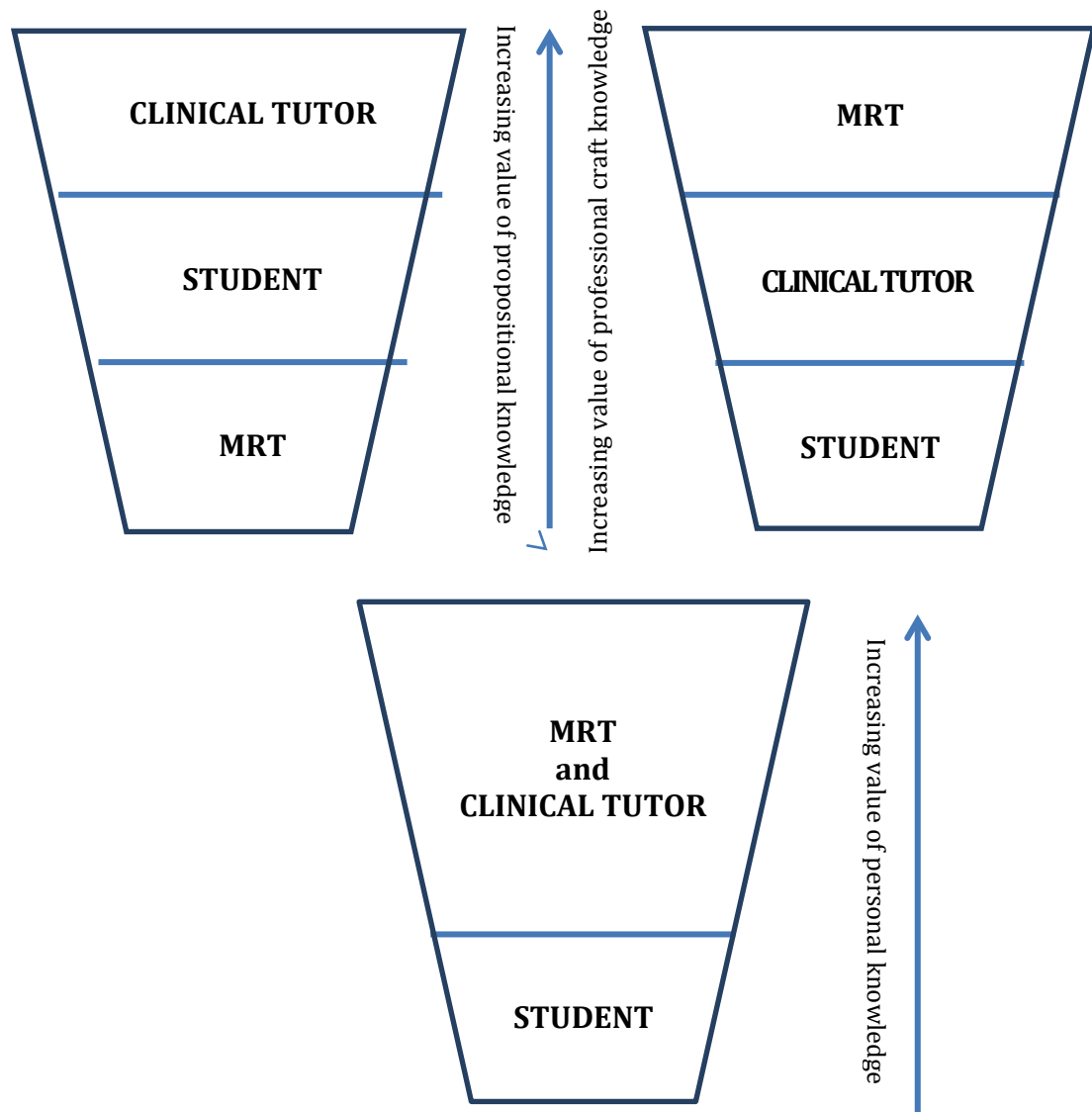
**Gina, MRT, INT.**

Gina has reported that she is aware that taking time to discuss images with students would be valuable; however, constraints, which were probably due to the

workload, make it impractical. It is likely that an MRT's experience enables them to view images rapidly to establish if they are acceptable or not. Lecturers in the academic setting and clinical tutors in the practice setting emphasise the importance of the development of image critique; a sequential process to check if an image is diagnostically acceptable. Image critique is associated with standards of practice and assessment and underpinned by propositional knowledge. If image critique is not encouraged or articulated by MRTs, then students may have difficulty accessing MRTs' knowledge in this area. If this is the case, they will be solely reliant on teaching of image critique from academic lecturers and clinical tutors.

### **Tensions for the Players: Students, MRTs and Clinical Tutors**

In the clinical learning setting, apparent tensions were related to the different goals of students, MRTs and clinical tutors in the practice setting. Students experience tensions due to MRTs and clinical tutors' different interests and priorities with regard to the types of knowledge needed for practice (Table 11). Clinical tutors and MRTs were also subjected to tensions with regard to the differences in the types of knowledge they value and prioritise to achieve their goals. MRTs acknowledged that their priority was to 'get the work done'. That is, they used knowledge that 'works'. However, they undermined the value of the knowledge they possessed and perceived that they needed knowledge similar to that of clinical tutors to be able to teach students effectively. Clinical tutors thought that MRTs need to acquire new knowledge for teaching medical imaging students. Students and clinical tutors did not view MRTs' professional craft knowledge as 'trustworthy' as propositional knowledge, therefore accentuating the *cultural capital* perceived to be held by the clinical tutors. The value of types of knowledge for students, MRTs and clinical tutors is illustrated in Figure 14.



**Figure 14. How Knowledge is Valued by Clinical Tutors, MRTs and Students**

A clinical tutor has highlighted the perceived need for the MRTs' knowledge base be enhanced:

*We could get the knowledge base up amongst other staff with maybe a training programme. The aim would be to boost their understanding of what's required. Not only would the staff benefit from it but the students also, because they would find they are not relying on a small group of people who they perceive to know all the answers.*

***Simon, Clinical Tutor, INT.***

Hence, clinical tutors experience frustration due to the MRTs' different (or insufficient) knowledge. Simon has suggested support is needed for MRTs to develop a level of knowledge that would be appropriate for teaching MRT students.

Further, he has clearly articulated that students perceive that the clinical tutors, rather than MRTs possess the knowledge for teaching.

### ***Recognition of MRTs' Professional Craft (Process Knowledge) to Alleviate Tension***

The findings of this study have highlighted the importance of propositional knowledge for students and clinical tutors. However, an understanding of professional craft knowledge may assist to enhance its value in the practice setting. Students learn the knowledge (propositional) prioritised by clinical tutors to develop their MRT practice, and also for the purpose of assessment. The value of professional craft knowledge must be promoted, as students will need this knowledge to manage workload demands when they become registered MRTs.

Despite students demonstrating that they were keen to learn alongside clinical tutors with the intention of gaining the knowledge they perceived they 'needed', the learning partnership enabled students to learn professional craft knowledge and habits from their MRT partners. A key advantage of the partnership was being able to learn and engage in dialogue with one MRT, providing a trusting relationship to ask questions and alleviate any confusion. The partnership enabled students to recognise the value of professional craft knowledge. Lizzie shows her appreciation of her partner's professional craft knowledge:

*I think having Sally work with me and show me things that she had learnt over her many years was very helpful and allowed me to consolidate my knowledge from class. She sometimes did things differently to what we had been taught but they worked and she was clear about why she did things in a particular way. I was able to weigh up what we learnt in class with what Sally did, talk about it and then decide what works for me.*

***Lizzie, student, email correspondence, July 2010***

In the exemplar above, the student has been exposed to the MRT's professional craft and personal knowledge, which is different to propositional knowledge acquired in class. Polkinghorne (2004) emphasises the importance of what an individual 'brings' to achieve a task, rather than the application of propositional knowledge as they perform their practice (p. 155):

*Practice is performed by carrying out one's background understandings of how to complete tasks. Thus, ordinary accomplishments in the world are not the result of applying theoretical propositions or generalized scientific laws to particular situations. People's backgrounds provide a sense of what to do to achieve an intended result. This sense takes the form of "how-to" knowledge, rather than knowledge "about" something or "what" something is.*

Mia, an MRT, demonstrated her professional craft knowledge 'in use' in the following excerpt:

*I think it's sometimes difficult for students to learn things that are not quite so obvious. MRTs develop particular sequences and ways of doing things to save time and for consistency. Also, there's things that we just do because we have been around for a while and they work. For example, students are taught to do a bilateral skyline patella examination [a specific radiographic projection of the knee] as separate exposures on separate image plates. Most MRTs do them together and so do I – it saves time and a single image must be easier for the radiologist to view. I don't know why students do it separately, there must be a reason for it.*

**Mia, MRT, FG**

Mia, has given an example of a 'habit' she employs in practice and has justified why she uses this particular approach, which is different from the approach the students are taught. MRTs' professional craft knowledge probably consists of shortcuts and heuristics, which assessors may not consider suitable for students to learn for the purpose of assessment. Further, if there are differences in what encompasses the knowledge base for MRTs and clinical tutors, each group may develop different habits.

Bourdieu and Dewey both explored the notion of habit and action and for Bourdieu power and social rank was particularly important (Cutchin, Aldrich, Bailliard, & Coppola, 2008). Bourdieu (1990) used the term '*habitus*' to provide a perspective on habit and defines it as (p. 72):

*....systems of durable and transposable dispositions, structured structures predisposed to function as structuring structures, that is, as principles of the generation and structuring of practices and representations which can be objectively "regulated" and "regular" without in any way being the product of obedience to rules, objectively adapted to their goals, without presupposing a conscious aiming at ends or an express mastery of the operations necessary to obtain them and, being all this, collectively*



*orchestrated without being the product of the orchestrating action of a conductor.*

Hence, *habitus* and action have a sense of regularity about them without relying on rules, and they are modifiable. Bourdieu (1990) refers to the *habitus* as ‘structuring structures’, that is, it is ‘structured’ by an individual’s past and experiences. Objective structures, influenced by the past, tend to be reproduced. *Habitus* is ‘structuring’, as it will assist to form an individual’s current and future practices (Maton, 2008). The *habitus* of the students, MRTs and clinical tutors within the clinical learning setting disposes each group to act in certain ways based on their background, experience and socialisation.

Dewey (1922) claimed that habits involve activity that is influenced by previous activity with more finely-tuned habits being performed with a greater level of unconsciousness. It is only when there is a glitch or interference in a routine habit that enhanced thinking takes place. Individual MRTs acquire habits “under the conditions set by prior customs” (Dewey, 1922, p. 58); customs therefore provide the standards for an individual’s activities. Dewey argued that although social and cultural processes shape an individual’s habits, an individual reproduces social customs through habit even though habits are usually acquired and used unconsciously (Cutchin et al., 2008). Dewey (1922) proposed that it is likely that an individual will follow, rather than resist the instructions of those with more experience and power in their early development. This means that it is probable that original thought will be suppressed as it will be easier for the emerging practitioners to follow the norm rather than resist. Further, Dewey (1922) differentiates between a technician and an artist and posits an artist is a “masterful technician” (p. 71) as technique or mechanism is combined with thought and feeling. We are therefore faced with two types of habit: routine and intelligent, with the latter being desirable. Talia, a student MRT, is alluding to the difference between routine and intelligent habits in the following excerpt:

*Most of the older MRTs, they don't actually remember quite a lot of their physics, they just remember their image criteria and they don't think about what they are doing so it's difficult for them to explain things...They influence you to just remember it for now but later on forget, whereas the younger ones, they are like no, no, no you do need to understand what's going on.*

**Talia, student, FG**

It is not possible to conclude if more mature MRTs have a greater tendency toward routine habits and if intelligent habits are more characteristic of younger MRTs. However, the previous excerpt suggests that mature MRTs primarily use routine habits in their practice. It does not mean that they do not employ intelligent habits but rather they are able to function adequately with routine habitual practice. A key aspect of this type of practice is that it 'gets the work done'. Jarvis (1992) points out that as practitioners become more proficient, the rules they relied on previously in their practice are forgotten. However, although this may be acceptable for some aspects of practice, Jarvis warns that poor practice could occur with habituation. Baird (1996) makes a similar point to Jarvis (1992) and posits it is likely MRTs will develop 'rules of thumb' and routinised practices and warns that, although the development of habits are necessary for MRTs to be effective in their work, there is the risk that standards may decrease. Hence, there needs to be ways in which a practitioner's knowledge base is challenged. This may occur if a practitioner is questioned by an experienced student, for example.

Although MRTs have a professional knowledge base that prioritises professional craft knowledge, they will continue to learn as a result of encountering different problems and cases (Eraut, 1994). However, if a professional continues to be involved in routine cases, then the learning may not contribute significantly to their professional knowledge base. It is non-routine cases that a practitioner has time to reflect on that would make a more important contribution to their knowledge base (Eraut, 1994).

Bourdieu's notion of *doxa* may help to understand the way in which MRTs appear to practice using their 'know-how' that is not reflective or conscious. Crossley (2004, p. 100) explains this point:

*Doxa consists of embodied and practical understandings and know-how, not mechanical reflexes. But it is practical and embodied and, at least insofar as it remains doxic, it is neither reflective or conscious. The doxic is what we know without knowing that we know it; what we abide by and adhere to with, at best, only a vague and inarticulate sense of doing so.*

In other words, aspects of MRTs' practice will involve functioning at an unconscious level. It seems they can adequately perform examinations, or parts of

examinations, without thinking about the steps involved. However, it is the doxic that may be difficult for students to learn due to the difficulties associated with its articulation. Belinda, an MRT, explains the challenges of articulating aspects of her practice:

*It's hard to start off from scratch with first year students, they just look at what I do. It's hard to explain all the things that you do, as some of what you do is automatic.*

**Belinda, MRT, FG**

Being able to describe the components of her performance without conscious thought is difficult for this MRT. It is probable that the aspects of professional craft knowledge (process knowledge) that do not involve reflection are difficult to articulate because they are embedded in a practitioner's practice. In such situations it is difficult to specify the 'rules' of practice. The term 'tacit knowledge' was coined by Polanyi (1967) to describe knowledge that is embedded in a practitioner's practice and is problematical to articulate.

Bourdieu's (1990) analogy of the game may also contribute to understanding MRTs' approach to practice, which is informed predominantly by professional craft knowledge. He argues that people take part in a game that involves "sensible practices" (Bourdieu, 1990, p. 66) and those who are players and have a "feel for the game" enact the practices with rationality. Maton (2008, p. 54) further explains that social agents "enjoy a particular point of view on proceedings based on their positions, and they learn the temp, rhythms and unwritten rules of the game through time and experience". Through experience and by being players in the game, MRTs learn particular ways of doing things that appear to sufficiently support their practice. They practise competently and safely using their professional craft knowledge. Although professional craft or process knowledge and personal knowledge are central to MRTs' practice, they will also draw on propositional knowledge to support their practice. MRTs have developed high levels of expertise over a number of decades; however, professional craft knowledge in radiography practice needs to be made explicit. Increasing research of radiographic practice is necessary to help define a realistic body of knowledge for medical imaging practice.

Tensions are evident as the interests, needs, and priorities for knowledge are valued differently by students, MRTs and clinical tutors. The differences are aligned with the goals for each group. The key goal for students is learning to meet competencies, whereas for the MRTs it is to ensure quality patient service. The prime goal for clinical tutors is to teach and ensure students meet the standards for best practice. Rather than students and clinical tutors focussing predominantly on propositional knowledge, professional craft knowledge needs to be recognised and promoted as students also need to learn ways that will prepare them to practise effectively and efficiently as registered professionals. Although clinical tutors and MRTs exhibit differences in relation to how they value and prioritise knowledge, Baird (2008) emphasises the need for students to be encouraged to develop critical and reflective thinking skills to make the “creation and integration of knowledge possible....” (p. 7).

### **Who Decides the Standards for Best Practice and Who Holds the Power?**

The MRTB is one of 16 New Zealand health registration authorities, appointed by the Minister of Health under the Health Practitioners Competence Assurance Act 2003. The key responsibility of the MRTB is to protect the health and safety of the New Zealand public by ensuring practitioners registered in the MRT profession are competent and fit to practice. The MRTB also accredits and monitors the programmes, courses and qualifications that education providers offer to ensure they meet registration requirements. In addition, the MRTB has developed guidelines providing a robust frame of reference with regard to competency requirements. Consequently, the registration board has a prime influence on the knowledge required for standards for best practice.

The New Zealand Institute of Medical Radiation Technology (NZIMRT) is the professional organisation representing MRTs and radiation therapists in New Zealand. The NZIMRT has several roles, including the maintenance of professional standards, by assisting in the development of course criteria for the education institutions. The MRTB is responsible for the regulation of the profession and therefore holds more power than the NZIMRT as it has greater *symbolic capital* (gate-keeping role) and *cultural capital* (standards of practice).

The education provider has significant *cultural*, *economic* and *symbolic capital*. Although the standards of practice are set by the registration body (MRTB), the education provider makes decisions around curriculum design in conjunction with standards of practice (*cultural capital*). The education provider also has marked *economic capital* as they fund the staff and clinical placements. In addition to *cultural* and *economic capital*, the education provider holds *symbolic capital*. They are a recognised provider of medical imaging education and students' learning in the academic setting is facilitated by individuals with expertise in specialist areas, many who hold higher degree qualifications with several years of teaching experience.

Individual teachers possess *symbolic capital* as they have qualifications and *cultural capital* as a result of the knowledge they have acquired. In addition, they possess *social capital* due to the networks and affiliations they have gained. Although the curriculum orchestrates content knowledge and to some extent assessment of learning, individual teachers can decide on teaching and assessment approaches in conjunction with the curriculum requirements. They can select in what ways they contribute to students' learning. Further, they will have their own individual perspective of what is best practice and are in a position to promote their view.

The MRTB (registration body) sets the competencies for practice, the NZIMRT (professional organisation) advises on standards and the education provider ensures the curriculum aligns with the MRTB's competency requirements. Individual teachers will have different approaches to teaching based on what they maintain is best practice. Hence, the organisations that affect the delivery of a medical imaging education programme and the individuals who teach all hold power due to the types of *capital* they possess. However, although various organisations are in a position to contribute to standards for practice, it is the MRTB that ultimately sets the standards of practice and holds the most power.

## **Summary**

Within the complex milieu of medical imaging practice, a fundamental necessity for students is to be able to access and construct knowledge that enables them to

develop their professional capacities. Students learn in a multifaceted setting, characterised by the uncertainty of an indeterminate volume of patients presenting with varying degrees of illness and injury. In addition to adjusting to the complexities of practice, MRT students learn in settings in which types of knowledge are prioritised and valued differently by students and their teachers. This chapter has explored the differences in the types of knowledge needed and valued by students, MRTs and clinical tutors. Accessing and prioritising knowledge markedly influences how MRT students learn. The types of knowledge held by clinical tutors, MRTs and student groups create tensions and a power interplay between the groups. The MRT profession is characterised by two main bodies of knowledge: knowledge for learning, assessment and certification and knowledge for practice. While there are central commonalities in the two bodies of knowledge, there are also important differences in the way that knowledge is valued and prioritised. It is the differences that creates tension. As this study has revealed, the differences in knowledge generates challenges for teaching and supervision for MRTs and for learning for students. It may be an opportune time for the profession to redefine the knowledge prioritised, valued and needed for practice and ultimately the standards for practice.

## CHAPTER TEN: CONCLUSIONS

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### Introduction

This study aimed to improve support for medical imaging students' learning experiences. In essence, findings in *Phase One* unquestionably demonstrated the need for change within the clinical learning setting to support medical imaging students' learning and MRTs who teach and supervise them. It was during *Phase Two* that an initiative was developed and subsequently implemented to establish its impact on students' learning and MRTs' teaching. Revisiting the research aims and questions for the study, actions to improve practice, implications and recommendations for practice, sustainability of the research outcomes, reflections on being a change agent, and considerations for providers of medical imaging education will be discussed in the initial part of this chapter. The latter part of the chapter will detail the progress to date, recommendations for further research, originality and research contributions, value of action research, limitations of the study and a concluding statement.

### Revisiting the Research Aims and Questions for the Study

Responses in relation to fulfilling the aims and research questions for this two-phase study have been summarised in Table 12. Importantly, during each phase of the study, the voice of students, MRTs and clinical tutors was heard, and in *Phase Two*, MRTS and students were able to make a contribution to change in relation to the facilitation of student learning.

*Phase One* of the study provided an in-depth understanding of the experiences of learning for medical imaging students. The research question for *Phase One* was: '*How do MRT students' learning experiences shape their professional capacities?*'

The findings have identified that the learning experiences shaping students' professional capacities in the academic and clinical settings were influenced predominantly by assessment requirements. In the academic setting, learning appeared to be mostly individualised and students were not significantly dependent on the support from others. Conversely, in the clinical setting students

were markedly dependent on support offered by both MRTs and clinical tutors. However, the contribution of clinical tutors, who valued and prioritised propositional knowledge (Eraut, 1994) in their teaching was important for students. Students' valued clinical tutors' teaching as they perceived they 'had the knowledge' that was essential for assessment.

The differences in the teaching offered by clinical tutors and MRTs created tensions for the students, clinical tutors and MRTs. This was predominantly due to MRTs feeling unsupported in their role as teachers, and the differences in the types of knowledge prioritised and valued by MRTs, students and clinical tutors. Further, MRTs perceived that the teaching performed by clinical tutors was prescriptive and curbed the opportunity for students to learn a variety of approaches to practice. Furthermore, the findings identified that within the clinical learning setting, supervision was at times ineffective.

In *Phase Two*, in fulfilment of the second aim of the study, an initiative to support students' learning and MRTs' teaching was developed, implemented and evaluated. The research question that guided *Phase Two* of the study was: '*How has learning for students and teaching for MRTs changed following the introduction of a learning/teaching initiative?*'

In the second phase of the study, the centrality of a relationship was integral to the learning partnership initiative, in which students gained a sense of belongingness within their clinical learning setting. The formation of robust relationships enabled MRTs and students in partnership to become known to each other which provided an anchor for students' learning. For MRTs, the relationship offered them opportunities to enhance their practice. They were encouraged to access knowledge and learn. Furthermore, the relationship supported the development of a cognitive apprenticeship (Collins, Brown & Newman, 1989) arrangement that emerged from MRTs' focussed and considered approaches to teaching, enabling students to develop a deeper understanding of dimensions of practice. Importantly, this type of support provided by the learning partnership initiative was not previously available for students. Further, the introduction of technology



(a virtual learning environment and personal digital assistant) offered a robust contribution to the facilitation of students' learning.

**Table 12: Research Aims, Questions and Findings**

<b>PHASE ONE</b>		
<b>Research Aim:</b> <i>To understand MRT students' experiences of learning and how they are negotiated and supported to shape their professional capacities.</i> <b>Primary Research Question:</b> <i>How do MRT students' learning experiences shape their professional capacities?</i>		
<b>Sub-questions</b>		
<i>In what ways do students engage with their learning experiences in the clinical and academic settings?</i>	<i>How are these experiences supported by other individuals?</i>	<i>What knowledge is required for MRT practice?</i>
<b>FINDINGS</b>		
<ul style="list-style-type: none"> <li>• Students' learning was shaped predominantly by assessment requirements</li> <li>• MRTs perceived that students were encouraged to learn in a prescriptive way, rather than learning a variety of approaches to practice</li> <li>• Differences in the teaching offered by clinical tutors and MRTs created tensions for the students, MRTs and clinical tutors,</li> <li>• Teaching by MRTs appeared to focus on a task-based approach rather than approaches which encouraged a deeper understanding</li> <li>• In the academic setting the level of engagement appeared to be influenced by the subject matter and/or the lecturer</li> </ul>	<ul style="list-style-type: none"> <li>• Learning in the academic setting appeared to be more individualised with limited dependence on the support of others</li> <li>• Students were significantly dependent on the support of others in the clinical learning setting</li> <li>• In the clinical setting support was provided by both MRTs and clinical tutors, however, students were eager to spend time with clinical tutors as they perceived they had the knowledge needed for assessment</li> <li>• Supervision in the clinical setting was at times ineffective</li> </ul>	<ul style="list-style-type: none"> <li>• A combination of propositional, professional craft knowledge and personal knowledge (Eraut, 1994; Higgs, Neville &amp; Titchens, 2001) is needed to support MRT practice</li> <li>• All stakeholders need to give greater value to experienced-based knowledge</li> <li>• Knowledge for practice needs to be redefined</li> </ul>
<b>PHASE TWO</b>		
<b>Research Aim:</b> <i>To develop, implement and evaluate an intervention to instigate change and to foster and improve the facilitation of quality learning experiences for medical imaging students.</i> <b>Research Question:</b> <i>How has learning for students and teaching for MRTs changed following the introduction of a learning/teaching initiative?</i>		

## FINDINGS

### Implementation of the learning partnership:

- A student's progression was advanced by gaining a sense of belonging as they developed a robust relationship with an MRT
- MRTs' practice was enhanced by being a part of the relationship
- Enabled effective goal setting for students
- Enabled thorough teaching/learning encounters demonstrating a cognitive apprenticeship arrangement (Collins, Brown & Newman, 1989)
- Learning progressed with the support of technology (virtual learning environment and personal digital assistant)

### Actions to Improve Practice

The participants and I worked closely together and successfully developed and implemented a learning partnership framework to improve the experience of learning for medical imaging students. The direction of *Phase Two* of the study was unclear at its outset, which is characteristic of action research. That is, the initiative was yet to be developed by the participants. Over several months, the committed participant group developed and introduced an initiative to support the facilitation of students' learning. As the partnership framework evolved, the group continuously introduced new ideas and made changes. Aspects related to the challenges of clinical education (outside of this study) were often raised by participants during action research meetings. The participant group was mindful of these challenges as they worked towards developing the initiative.

It was not only the students who benefited from the partnership; it was also markedly valued by the MRTs. Therefore, MRTs were invigorated by their 'new' approach to teaching and students benefited from the unequivocal support for their learning. Undoubtedly, this type of supportive framework progressed students' learning. They increased their *cultural* (knowledge), *social* (affiliations) and *symbolic* (increased recognition as their contributions increased) *capital*. Hence, the balance of these types of *capital* in the MRT/student partnership was more evenly distributed.

During this journey, I experienced a marked sense of achievement from observing changes in the ways in which students and MRTs approached their learning and teaching, respectively. As an educator in medical imaging for many years, the question I continue to ask myself is, 'In view of the benefits a partnership

arrangement for learning, why has a similar arrangement not been introduced previously?’

## **Implications and Recommendations for Practice**

Although the implementation of the learning partnership was mostly straightforward, tensions did emerge. The tensions included, insufficient time, MRTs’ lack of preparedness for teaching and the impact of assessment. The tensions create challenges for the future implementation of the initiative; hence, suggestions of how to address the challenges are a vital next step towards sustainable change. Addressing the challenges involves changing the culture of practice which has impacted on the students, MRTs and clinical tutors, as revealed by the data. Practice is not solely influenced either by *habitus*, *capital* or *field* but rather, it is the blend of these entities that forms practice. Therefore, the culture of practice will change with changes in professional and personal *habitus*. In turn, the *symbolic* (recognition), *social* (increased affiliations in the practice area) and *cultural* (knowledge) *capital* is likely to be increased for MRTs, leading to a redistribution of *capital* between the MRTs and clinical tutors. An increase in *capital* for MRTs will subsequently benefit the students as the MRTs will have acquired knowledge and recognition for their role as a ‘teacher’. It is likely students will then be less affected by the disruptive nature of the power interplay between the clinical tutors and MRTs that was evident in the data. In addition, an increase in *capital* (*symbolic, social and cultural*) for MRTs is likely to enhance their job satisfaction which will benefit the profession as a whole.

In the following discussion recommendations (‘go forward’ strategies) will be offered as suggestions of how to address the issues (tensions) identified in the study.

### **Insufficient Time**

A key tension associated with the partnership was the limitation of time. The issue of insufficient time has been highlighted in other learning partnership or mentoring arrangements ((Colhart et al., 2010; Veeramah, 2012). MRTs and students expressed the need to spend more face-to-face time with each other; however, the availability of additional time was constrained by students needing to

gain experience in various areas within the radiology department, rostering, and MRTs' other commitments. Nonetheless, MRTs gained notable satisfaction from being a part of the partnership and demonstrated enthusiasm and commitment to it. In addition, the opportunity for students to engage in online dialogue with their MRT partners was a valuable way to support their learning. For MRTs, however, the time involved in responding to their student partners' questions online was both outside their job description and beyond their call of duty. MRTs attempted to reply to students' postings during work time but they were often interrupted by the demands of their job. MRTs also responded in their own time, usually in the evening. The length of the online responses (refer to the 'Evidence of Actions', CD inserted in back cover) undoubtedly demonstrated the significant time given by MRTs. However, giving time outside of working hours could not be an expectation of MRTs if the initiative is implemented in the future. Many MRTs also work shifts, which is an additional demand within their working lives.

***Issue:** MRTs do not have time available currently to adequately support students.*

### **Funding Time**

For the successful, future implementation of the learning partnership, funding is needed to address the issue of insufficient time for MRTs to teach. Funding would need to be secured so that MRTs' 'giving of time' is recognised; this additional time would need to be protected to enable them to fulfil their role within the partnership. Currently, funding of clinical education is the responsibility of the education provider and, therefore, the provider will need to be convinced that a redistribution of funds will improve clinical education for MRT students. The majority of funding for teaching medical imaging students in clinical settings is allocated to clinical tutors who are employed by the education provider. Essentially, a small number of clinical tutors are receiving payment for teaching a significant number of students. If the approach to funding is reconsidered then a proportion of funding could be allocated to the District Health Board (DHB). This would allow a more even distribution of the money available for clinical education, with a greater investment in the MRTs who teach the students. This does not mean there is not a place for clinical tutors. Link tutors or clinical placement coordinators could be instigated to oversee clinical education for undergraduate

students in the clinical areas and support MRTs in their teaching and supervision role. Alternatively, consideration of joint clinical tutor/lecturer positions may assist to strengthen relations between MRTs and clinical tutors, as well as the clinical and academic settings.

For clinical education to be valued by all stakeholders, it seems that greater value needs to be placed on the contributions of MRTs to student education. Therefore, a more cohesive approach is needed for the delivery of clinical education so that a small group (clinical tutors) are not perceived by MRTs and students to be the only 'experts' in education. MRTs are experienced practitioners with a marked level of knowledge and skill. They are in a prime position to assist students to build on previous knowledge and develop new knowledge, skills and a professional identity. Therefore, MRTs' contributions need to be recognised, acknowledged and supported. If changes were made to the way in which education is delivered, there would need to be some investment to enhance the relationships between MRTs and clinical tutors. MRTs and, to a lesser extent, students currently perceive MRTs' contributions 'do not count' and therefore MRTs can feel undervalued and marginalised.

***Go forward strategy:*** Stakeholders need to consider a redistribution of funding arrangements in favour of MRTs.

### **MRTs' Lack of Preparedness for Teaching**

MRTs perceived that they did not have the 'tools' to teach MRT students in a similar way to clinical tutors. Gaps in MRTs' knowledge (propositional) and a paucity of knowledge about teaching and learning were the key constraints to enable effective performance of their teaching role. MRTs are important and central contributors to students' learning and yet they explicitly identified that they were challenged by their role. MRTs benchmarked their teaching practice against the clinical tutors who they perceived had the necessary knowledge for teaching and assessment. Frequently, this made MRTs hesitant to teach. The tripartite relationship between students, MRTs and clinical tutors was disruptive as MRTs and students perceived the clinical tutors to have a type and depth of

knowledge that MRTs did not possess. Hence, MRTs performed a teaching role that was not always valued by those around them.

***Issue:*** *MRTs appear to lack confidence in their teaching role.*

If MRTs' knowledge and teaching are perceived to have lesser value than that of the clinical tutors, this could have a marked long-term impact on the profession. The potential long-term effects could be that MRTs become disinterested and apathetic in their teaching role and their sense of worth could be diminished. This may well be detrimental for the progression of the profession as MRTs may lose interest in enhancing their practice. Sim and Radloff (2009) revealed low self-esteem and apathy in medical radiation science practitioners in a study related to CPD. These authors argued the key to practitioners rejuvenating their interest in the profession is to enhance their reflective practice capabilities. If practitioners do not have the drive or motivation to engage in CPD they may also be apathetic with regard to teaching and supervision of MRT students. Nonetheless, good teaching and supervision is vital for the development of competent professionals who are able to deliver high-quality care to patients. Therefore, being involved in teaching needs to be viewed as 'attractive' by practitioners.

***Go forward strategy:*** *Create a culture of practice where MRTs are drawn to take on students to enhance their professional and personal habitus.*

### **Support and Development for MRTs**

This study has called for support for MRTs in their teaching and supervision role. If MRTs were supported in their role as a 'teacher' then it is likely their practice of teaching will emerge from the interactions between their individual and professional *habitus* and their position in the *field (capital)* (Maton, 2008). The support provided will increase their *cultural capital* (knowledge) and *symbolic capital* (increased recognition as a 'teacher', by students and clinical tutors).

***Issue:*** *MRTs suggested they did not have enough current knowledge to underpin their confidence as teachers.*

MRTs found that the information they acquired about the BHSc (MI) programme (posted on the online platform) helped them to understand aspects of the curriculum, including requirements and expectations for students at each level within the programme. Further, support for understanding approaches to teaching and learning occurred informally during action research meetings involving discussions about teaching and learning. If the initiative is introduced in the future, a blended approach to include face-to-face sessions and online modules could enable MRTs to develop an understanding of principles of teaching, supervision, assessment and the structure of the medical imaging programme.

MRTs' knowledge was enhanced by being in partnership with the students, in particular, through their online responses to students' questions. They accessed literature to support their replies to students. If the initiative becomes a permanent strategy (subject to funding) in the DHB in which the study was located, support to enhance MRTs' knowledge could be offered in two ways. Firstly, a needs analysis could be conducted to establish the areas in which MRTs require their knowledge to be 'refreshed' and an MRT with teaching experience could be employed (following a redistribution of funding) to facilitate sessions for MRTs. Secondly, CPD sessions could focus on particular areas identified by MRTs for which they perceive to have gaps in their knowledge.

***Go forward strategy:*** *The education provider works with the clinical area in providing resources, teaching and support to enhance MRTs' competence and confidence.*

### **Differences in Knowledge**

If MRTs, students and clinical tutors prioritise knowledge differently, then how is a professional body of knowledge defined for the MRT profession? Undoubtedly, students need to learn rules, precision and a body of propositional knowledge for practice, however, there are aspects contained within the MRTs' 'knowledge bank' that should also be valued. Professional craft or process knowledge, rather than 'textbook' knowledge, is the knowledge that students will predominantly encounter in the clinical setting (Egan & Jaye, 2009). Students transition from being a student to a registered professional almost immediately. At this point, they

will make decisions and prioritise workflow without assistance; therefore, the MRTs' knowledge is likely to be critical in their new role as a registered professional. This disjuncture represents a dichotomy between epistemology (how it 'ought' to be done) and ontology (how it 'is' for those in practice). Hence, in addition to propositional knowledge that students need to learn, professional craft knowledge or process knowledge needs to be given greater value.

***Issue:** Currently epistemological knowledge seems to be given priority over ontological practice-based knowing.*

The development of the learning partnership enabled MRTs to guide students using both propositional knowledge (mainly via the online discussions) and professional craft knowledge (through face-to-face encounters). The learning partnership provided a way of valuing the importance of both of these types of knowledge. When MRTs explored the literature, prior to responding to questions students posted online, they were able to compare and discuss what was considered the 'right way' of doing things (as specified in the literature) with their own practice. Therefore, they were able to critique their own practice. In addition, an increase in the contributions that MRTs made to students' learning, gave them a more legitimate teaching role.

***Go forward strategy:** Further develop ways, such as the online relationship, where MRTs and students recognise the value of experienced-based insights.*

### **Impact of Assessment**

The key reason students were eager to spend time with clinical tutors was to try to gain the knowledge they needed to pass assessment. The knowledge for assessment was held predominantly by the clinical tutors. Clinical assessment is usually a central focus for students in health professional programmes; however the impact of assessment was particularly marked for medical imaging students. Assessment governed the students' learning. The study has revealed that assessment seems to be 'getting in the way' of teaching and learning. MRTs frequently explained to students that their teaching may be different to the requirements for assessment, which made MRTs hesitant to teach. Boud (2006) points out that "assessment probably provokes more anxiety among students and



irritation among staff than any other feature of higher education” (p. xvii). The key purpose of health professional programmes is to develop students who understand both the specific and general aspects of safe, competent practice. Medical imaging students are required to complete a substantial amount of assessment. In the clinical setting, if a student’s primary focus is to complete assessment, the development of a broad understanding of MRT practice may be constrained.

***Issue:*** *Assessment appears to be out of context of the learning experience, providing a disconnect for both students and MRTs.*

An evaluation of the current schedule and approach to assessment of students is required. Students’ goals for learning are currently driven by assessment which has a marked impact on teaching and learning, therefore, the type and amount of assessment and assessment processes need to be evaluated. The assessment that students are currently required to complete involves a one-off, snapshot of their performance (by a clinical tutor), which may not be the most effective approach for student learning. It seems like a fitting time to think about a major revamp to clinical assessment. The MRTs who work alongside the students are in a prime position to assess a student’s performance. They know more about the student’s overall capabilities, than whether they can complete a specific radiographic examination of an ankle, for example. They are positioned to be able to provide a holistic view of a student’s practice and to ascertain if students have achieved particular competencies, such as effective communication skills and interactions with patients, and their ability to work in a team. Students could undergo a series of ongoing assessments (conducted by the MRTs), which could then be viewed by an independent evaluator to determine a student’s pathway (for example, identifying if the student needs any remedial action).

One could argue that if MRTs in partnership were also involved in assessing their student partner, this may change the relationship. In this study, the MRT in partnership offered an ‘ongoing evaluation’ of the student, both verbally and in a written form (*Record of student engaging with a case*). ‘Assessment’ of the student by their MRT partner did not appear to affect the relationship between the student

and the MRT. This was probably due to the fact that a trusting relationship had been formed. A number of different MRTs would be involved in this alternative approach to assessment, which would be likely to increase the reliability of the assessment process.

The MRTs' position in facilitating students' learning could be strengthened by being involved in the process of assessment. This would mean that assessment would no longer primarily be the role of the clinical tutors. Many MRTs have marked experience in particular areas within radiology; if they were supported to develop an understanding of assessment processes, they could make a valuable contribution to the clinical education of MRT students.

***Go forward strategy:*** *Involve stakeholders in redesigning assessment aims and processes.*

***Issue:*** *The MRTB (MRTB, 2004) Code of Ethics does not include a statement about teaching and supervision, which may affect how it is valued by stakeholders*

A marked disjuncture between the education provided by the MRTs and the clinical tutors is evident in this study. The profession needs to acknowledge this disjuncture and the associated tensions to ensure the provision of quality clinical education. The requirements of the registration body may be an appropriate place to start. Although the MRTB competency requirements (MRTB, 2011) specify that MRTs must be able to "Perform in an instructional/educational role" (Clause 1.6), there is no reference to a responsibility for teaching and supervision in the Code of Ethics (MRTB, 2004). Codes of Ethics or Codes of Conduct for other health professional groups, for example, nursing (Nursing Council of New Zealand, 2012, principle 6.7) and physiotherapy (Physiotherapy Board of New Zealand, 2011, principle 5.6) include statements related to teaching, supervision and support of less experienced-colleagues. It is imperative that a clause related to MRTs' responsibility for supervision and teaching is included in the Code of Ethics so that the importance of this duty within MRTs' practice is acknowledged. MRTs may not necessarily be involved in the facilitation of learning for undergraduate students; however, they may supervise MRTs undertaking postgraduate education to enable

registration to practice in areas such as MRI and ultrasound. Teaching and supervision should be valued as an integral dimension of MRTs' practice. The MRTB Code of Ethics is out-dated (2004), therefore, it is an opportune time to recommend a revision.

***Go forward strategy:*** *The MRTB's Code of Ethics needs to be updated to include a statement about teaching and supervision.*

### **Curriculum Revision**

Many of the recommendations ('go forward' strategies) that I identified above, point to the urgent need for curriculum revision. While there is a disconnect between knowledge that is valued and prioritised by MRTs and clinical tutors, a new knowledge for practice could be achieved if the similarities and differences in the MRTs' and clinical tutors' knowledge were taken into account. Due to the need to define the knowledge for practice and the impact of assessment identified in this study, curriculum change is a priority recommendation of this study. Key stakeholders should be involved in a revision, including representatives from the education provider, MRTs from clinical learning settings, current students and recent graduates. Importantly, the MRTs who are based in clinical learning areas and students will be key players in this development. Eraut (1994) suggests three questions that would be most pertinent for this process. The questions are:

- (i) What is our professional knowledge base?
- (ii) What is best learned in higher education, what is best learned in professional practice and what is best learned through an integrated course involving both contexts?
- (iii) What has to be learned before qualification, and what is best postponed until after qualification? (p. 119).

### **Sustainability of the Research Outcomes**

A key consideration for action research is to incorporate ways to foster the sustainability of a change that has improved practice. It is also important to acknowledge that in this study, although the action research process needed to terminate for the completion of a PhD thesis, it will continue. To date, actions have

occurred in response to the outcomes of my study and planning is currently taking place to ensure the sustainability of a framework to support teaching and learning in clinical settings. The actions include; facilitation of workshops, the introduction of a learning partnership framework for Year One and Two students at the site the study was located, and curriculum revision. In view of these changes a potential way in which funding could be redistributed has been suggested.

### **Workshop Series for Medical Radiation Technologists**

As a result of discussions about the findings of my study with the MRT team leader (refer to letter from team leader, Appendix C) at the District Health Board (DHB) in which the study was located, I was recently invited to facilitate a series of workshops related to teaching and supervision for all MRT staff. Nine sessions were offered and a total of sixty two MRTs attended. The fundamentals of assessment and supervision, teaching clinical skills, feedback, and questioning techniques are examples of topics covered in these sessions. In addition, social learning theories were introduced to participants to make them aware of the how context, including interactions with others influences learning. For example, the notion of role-modelling and the promotion of capabilities such as self-regulation [a student monitoring and evaluating their actions against an experienced professional], self-reflection and self-efficacy [increase in confidence when achieving outcomes] were highlighted. (Bandura, 1986). As a further example, participants were also introduced to a sociocultural perspective to demonstrate how context can influence learning and knowledge development (Lave & Wenger, 1991; Eraut, 2004a; Billett, 2002; 2005). Facilitation of the sessions was undertaken as part of my university role with funding secured by the DHB to enable this to happen. This is a promising beginning for future developments to enhance teaching and supervision. The opportunity provided some initial support for MRTs' teaching and supervision, with the key intention of stimulating an interest in teaching. The sessions were evaluated by the participants and the feedback was very positive.

## **Introducing a Learning Partnership Framework to Support Teaching and Learning**

Discussions are currently taking place with the team leader at the DHB to further develop support for the facilitation of students' learning. It is intended that a part of the framework developed in this study will be implemented at the commencement of 2014. I am working with the MRT team leader to enable the introduction of a learning partnership framework which will comprise some key facets of the learning partnership arrangement implemented in this study. These include formation of student and MRT pairs; protected scheduled time for students and MRTs to learn and work together; completion of a background questionnaire to enable the MRT and student in partnership to familiarise themselves with their partner; implementation of the supervisory framework; and setting up an arrangement for online communication for MRTs and students in partnership.

Due to a change in programme delivery in 2014, Year One students will not commence in a clinical learning setting until the second semester (July 2014). Hence, the team leader has suggested that a mentoring framework could be introduced with Year Two students (16) in semester one (February, 2014) and Year One students (16) in semester two (July, 2014). At a time that the introduction of the framework for Year One and Two students has been effectively established, consideration will then be given to final year students. If mentors (MRT partners) are agreeable, it is possible that Year One and Year Two students could continue with their designated mentors. However, ways of managing staff changes (resignation or changing role) will need to be carefully considered to ensure that replacement mentors are available.

I will implement the framework in conjunction with the team leader. Further, I will provide initial support for mentors through initial orientation sessions (followed by ongoing sessions) and online communication. Social learning theories will be emphasised and promoted to ensure MRTs have an understanding of how these theories underpin students' learning in the clinical setting (Bandura, 1986; Lave & Wenger, 1991; Billett, 2002, 2005; Rogoff, 1990). The development of a cognitive apprenticeship (Collins, Brown & Newman, 1989) arrangement which emerged during this study, will be encouraged. Ongoing support sessions for the mentors will emphasise the importance of fostering reflection, the development of

effective questioning techniques and critique of practice issues to assist students to develop a deeper understanding as they learn.

At a time when the mentoring arrangement is well established, two MRTs will be allocated to take over my role. I have made other clinical sites aware that a mentoring arrangement will be introduced into the DHB that the study was located and that once established I will work with team leaders at other clinical learning sites offering placements for medical imaging students. It is important that the delay is limited prior to the introduction of the scheme to other clinical sites so that students based at these sites do not feel they are disadvantaged.

I plan to work with the professional body (New Institute of Medical Radiation Technologists) to obtain continuing professional development (CPD) credit validation for the MRTs involved, to acknowledge their contribution.

### **Curriculum Revision**

In December 2012, I was invited to present the key findings of my study to the medical imaging team at the tertiary education provider in which I am employed on a part-time basis. The BHSc (MI) degree is about to undergo a major revision. The Head of Department and Programme Leader for the medical imaging programme associated with this study were keen for the team to be informed of the findings of my study prior to undertaking the revision of the undergraduate degree. Since the findings have some marked implications for curriculum development, it was a fitting time to offer an overview of the findings to the team. The findings of this study have influenced potential changes within the curriculum. For example, clinical assessment for the programme is undergoing a major review. I have been employed by the educational provider offering the medical imaging programme for an additional 0.2 full time equivalent appointment to explore ways to improve assessment for learning in the clinical setting. This will be an ongoing project and data will be collected to establish the effectiveness of the introduction of a new clinical assessment schedule in preparing students for practice.

## **Redistribution of Funding**

Discussions are currently taking place between the education provider delivering the medical imaging programme and clinical learning sites in relation to the distribution of funding for clinical tuition. The findings of this study have influenced this potential change. It is most likely that a significant proportion of the funding will be redistributed to the clinical learning sites and invested into MRTs to recognise their role in teaching and supervision. Therefore, it is likely clinical tutors will be employed by the clinical learning site, rather than the education provider. It will be necessary for the education provider to transfer funds to assist to support the tutors' role. In addition, it will be important that an individual is appointed to manage the overall process of education at a clinical learning site. This may be a joint appointment between both sites and the individual could be given the title of 'Clinical Educator' (or similar). He/she will be responsible for the process of supervision and teaching to ensure that MRTs have adequate support to assist them with their teaching, and to ensure links between the academic and clinical settings.

## **Reflections on Being a Change Agent**

For a change to occur, that is, the introduction of a learning partnership framework, it was critical that I developed robust, open, trusting relationships. Forsyth (2012) points out that a change agent needs to be motivated and take responsibility for the change. Central to action research is the involvement of participants to foster change. However, careful facilitation of the process was required by me as the researcher to provide guidance and direction for the participant group. I arranged meetings with the participants, facilitated discussion, kept the group on track, and developed the online platform (with contributions from participants). The involvement of committed participants enabled the group to work toward making a key change in teaching and supervision for medical imaging students. However, I was well aware that I was the driver and the group was dependent on me as the researcher to progress the development. The group raised ideas and suggestions early on but they lent on me to make decisions about how we would progress. I assumed it was because they perceived that I had the most experience in education within the group. Forsyth

(p. 33) suggests that a change agent should feel that they have “appropriate responsibility and authority to affect change”

It was important I kept in mind that the participants relied on me in the decision-making process. I needed to be sure that decisions were not biased by my views, perceptions or vision of how the development should have proceeded as the initiative was ‘for’ the participants. At the action research meetings where most of the decisions were made I asked questions to ensure participants had the opportunity to voice their views or seek clarification when necessary.

Effective communication was central in my role as researcher/change agent. At the first meeting with the participants in *Phase Two* of the study I clearly articulated the need for change. It was vital the participants understood the call for change as the group and I then needed to think about designing an initiative to foster the change. Communication was central to the planning, implementation, and evaluation of the learning partnership. Dialogue occurred during the action research meetings. Email was utilised when I needed to pass on additional information or if the other participants in the research group sought clarification. As the facilitator of the sessions, I embraced openness in the discussions. When both students and MRTs attended action research meetings together I was cognisant of the potential power differential between the students, and the MRTs and me. I endeavoured to facilitate these sessions so that the students felt comfortable about offering their views and perspectives. It was evident that the MRTs in the group encouraged the students to speak and would frequently direct questions to them. The group size was appropriate to stimulate and engage in constructive discussion.

As the researcher, other drivers that fostered change were passion and energy, proximity to the participants and the reward of satisfaction as each stage of the development progressed. I was clearly passionate about this study. In 1999, for my Master’s thesis I explored the notion of the meaning of supervision and learning for student MRTs and their supervisors. I have relished the opportunity to build on key recommendations from my previous study. My enthusiasm and energy has been stimulated by instigating an initiative that has made a difference



to the support for MRTs' teaching and students' learning. My closeness to the participants has also enabled a change to occur with limited resistance. Although I knew the students in the group, I did not know the MRTs. I had met them previously but had not worked with them. We developed a bond very early on in the study which supported open discussion. There was a sense of satisfaction as each stage of the learning partnership was developed and implemented. The enthusiasm of the participants when convened for action research meetings was an additional reward for me.

However, I am mindful of the limits of change. As a researcher although I have instigated change I am aware that I need to continue to foster relationships to gain buy in from all stakeholders to ensure ongoing change. During this study, my influence came from my developing expertise rather than any formal role that mandated an agenda for change. The way forward was therefore to continue in relationship with stakeholders, suggesting, encouraging, facilitating and enthusiastically taking up whatever opportunities were presented.

### **Considerations for Providers of Medical Imaging Education**

The nature of an action research study such as this study is contextual. It is influenced by funding, curricula, stakeholder relations and requirements of graduates. However, this study has identified some key features that are important considerations for providers of medical imaging education involved in developing or reviewing medical imaging programmes.

Firstly, it can no longer be expected by the education provider and clinical learning sites that MRTs will learn how to teach and supervise through experience. To ensure that students engage in quality learning experiences with effective teaching, MRTs need support and guidance.

Secondly, there is a need to carefully consider relationships between the education provider and sites that offer clinical placements. Relationships can be fostered and sustained by ensuring stakeholders (including students) are involved in curricular development. Further, the inclusion of MRTs in a learning partnership

arrangement may also enhance relationships between the clinical and academic settings.

Thirdly, consideration needs to be given to the distribution of funding (which is nearly always constrained) to ensure the most effective use of funding. It is important that MRTs are acknowledged and recognised for their teaching. MRTs are an important asset in relation to teaching and supervision of medical imaging students therefore, investment in this group is vital.

Fourthly, if there is an opportunity for students to upload images on a virtual learning platform to enable critique with an MRT's input, this could be a valuable way for students to develop robust decision-making skills. The potential to develop these skills is at times impeded by the busy clinical environments in which students learn. It is important that the time required of MRTs to respond to students' critique is considered within the redistribution of funding outlined above.

An alternative arrangement could be to separate the online component of the learning partnership from the MRT relationship and create another partnership with an MRT 'teacher' employed specifically for that purpose. This study revealed the value for students of getting feedback on their images from an experienced practitioner. That person need not necessarily be someone who was directly involved in the radiographic examinations with a student. Students require a trusted person to help them 'see'. If a person was employed to take on this role, it could be expanded across all years of the degree programme. If this role was a specific part of an individual's job description, they would have the time and commitment to offer quality feedback. It is unlikely that one MRT would be in this position full-time, however, proportions of a full-time appointment could be allocated to a number of MRTs for this important role.

Fifthly, the introduction of a learning partnership framework in this study ran effortlessly, albeit with a small group of enthusiastic participants. The logistics of translating this initiative to a larger group will be challenging. A marked amount of planning and negotiation with management within the radiology department will

need to occur. In view of planning and scheduling, it would be ambitious and naive to think the entire MRT staff in a radiology department could be transformed into a partnership arrangement. Further, not all MRTs may be suitable or want to be a part of this arrangement. The pressures related to constrained resources may mean that MRTs would be concerned about needing to take on additional responsibility. However, this study has allowed a group of people to have a shared vision and their involvement in the initiative has been empowering for them. If this type of initiative is introduced in the future, it may be appropriate to instigate a gradual implementation with smaller groups to limit any potential impact on a radiology department.

Improving the quality of clinical education for medical imaging students is an important consideration for educators. Although, this study is context-specific the considerations mentioned above may be useful for educators in medical imaging who are involved in curriculum revision to improve the quality of the learning experience for students.

## **Recommendations for Further Research**

This study opens up several areas for research in the future, both within medical imaging and other health professional groups. The issue of assessing students in a manner that encourages and supports their development toward being competent, work-ready graduates is a key challenge that has arisen from this study. Further action research in piloting new assessment strategies with MRT staff, clinical tutors and students would be of value.

MRTs have found it valuable to be involved in the learning partnership for their own professional development. The short course in teaching and supervision that I developed in my university role as an outcome of this research could be further expanded, increasing its depth and breadth. It could then be introduced and evaluated to establish its impact in relation to MRTs' role in teaching and supervision.

*Phase Two* of this study comprised four partnerships. If this arrangement is introduced with an increased number of partnerships, it would be worthwhile to establish its effectiveness on a larger scale.

The study identified the facilitators and barriers of students using a PDA to collect evidence of their clinical learning. The barriers to the introduction of this device were related mostly to its design features and functionality. A study to evaluate the impact on learning following the introduction of a contemporary portable device with a larger screen size (for example, a tablet) may be beneficial. The potential of technology continues to offer previously unimagined opportunities. There is a need for ongoing research to ensure opportunities are seized, but also evaluated for impact and cost effectiveness.

It is assumed by educators that placing students in particular speciality areas at designated times throughout the three-year medical imaging degree programme, will allow them to gain experience to meet competency requirements. This study focussed on students' learning in a general radiology area. However, little is known about students' experiences of learning in the specialty areas within (and associated with) a radiology department (for example, the emergency, intensive care or CT departments). It would be useful to ascertain the types of learning opportunities offered and teaching/learning encounters that occur in different areas within a radiology department. In addition to the findings being useful for those facilitating clinical education, they may also be beneficial to management within a radiology department, as students' experiences of learning may influence future recruitment to speciality areas.

## **Originality and Research Contributions**

Prior to this study, an understanding of the learning experiences for medical imaging students and how those experiences are supported was limited. Raising the awareness for stakeholders of students' experiences of learning and support for those experiences will be valuable for improving medical imaging education. The real value of this project is that ideas were put into practice. Pitfalls were recognised and adjustments made where possible. The significant difference in the quality of the students' learning experience is compelling; there has to be a way to ensure all students have such an opportunity to learn in a more formal partnership arrangement alongside the practitioners who will become their professional colleagues. This study is directly related to MRT students, however, when I have

presented to audiences of other health professionals there have been indications that they related to the challenges and valued the insights.

## **Value of Action Research**

Action research enabled stakeholders to be placed in a prime position to contribute to improving the facilitation of learning for medical imaging students. Employing an action research approach was fundamental to enable involvement of the key stakeholders. I maintained that it was essential that students and MRTs were able to participate in the development of an initiative to support their learning and teaching, as it needed to 'work for them'. In addition, in *Phase Two* of the study, I unquestionably needed 'buy in' from the clinical staff, as I was entering a world of teaching and learning in a clinical setting that I was not a part of. I felt confident that the clinical staff, tutors and students would be more responsive and enthusiastic about the initiative if they were part of the development. My assumption was supported, as the participants were eager to be involved. They attended meetings, achieved the objectives they had set between meetings and invested time (sometimes outside their usual working day) in the design and implementation of the initiative. Importantly, the participants' voice has been heard and their offerings of ideas, insights, views, perceptions and concerns have been integral to this study.

## **Limitations**

### **Participants**

As the researcher, I was known to the student participants within this study. I had taught the Year Two students (focus group participants and participants for observation in the clinical setting and classroom) in the previous year. In addition, I had taught the Year One students who were part of the learning partnership initiative in Semester One of the same year the partnerships commenced. Although I had previously taught both of these groups, I was not involved in teaching them for the duration of the study. I emphasised to the student participants prior to the study that sharing and contributing their experiences would have no effect on them as students in the programme; however, their stories may have been guarded as they knew me as their 'teacher'. On the other hand,

because they did know me, they may have been at ease sharing their experiences, ideas and perceptions.

The student and MRT participants may have volunteered to be a part of this study because they were motivated, enthusiastic individuals with an interest in teaching and learning. Although more than 40 participants were involved in this study, I may not have heard the voice of students, MRTs and clinical tutors with different but important experiences of teaching and learning. However, there were particular aspects related to the participant groups that made me feel confident about reducing potential bias associated with self-selection. In *Phase One* of the study I recruited Year Two students for a focus group based on their clinical learning site. That is, it was important that the focus group comprised students from different clinical sites to capture experiences of learning from a variety of contexts. I emphasised to the Year Two cohort that the participant group needed to comprise students from a variety of clinical placements. This may have encouraged students to participate as they may have seen it as an opportunity for their voice to be heard in relation to learning at their particular site. This approach to selection may have potentially reduced bias as although participation was voluntary the most enthusiastic or motivated students may not have been included in the group. Further, some students identified that they wished to be a part of this arrangement as they were confronted by challenges within their clinical learning. For me as the researcher, this was reassuring as when I called for volunteer participants it was unlikely that only students who were motivated and progressing without difficulty would comprise the participant group.

In addition, although MRTs' participation in a focus group in *Phase One* of the study was voluntary, the make-up of the group was determined by the availability of MRTs at the clinical site on the day the focus group was to be conducted. Therefore, this may have reduced bias associated with self-selection.

In addition, I am mindful of that I have drawn on the experiences of two clinical tutors only. However, my experience of working for more than twenty years in this field resonates with what they are saying.

### **Context Specific**

This study explores the experiences of MRTs, clinical tutors and students. Hence, it has examined the experiences and absorbed the contributions of a context defined by time and location. Although this research is related to a unique context and offers understandings of the stakeholders involved in medical imaging education associated with one education provider in New Zealand, it could be valuable for other medical imaging and health professional education programmes comprising academic and clinical components.

### **Learning Style Questionnaires**

The intention of participants completing learning style questionnaires at the commencement of the study was to attempt to align MRTs and students in partnerships with a similar learning style. Although all participants completed the questionnaires, they decided that it was unnecessary to be aligned with a partner with a similar learning style, as it would be impractical to instigate this with a larger group. Participants were keen to find out their individual learning styles, however, it was for their interest only as these data were not used for its initial purpose. This outcome is a characteristic of action research in which actions taken are not always effective. Nonetheless, the data collected was beneficial the student and MRT in partnership to be aware each other's learning preference/s. For future implementation of the learning partnership it may be beneficial to include the VARK questionnaire only. Participants found the VARK questionnaire to be more beneficial than the Paragon Learning Inventory as the results were perceived by the participants to be 'more practical' as they were easier to interpret.

### **Support Focussed on the Students**

My vested interest in the development of a learning partnership was to provide greater support for students' learning in the clinical setting. The development was aimed to also support the MRTs in their teaching; however, support in the partnership focussed mostly on the students. Nevertheless, MRTs did benefit from being involved. They revitalised their interest in teaching and learning, were acknowledged by the students for their teaching contributions and enhanced their learning.

## **Concluding Statement**

Learning for MRT students occurs in a frequently busy, unpredictable context. Therefore, it is imperative so that educators have an in-depth understanding of students' experiences to ensure those experiences are well supported. Within this study, it has been most evident that the learning partnership, which provided a new way to support teaching and learning in the clinical setting, made a notable difference to the students' learning experience. The supportive partnership promoted the development of confidence and competence, gave the students a sense of belonging and encouraged them to explore and question aspects of practice to progress their learning. Further, the partnership supported the enhancement of MRTs' practice.

MRTs who perform most of the teaching for medical imaging students are pressured not only by the need to keep up-to-date with the advances in technology but also by other demands such as budget constraints and increased workloads. Hence, it is crucial that the MRT's role in the facilitation of student learning is recognised and that they are supported in their role. If this does not occur, they may lose interest or make their teaching role a low priority due to the burden of other pressures affecting them. The recognition and acknowledgement of the MRT's role in the learning partnership was clearly satisfying for them. However, it needs to be acknowledged that not all MRTs will be suited to this role, and others may choose not to take it on. Further, by being key participants in this action research study, MRTs have revealed aspects of practice which they find to be constraining. Prior to this study, they had not had the opportunity to explore with others 'why things are as they are'. To enable MRTs to be supported and recognised for their contributions to teaching and supervision for medical imaging students, redistribution of funding for clinical education needs to occur.

Amendments to the learning partnership arrangement following its implementation demonstrated that students and MRTs adapted to ensure that it worked for them. They had no hesitation to change or delete processes that were not working satisfactorily. It is imperative that education providers stay attuned to 'what works' rather than adhering to pre-formed expectations and processes that students are required to work through, regardless of their usefulness.



I propose that a thorough deliberation is given to a future, permanent implementation of a learning partnership arrangement for novice students. The arrangement is noticeably beneficial for the stakeholders: students, MRTs, clinical tutors and the education provider, and ultimately the profession. The power of a learning partnership arrangement will likely cultivate collegiality in the clinical learning setting, and between the clinical and academic settings. The findings of this study challenge the education providers to work with clinical sites to implement learning partnership arrangements to support student learning.

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## **APPENDIX A - ETHICAL PROCEDURES**

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**Ethical Approval**

**Participant Information**

**Consent Forms**

14 December 2007

Ms Andrea Thompson  
7 Irirangi Rd  
One Tree Hill  
Auckland

Dear Andrea

NTX/07/134/EXP

**The curriculum as lived: the teaching/learning experiences  
towards preparing students for their role as medical radiation  
technologists.**

Principal Investigator: Ms Andrea Thompson

Thank you for your application received 7 December 2007. The above study has been given ethical approval by the Deputy Chairperson of the **Northern X Regional Ethics Committee** under delegated authority.

**Approved Documents**

- Protocol (undated but received 7/12/07)
- Patient Information Sheet/Consent Form (PIS/Cons undated but received 7/12/07)

Please insert a footer with version number and date on the Information Sheet and Consent Form.

**Accreditation**

The Committee involved in the approval of this study is accredited by the Health Research Council and is constituted and operates in accordance with the Operational Standard for Ethics Committees, April 2006.

**Progress Reports**

The study is approved until 14 December 2008. However, the Committee will review the approved application annually and notify the Principal Investigator if it withdraws approval. It is the Principal Investigator's responsibility to forward a progress report covering all sites prior to ethical review of the project on **14 December 2008**. The report form is available on <http://www.newhealth.govt.nz/ethicscommittees> (progress reports). Please note that failure to provide a progress report may result in the withdrawal of ethical approval.

A final report is also required at the conclusion of the study.

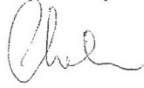
**Amendments**

It is also a condition of approval that the Committee is advised of any adverse events, if the study does not commence, or the study is altered in any way, including all documentation eg advertisements, letters to prospective participants.

**Please quote the above ethics committee reference number in all correspondence.**

It should be noted that Ethics Committee approval does not imply any resource commitment or administrative facilitation by any healthcare provider within whose facility the research is to be carried out. Where applicable, authority for this must be obtained separately from the appropriate manager within the organisation.

Yours sincerely

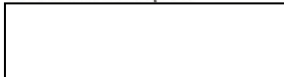
A handwritten signature in black ink, appearing to read 'Cheh', written in a cursive style.

**Cheh Chua(Ms)**  
**Assistant Administrator**  
**Northern X Regional Ethics Committee**

cc: ADHB Research Office A+4000

22 January 2009

Ms Andrea Thompson



Dear Andrea

**Title: The teaching-learning nexus: supporting and preparing students for their role as medical radiation technologists.**

**Investigator: Ms Andrea Thompson Supervisor: Dr Elizabeth Smythe**

**Ethics Ref: NTY/09/04/EXP**

The above study has been given ethical approval by the **Deputy Chairperson** of the Northern Y Regional Ethics Committee.

**Approved Documents**

Advert.

Information sheet for students

Information sheet for medical radiation technologists.

Consent form.

Potential questions list.

**Progress Reports**

The study is approved until **30 December 2010**. The Chairperson will review the approved application annually and notify the Investigator if they withdraw approval. It is the Investigator's responsibility to forward a progress report prior to ethical review of the project in **22 January 2010**. The report form is available on <http://www.newhealth.govt.nz/ethicscommittees>. Please note that failure to provide a progress report may result in the withdrawal of ethical approval. A final report is also required at the conclusion of the study.

**Amendments**

It is also a condition of approval that the Committee is advised if the study does not commence, or is altered in any way, including all documentation eg advertisements, letters to prospective participants.

**Please quote the above ethics committee reference number in all correspondence.**

**It should be noted that Ethics Committee approval does not imply any resource commitment or administrative facilitation by any healthcare provider within whose facility the research is to be carried out. The organisation may specify their own processes regarding notification or approval.**

Yours sincerely



 **Amrita Kuruvilla**  
Northern Y Ethics Committee Administrator

Email: [amrita\\_kuruvilla@moh.govt.nz](mailto:amrita_kuruvilla@moh.govt.nz)



## MEMORANDUM

### Auckland University of Technology Ethics Committee (AUTEC)

To: Liz Smythe  
From: **Madeline Banda** Executive Secretary, AUTEC  
Date: 19 December 2007  
Subject: Ethics Application Number 07/223 **The curriculum as lived: the teaching/ learning experiences towards preparing students for their role as medical radiation technologists.**

Dear Liz

Thank you for providing written evidence as requested. I am pleased to advise that it satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC) at their meeting on 10 December 2007 and that as the Executive Secretary of AUTEC I have approved your ethics application. This delegated approval is made in accordance with section 5.3.2.3 of AUTEC's *Applying for Ethics Approval: Guidelines and Procedures* and is subject to endorsement at AUTEC's meeting on 21 January 2008.

Your ethics application is approved for a period of three years until 19 December 2010.

I advise that as part of the ethics approval process, you are required to submit to AUTEC the following:

- A brief annual progress report indicating compliance with the ethical approval given using form EA2, which is available online through <http://www.aut.ac.nz/about/ethics>, including when necessary a request for extension of the approval one month prior to its expiry on 19 December 2010;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/about/ethics>. This report is to be submitted either when the approval expires on 19 December 2010 or on completion of the project, whichever comes sooner;

It is also a condition of approval that AUTEC is notified of any adverse events or if the research does not commence and that AUTEC approval is sought for any alteration to the research, including any alteration of or addition to the participant documents involved.

You are reminded that, as applicant, you are responsible for ensuring that any research undertaken under this approval is carried out within the parameters approved for your application. Any change to the research outside the parameters of this approval must be submitted to AUTEC for approval before that change is implemented.

Please note that AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to make the arrangements necessary to obtain this.

To enable us to provide you with efficient service, we ask that you use the application number and study title in all written and verbal correspondence with us. Should you have any further enquiries regarding this matter, you are welcome to contact Charles Grinter, Ethics Coordinator, by email at [charles.grinter@aut.ac.nz](mailto:charles.grinter@aut.ac.nz) or by telephone on 921 9999 at extension 8860.

On behalf of the Committee and myself, I wish you success with your research and look forward to reading about it in your reports.

Yours sincerely

Madeline Banda  
Executive Secretary  
Auckland University of Technology Ethics Committee

Cc: Andrea Thompson [athompson@unitec.ac.nz](mailto:athompson@unitec.ac.nz)

From the desk of ...  
Madeline Banda  
Executive Secretary  
AUTEC

Private Bag 92006, Auckland 1142  
New Zealand  
E-mail: [madeline.banda@aut.ac.nz](mailto:madeline.banda@aut.ac.nz)

Tel: 64 9 921 9999  
ext 8044  
Fax: 64 9 921 9925  
page 1 of 1





## MEMORANDUM

### Auckland University of Technology Ethics Committee (AUTEC)

To: Elizabeth Smythe  
From: **Madeline Banda** Executive Secretary, AUTEC  
Date: 20 March 2009  
Subject: Ethics Application Number 09/36 **The teaching-learning nexus: supporting and preparing students for their role as medical radiation technologists.**

Dear Elizabeth

I am pleased to advise that the Auckland University of Technology Ethics Committee (AUTEC) approved your ethics application at their meeting on 9 March 2009. Your application is now approved for a period of three years until 9 March 2012.

AUTEC recommends that the Information Sheet would be improved if it also contained advice about how much time participants would be required to give to the study.

I advise that as part of the ethics approval process, you are required to submit to AUTEC the following:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/about/ethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 9 March 2012;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/about/ethics>. This report is to be submitted either when the approval expires on 9 March 2012 or on completion of the project, whichever comes sooner;

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are reminded that, as applicant, you are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

Please note that AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to make the arrangements necessary to obtain this. Also, if your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply within that jurisdiction.

When communicating with us about this application, we ask that you use the application number and study title to enable us to provide you with prompt service. Should you have any further enquiries regarding this matter, you are welcome to contact Charles Grinter, Ethics Coordinator, by email at [charles.grinter@aut.ac.nz](mailto:charles.grinter@aut.ac.nz) or by telephone on 921 9999 at extension 8860.

On behalf of the AUTEC and myself, I wish you success with your research and look forward to reading about it in your reports.

Yours sincerely

Madeline Banda  
Executive Secretary  
Auckland University of Technology Ethics Committee

Cc: Andrea Thompson [athompson@unitec.ac.nz](mailto:athompson@unitec.ac.nz)

From the desk of ...  
Madeline Banda  
Executive Secretary

Private Bag 92006, Auckland 1142  
New Zealand  
E-mail: [madeline.banda@aut.ac.nz](mailto:madeline.banda@aut.ac.nz)

Tel: 64 9 921 9999  
ext 8044  
Fax: 64 9 921 9925

**Service:** DHB Research Office  
Office: Level 8, Bldg. 13, GCC Postal: PB 92189 Auckland  
Phone: 630-9943  
Ext: 4085, 4077 and 3122  
Fax: 630 - 9799 or 4999

8 January 2008

Ms Andrea Thompson  
7 Irirangi Road  
One Tree Hill  
Auckland

Dear Ms Thompson

**RE: Research project A+4000 (Ethics #NTX/07/134/EXP) The Curriculum as Lived: the Teaching/Learning Experiences towards Preparing Students for Their Role as Medical Radiation Technologists**

The Research Office under delegated authority from the Research Review Committee wishes to thank you for the opportunity to review your study and has given approval for your research project.

This approval is given based on the materials submitted for the DHB-RRC via the Research Office. It is **essential** that you notify the Research Office immediately should there be changes or amendments to the study, and these changes must be highlighted on your documents, e.g. changes to the protocol, study finance, legal documents and/or change of study status. Continued DHB approval for research is dependent on the Research Office receiving all new documentation.

Please send a copy of your final report to the Research Office (Level 8, Bldg 13, Greenlane Clinical Centre, PB 92189, Auckland) on completion of the project.  
If you have any questions please do not hesitate to contact the Research Office.

Yours sincerely  
**On behalf of the Research Review Committee**  
**Gayl Humphrey**  
**Manager, Research Office**  
cc: Dr Alan List, Clinical Director, Radiology  
Kathryn Bush, Team Leader, Radiology

**This is the DHB Approval for Research. Please keep in your Trial Master File.**



Research Office  
Level 14, Support Bldg  
Auckland City Hospital  
PB 92024  
Grafton, Auckland  
Phone: 64 9 307 4949 Extn. 23854  
Email: [SamanthaJ@adhb.govt.nz](mailto:SamanthaJ@adhb.govt.nz)  
Website: [www.adhb.govt.nz/ResearchOffice](http://www.adhb.govt.nz/ResearchOffice)

25 August 2009

Ms Andrea Thompson  
7 Irirangi Road  
One Tree Hill  
Auckland

**This is the ADHB Management Approval.  
Please keep in your Trial Master File.**

Dear Andrea

**RE: Research project A+4312 (Ethics # NTY/09/04/EXP) – The Teaching-learning Nexus: Supporting and Preparing Students for Their Role as Medical Radiation Technologists**

The Research Office under delegated authority from the Research Review Committee would like to thank you for the opportunity to review your study and has given approval for your research project.

This approval is given based on the materials submitted for the ADHB-RRC via the Research Office. It is **essential** that you notify the Research Office immediately should there be changes or amendments to the study, and these changes must be highlighted on your documents, e.g. changes to the protocol, study finance, legal documents and/or change of study status. Continued Auckland DHB approval for research is dependant on the Research Office receiving all new documentation.

Please send a copy of your final report to the Research Office (Level 14, Support Bldg, Auckland City Hospital, PB 92024, Auckland) on completion of the project.

If you have any questions please do not hesitate to contact the Research Office.

Yours sincerely

On behalf of  
the ADHB Research Review Committee  
Dr Samantha Jones  
Manager, Research Office  
Auckland DHB

c.c. Alan List, Leigh Anderson



## **PARTICIPANT INFORMATION SHEET FOR STUDENT MEDICAL RADIATION TECHNOLOGISTS (*FOCUS GROUP*)**

My name is Andrea Thompson. I am a student at Auckland University of Technology, enrolled in a PhD in the Faculty of Health and Environmental Sciences. I have chosen this area for research because of my involvement in medical imaging education.

### ***Project title***

The curriculum as lived: the teaching/learning experiences towards preparing students for their role as medical radiation technologists.

### ***Invitation to participate***

You are invited to participate in my research and I would appreciate any assistance you can provide. I would like to facilitate a focus group comprising six to eight year two medical imaging students. A focus group is undertaken so that participants can discuss experiences, feelings, perceptions and attitudes in relation to the focus of the research, in this case, the teaching/learning experiences for medical imaging students. This will involve approximately 60-90 minutes of your time outside your normal class or clinical learning time. While I appreciate your assistance you can offer me, you are under no obligation to participate. You can withdraw from the study at any time up to 1 March 2009.

### ***What is the purpose of the study?***

The purpose of this study is to understand how undergraduate medical imaging students engage in both the academic and clinical experiences that are provided for them and how these experiences shape the development of their professional capacities. It is anticipated that the findings of this study will assist to foster and improve teaching and learning processes for undergraduate medical imaging students. Following completion of my PhD I intend to both publish aspects of the study in relevant journals and present at conferences.

### ***How was I chosen to be asked to participate in the study?***

Year two medical imaging student participants will be selected as you have more experience of teaching and learning processes than students year one students. Year three students would also be appropriate for this study, however, their learning is likely to be more self-directed than year two students therefore, they will be less dependent on teaching so the processes may not be so evident. Your contribution to this study is very valuable; therefore, I will be honouring the input of all participants.

### ***What happens in the study?***

During the focus group you will be encouraged to share your experiences of teaching and learning as a student enrolled in the medical imaging programme. The duration of the discussion will be between approximately 60-90 minutes and I hope to be able to audio tape this discussion. I will forward the transcript of the focus group discussion to you so that you can check that it accurately reflects the discussion that occurred. I will definitely not be assessing your practice. If you would like a précis of the outcomes of the study, I will forward one to you.

### ***What are the discomforts and risks?***

Due to the fact that I am a lecturer within the medical imaging programme (although I am not currently teaching you), we know each other and therefore you may feel uncomfortable about sharing your experiences. The information you provide will only be used for the purpose of the study. However, it must be emphasised that no student will be involved in an experience in the research that is detrimental to their achievement in the programme.

***How will these discomforts and risks be alleviated?***

The information you provide will only be used for the purpose of the study. It must be emphasised that no student will be involved in an experience in the research that is detrimental to their achievement in the programme. If you are adversely affected by being a participant in this study you will be able to access the \_\_\_\_\_ Counselling Centre for support.

***What are the benefits?***

It is likely that your involvement as a result of sharing your experiences will contribute to fostering and improving teaching and learning processes for medical imaging students.

***How is my privacy protected?***

I wish to audio tape this discussion. This will be done with your consent and could be turned off at any time during the discussion. All information will remain confidential. Although it is unlikely that you will be identified in the study; you could be, for example, if you discuss a unique learning approach or strategy that you employ. If this occurs I will ensure to check with you that you agree to information being included which could potentially identify you.

***Costs to the participants***

The potential cost to the participant is time, that is, 60-90 minutes of your time outside your normal class and clinical learning time.

***Participant concerns***

Any concerns regarding the nature of this project should be notified in the first instance to the project supervisor

***Principal Supervisor***

Dr Elizabeth Smythe  
Associate Professor  
Faculty of Health & Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: liz.smythe@aut.ac.nz

***Associate Supervisor***

Dr Marion Jones  
Associate Dean (Postgraduate)  
Faculty of Health and Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: marion.jones@aut.ac.nz

Any concerns regarding the conduct of the research should be notified to *the Executive Secretary, AUTECH, Madeline Banda, madeline.banda@aut.ac.nz, 921 9999 ext 8044.*

Thank you very much for your time and assistance in making this study possible. If you are interested in being a participant in this study please contact me by email or phone me.

***Contact Details***

Andrea Thompson  
Email: andreathompson@xtra.co.nz  
Phone: 8154321 extn 8413

AUTECH Reference Number: 07/223



## **PARTICIPANT INFORMATION SHEET FOR STUDENT MEDICAL RADIATION TECHNOLOGISTS (*OBSERVATION IN THE CLASSROOM*)**

My name is Andrea Thompson. I am a student at Auckland University of Technology, enrolled in a PhD in the Faculty of Health and Environmental Sciences. I have chosen this area for research because of my involvement in medical imaging education.

### ***Project title***

The curriculum as lived: the teaching/learning experiences towards preparing students for their role as medical radiation technologists.

### ***Invitation to participate.***

You are invited to participate in my research and I would appreciate any assistance you can provide. I would like to observe student/lecturers encounters within the academic setting to provide information in relation to the focus of the research, in this case, the teaching/learning experiences for medical imaging students in preparation for their role as medical radiation technologists. This will involve observation of a one-hour classroom session. While I appreciate your assistance you can offer me, you are under no obligation to participate. You can withdraw from the study at any time up to 1 March 2009.

### ***What is the purpose of the study?***

The purpose of this study is to understand how undergraduate medical imaging students engage in both the academic and clinical experiences that are provided for them and how these experiences shape the development of their professional capacities. It is anticipated that the findings of this study will assist to foster and improve teaching and learning processes for undergraduate medical imaging students. Following completion of my PhD I intend to both publish parts of the study in relevant journals and present at conferences.

### ***How was I chosen to be asked to participate in the study?***

Since the central focus for this study is teaching and learning experiences for undergraduate medical imaging students, it is most appropriate to observe teaching and learning encounters to assist me to understand how teaching and learning occurs within a classroom setting. Your contribution to this study is very valuable; therefore, I will be honouring the input of all participants.

### ***What happens in the study?***

I intend to observe a one 60 minute classroom session to observe teaching and learning encounters. During the time that I am observing I will be taking notes related to my observations. Direct observation will allow me as the researcher to capture a variety of interactions that occur between the lecturer and students and therefore enhance my understanding of the learning context. If you would like a précis of the outcomes of the study, I will forward one to you.

### ***What are the discomforts and risks?***

Due to the fact that I am a lecturer within the medical imaging programme (although I am not currently teaching you), we know each other and therefore you may feel uncomfortable about being observed.

***How will these discomforts and risks be alleviated?***

It must be emphasised that no student will be involved in an experience in the research that is detrimental to their achievement in the programme. The information you provide will only be used for the purpose of the study and I definitely will not be assessing you. If you are adversely affected by being a participant in this study you will be able to access the \_\_\_\_\_ Counselling Centre for support.

***What are the benefits?***

It is likely that the data collected from observation will contribute to the findings and consequently assist in fostering and improving teaching and learning processes for medical imaging students.

***How is my privacy protected?***

All information will remain confidential. Although it is unlikely that you will be identified in the study; you could be, for example, if you display a unique learning approach or strategy that you employ. If this occurs I will ensure to check with you that you agree to information being included which could potentially identify you.

***Costs to the participants***

No cost

***Participant concerns***

Any concerns regarding the nature of this project should be notified in the first instance to the project supervisor.

***Principal Supervisor***

Dr Elizabeth Smythe  
Associate Professor  
Faculty of Health & Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: liz.smythe@aut.ac.nz

***Associate Supervisor***

Dr Marion Jones  
Associate Dean (Postgraduate)  
Faculty of Health and Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: marion.jones@aut.ac.nz

Any concerns regarding the conduct of the research should be notified to *the Executive Secretary, AUTECH, Madeline Banda, madeline.banda@aut.ac.nz, 921 9999 ext 8044.*

Thank you very much for your time and assistance in making this study possible. If you are interested in being a participant in this study please contact me by email or phone me.

***Contact Details***

Andrea Thompson  
Email: andreathompson@xtra.co.nz  
Phone: 8154321 extn 8413

AUTECH Reference Number: 07/223



## **PARTICIPANT INFORMATION SHEET FOR STUDENT MEDICAL RADIATION TECHNOLOGISTS (OBSERVATION IN THE CLINICAL SETTING) .**

My name is Andrea Thompson. I am a student at Auckland University of Technology, enrolled in a PhD in the Faculty of Health and Environmental Sciences. I have chosen this area for research because of my involvement in medical imaging education.

### ***Project title***

The curriculum as lived: the teaching/learning experiences towards preparing students for their role as medical radiation technologists.

### ***Invitation to participate.***

You are invited to participate in my research and I would appreciate any assistance you can provide. I would like to observe student/practitioner partnerships within the clinical learning setting to provide information in relation to the focus of the research, in this case, the teaching/learning experiences for medical imaging students. This will involve approximately up to three half days of observation, that is, up to a total of nine hours. While I appreciate the assistance you can offer me, you are under no obligation to participate. You can withdraw from the study at any time up to 1 March 2009.

### ***What is the purpose of the study?***

The purpose of this study is to understand how undergraduate medical imaging students engage in both the academic and clinical experiences that are provided for them and how these experiences shape the development of their professional capacities. It is anticipated that the findings of this study will assist to foster and improve teaching and learning processes for undergraduate medical imaging students. Following completion of my PhD I intend to both publish aspects of the study in relevant journals and present at conferences.

### ***How was I chosen to be asked to participate in the study?***

Since the central focus for this study is teaching and learning experiences for undergraduate medical imaging students, it is appropriate to observe teaching and learning encounters within the clinical setting to assist me to understand how teaching and learning occurs in a relationship between a medical radiation technologist (MRT) and a student. Your contribution to this study is very valuable; therefore, I will be honouring the input of all participants.

### ***What happens in the study?***

I intend to spend up to three sessions with you and an MRT to observe teaching and learning encounters within this partnership. I will observe from a distance, however, if necessary I hope to be able to assist you with patient management activities such as transfer. During the time that I am observing I will be taking notes related to my observations. I may, if it is convenient, ask you questions between patient examinations. Direct observation will allow me as the researcher to capture a variety of interactions that occur between practitioners and students and therefore enhance my understanding of the learning context. It is important to note that I will not be assessing you. If you would like a précis of the outcomes of the study, I will forward one to you.

### ***What are the discomforts and risks?***

Due to the fact that I am a lecturer within the medical imaging programme (although I am not currently involved in teaching or assessing you), we know each other, therefore there may be some discomfort associated with being observed.



***How will these discomforts and risks be alleviated?***

It must be emphasised that no student will be involved in an experience in the research that is detrimental to their achievement in the programme. The information you provide will only be used for the purpose of the study and I definitely will not be assessing you. If you are adversely affected by being a participant in this study you will be able to access the \_\_\_\_\_ Counselling Centre for support.

***What are the benefits?***

It is likely that your involvement as a result of sharing your experiences will contribute to fostering and improving teaching and learning processes for medical imaging students.

***How is my privacy protected?***

All information will remain confidential. Although it is unlikely that you will be identified in the study; you could be, for example, if you display a unique learning approach or strategy. If this occurs I will ensure to check with you that you agree to information being included which could potentially identify you.

***Costs to the participants***

No cost.

***Participant concerns***

Any concerns regarding the nature of this project should be notified in the first instance to the project supervisor

***Principal Supervisor***

Dr Elizabeth Smythe  
Associate Professor  
Faculty of Health & Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: liz.smythe@aut.ac.nz

***Associate Supervisor***

Dr Marion Jones  
Associate Dean (Postgraduate)  
Faculty of Health and Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: marion.jones@aut.ac.nz

Any concerns regarding the conduct of the research should be notified to *the Executive Secretary, AUTEK, Madeline Banda, madeline.banda@aut.ac.nz, 921 9999 ext 8044.*

Thank you very much for your time and assistance in making this study possible. If you are interested in being a participant in this study please contact me by email or phone me.

***Contact Details***

Andrea Thompson  
Email: andreathompson@xtra.co.nz  
Phone: 8154321 extn 8413

AUTEK Reference Number: 07/223



## **PARTICIPANT INFORMATION SHEET FOR MEDICAL RADIATION TECHNOLOGISTS (FOCUS GROUP)**

### ***Date:***

My name is Andrea Thompson. I am a student at Auckland University of Technology, enrolled in a PhD in the Faculty of Health and Environmental Sciences. I have chosen this area for research because of my involvement in medical imaging education.

### ***Project title***

The curriculum as lived: the teaching/learning experiences towards preparing students for their role as medical radiation technologists.

### ***Invitation to participate.***

You are invited to participate in my research and I would appreciate any assistance you can provide. I would like to facilitate a focus group comprising six to eight medical radiation technologists (MRT). A focus group is undertaken so that participants can discuss experiences, feelings, perceptions and attitudes in relation to the focus of the research, in this case, the teaching/learning experiences for medical imaging students. This will involve approximately 60-90 minutes of your time outside your working hours. While I appreciate the assistance you can offer me, you are under no obligation to participate. You can withdraw from the study at any time up to 1 March 2009.

### ***What is the purpose of the study?***

The purpose of this study is to understand how undergraduate medical imaging students engage in both the academic and clinical experiences that are provided for them and how these experiences shape the development of their professional capacities. It is anticipated that the findings of this study will assist to foster and improve teaching and learning processes for undergraduate medical imaging students. Following completion of my PhD I intend to both publish aspects of the study in relevant journals and present at conferences.

### ***How was I chosen to be asked to participate in the study?***

Since the central focus for this study is teaching and learning experiences for undergraduate medical imaging students, it is appropriate to incorporate a discussion with MRT practitioners as part the data collection for this study to establish their perceptions of teaching and learning processes within the clinical setting. Your contribution to this study is very valuable; therefore, I will be honouring the input from all participants.

### ***What happens in the study?***

During the focus group you will be encouraged to share your experiences of teaching and learning as a MRT who assists to facilitate clinical learning for medical imaging students. The duration of the discussion will be between approximately 60-90 minutes outside your normal duties and I would like to audio tape this discussion. I will forward the transcript of the focus group discussion to you so that you can check that it accurately reflects the discussion that occurred. It must be emphasised that I will not be assessing supervision/teaching performance. I will forward the transcript of the focus group discussion to you so that you can check that it accurately reflects the discussion that occurred. I will definitely not be assessing your practice. If you would like a précis of the outcomes of the study, I will forward one to you.

***What are the discomforts and risks?***

There may be some discomfort associated with exposure of your supervision and teaching approaches. Further, if you are a less experienced practitioner you may feel more reluctant to share your views.

***How will these discomforts and risks be alleviated?***

It is entirely up to you how much or little you contribute to the discussion. It must be emphasised that I will not be assessing supervision/teaching performance. Further, you may withdraw your participation at any time during the discussion. If you are adversely affected by being a participant in this study you will be able to access the AUT Health and Counselling Centre for support.

***What are the benefits?***

It is likely that your involvement as a result of sharing your experiences will contribute to fostering and improving teaching and learning processes for medical imaging students.

***How is my privacy protected?***

I wish to audio tape this discussion. This will be done with your consent and could be turned off at any time during the discussion. All information will remain confidential. Although it is unlikely that you will be identified in the study; you could be, for example, if you discuss a unique teaching approach or strategy that you employ. If this occurs I will ensure to check with you that you agree to information being included which could potentially identify you.

***Costs to the participants***

The potential cost to the participant is time, that is, 60-90 minutes of your time outside your normal duties.

***Participant concerns***

Any concerns regarding the nature of this project should be notified in the first instance to the project supervisor

***Principal Supervisor***

Dr Elizabeth Smythe  
Associate Professor  
Faculty of Health & Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: liz.smythe@aut.ac.nz

***Associate Supervisor***

Dr Marion Jones  
Associate Dean (Postgraduate)  
Faculty of Health and Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email:marion.jones@aut.ac.nz

Any concerns regarding the conduct of the research should be notified to *the Executive Secretary, AUTEK, Madeline Banda, madeline.banda@aut.ac.nz, 921 9999 ext 8044.*

Thank you very much for your time and assistance in making this study possible. If you are interested in being a participant in this study please contact me by email or phone me.

***Contact Details***

Andrea Thompson  
Email: andreathompson@xtra.co.nz  
Phone: 8154321 extn 8413

AUTEK Reference Number: 07/223



## **PARTICIPANT INFORMATION SHEET FOR MEDICAL RADIATION TECHNOLOGISTS (INTERVIEW)**

My name is Andrea Thompson. I am a student at Auckland University of Technology, enrolled in a PhD in the Faculty of Health and Environmental Sciences. I have chosen this area for research because of my involvement in medical imaging education.

### ***Project title***

The curriculum as lived: the teaching/learning experiences towards preparing students for their role as medical radiation technologists.

### ***Invitation to participate.***

You are invited to participate in my research and I would appreciate any assistance you can provide. I would like to conduct an interview with you at some point soon after I have observed you and a student in the clinical setting to help me to understand experiences of teaching and learning towards preparing students for their role as medical radiation technologists. This will involve approximately 45 minutes of your time outside your normal work time. The interview will be conducted at a location and time that is convenient for you. While I appreciate your assistance you can offer me, you are under no obligation to participate. You can withdraw from the study at any time up to 1 March 2009.

### ***What is the purpose of the study?***

The purpose of this study is to understand how undergraduate medical imaging students engage in both the academic and clinical experiences that are provided for them and how these experiences shape the development of their professional capacities. It is anticipated that the findings of this study will assist to foster and improve teaching and learning processes for undergraduate medical imaging students. Following completion of my PhD I intend to both publish aspects of the study in relevant journals and present at conferences. If you would like a précis of the outcomes of the study, I will forward one to you

### ***How was I chosen to be asked to participate in the study?***

Since the central focus for this study is teaching and learning experiences for undergraduate medical imaging students, it is appropriate to interview MRT practitioners following observation of each student/MRT partnership as a part of the data collection for this study to establish their perceptions of teaching and learning processes within the clinical setting. Your contribution to this study is very valuable; therefore, I will be honouring the input from all participants.

### ***What happens in the study?***

During the interview you will be encouraged to share your experiences of teaching and supervising students. The duration of the interview will be approximately 45 minutes and I hope to be able to audio tape it. I will forward the transcript of the interview to you so that you can check that it accurately reflects the discussion that occurred. If you would like a précis of the outcomes of the study, I will forward one to you.

### ***What are the discomforts and risks?***

There may be some discomfort associated with exposure of your supervision and teaching approaches. Further, if you are a less experienced practitioner you may feel more reluctant to share your views.

***How will these discomforts and risks be alleviated?***

It is entirely up to you how much or little you contribute to the interview. It must be emphasised that I will not be assessing supervision/teaching performance. If you are adversely affected by being a participant in this study you will be able to access the AUT Health and Counseling Centre for support.

***What are the benefits?***

It is likely that your involvement as a result of sharing your experiences will contribute to fostering and improving teaching and learning processes for medical imaging students.

***How is my privacy protected?***

I wish to audio tape this interview. This will be done with your consent and could be turned off at any time during the discussion. You may withdraw yourself or any information provided for this study at any time prior to the completion of data collection without being disadvantaged in any way. All information will remain confidential. Although it is unlikely that you will be identified in the study; you could be, for example, if you discuss a unique teaching approach or strategy that you employ. If this occurs I will ensure to check with you that you agree to information being included which could potentially identify you.

***Costs to the participants***

The potential cost to the participant is time, that is, approximately 45 minutes of your time outside your normal class and clinical learning time.

***Participant concerns***

Any concerns regarding the nature of this project should be notified in the first instance to the project supervisor

***Principal Supervisor***

Dr Elizabeth Smythe  
Associate Professor  
Faculty of Health & Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: liz.smythe@aut.ac.nz

***Associate Supervisor***

Dr Marion Jones  
Associate Dean (Postgraduate)  
Faculty of Health and Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: marion.jones@aut.ac.nz

Any concerns regarding the conduct of the research should be notified to *the Executive Secretary, AUTECH, Madeline Banda, madeline.banda@aut.ac.nz, 921 9999 ext 8044.*

Thank you very much for your time and assistance in making this study possible. If you are interested in being a participant in this study please contact me by email or phone me.

***Contact Details***

Andrea Thompson  
Email: andreathompson@xtra.co.nz  
Phone: 8154321 extn 8413

AUTECH Reference Number: 07/223



## **PARTICIPANT INFORMATION SHEET FOR MEDICAL RADIATION TECHNOLOGISTS (*OBSERVATION IN THE CLINICAL SETTING*)**

### ***Date:***

My name is Andrea Thompson. I am a student at Auckland University of Technology, enrolled in a PhD in the Faculty of Health and Environmental Sciences. I have chosen this area for research because of my involvement in medical imaging education.

### ***Project title***

The curriculum as lived: the teaching/learning experiences towards preparing students for their role as medical radiation technologists.

### ***Invitation to participate.***

You are invited to participate in my research and I would appreciate any assistance you can provide. I would like to observe student/practitioner partnerships within the clinical learning setting to provide information in relation to the focus of the research, in this case, the teaching/learning experiences for medical imaging students. This will involve approximately up to three half days of observation, that is, up to a total of nine hours. While I appreciate the assistance you can offer me, you are under no obligation to participate. You can withdraw from the study at any time up to 1 March 2009.

### ***What is the purpose of the study?***

The purpose of this study is to understand how undergraduate medical imaging students engage in both the academic and clinical experiences that are provided for them and how these experiences shape the development of their professional capacities. It is anticipated that the findings of this study will assist to foster and improve teaching and learning processes for undergraduate medical imaging students. Following completion of my PhD I intend to both publish aspects of the study in relevant journal articles and present at conferences.

### ***How was I chosen to be asked to participate in the study?***

Since the central focus for this study is teaching and learning experiences for undergraduate medical imaging students, it is appropriate to observe teaching and learning processes within the clinical setting to assist me to understand how teaching and learning occurs in a relationship between a medical radiation technologist and a student. Your contribution to this study is very valuable; therefore, I will be honouring the input from all participants.

### ***What happens in the study?***

I intend to spend up to three sessions with you and a student and observe processes of teaching and learning. I will observe from a distance, however, if necessary I hope to be able to assist you with patient management activities such as transfer. During the time that I am observing I will be taking notes related to teaching and learning. I may, if it is convenient, ask you questions between patient examinations. Direct observation will allow me as the researcher to capture a variety of interactions that occur between practitioners and students and therefore enhance my understanding of the learning context. It must be emphasized that I will not be assessing supervision/teaching performance. If you would like a précis of the outcomes of the study, I will forward one to you.

### ***What are the discomforts and risks?***

There may be some discomfort associated with exposure of your supervision and teaching approaches.

***How will these discomforts and risks be alleviated?***

We will have an initial discussion about the position from which I will observe to ensure that it is comfortable for you. During the time that I will be involved in observation, if at any point you feel uncomfortable please let me know and I will remove myself from the radiology room. Further, you have the right to withdraw participation at any time. However, it must be emphasised that I will not be assessing supervision/teaching performance. If you are adversely affected by being a participant in this study you will be able to access the AUT Health and Counselling Centre for support.

***What are the benefits?***

It is likely that your involvement as a result of sharing your experiences will contribute to fostering and improving teaching and learning processes for medical imaging students.

***How is my privacy protected?***

All information will remain confidential. Although it is unlikely that you will be identified in the study; you could be, for example, if you employ a unique teaching approach or strategy that you employ. If this occurs I will ensure to check with you that you agree to information being included which could potentially identify you.

***Costs to the participants***

No cost.

***Participant concerns***

Any concerns regarding the nature of this project should be notified in the first instance to the project supervisor

***Principal Supervisor***

Dr Elizabeth Smythe  
Associate Professor  
Faculty of Health & Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: liz.smythe@aut.ac.nz

***Associate Supervisor***

Dr Marion Jones  
Associate Dean (Postgraduate)  
Faculty of Health and Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: marion.jones@aut.ac.nz

Any concerns regarding the conduct of the research should be notified to *the Executive Secretary, AUTEK, Madeline Banda, madeline.banda@aut.ac.nz, 921 9999 ext 8044.*

Thank you very much for your time and assistance in making this study possible. If you are interested in being a participant in this study please contact me by email or phone me.

***Contact Details***

Andrea Thompson  
Email: andreathompson@xtra.co.nz  
Phone: 8154321 extn 8413

AUTEK Reference Number: 07/223



## **PARTICIPANT INFORMATION SHEET FOR MEDICAL RADIATION TECHNOLOGISTS PARTICIPATING IN THE STUDY (*DEVELOPMENT OF AN INITIATIVE TO SUPPORT THE FACILITATION OF LEARNING*)**

### **DATE:**

My name is Andrea Thompson. I am a student at Auckland University of Technology, enrolled in a PhD in the Faculty of Health and Environmental Sciences. I have chosen this area for research because of my involvement in medical imaging education.

### ***Project title***

The teaching-learning nexus: supporting and preparing students for their role as medical radiation technologists

### ***Invitation to participate.***

You are invited to participate in my research and I would appreciate any assistance you can provide. In collaboration with medical radiation technologists (MRTs), clinical educators and year one students I intend to design, implement and evaluate a learning partnership programme to support both students' learning and MRTs' facilitation of the learning process respectively. While I appreciate your assistance you can offer me, you are under no obligation to participate. You can from the study at any time up to 30 May 2010.

### ***What is the purpose of the study?***

The purpose of this study is to implement a teaching/learning strategy with the intention to foster students' learning experiences and to provide support for MRTs who facilitate students' learning experiences in the clinical setting. If such an initiative clearly provides additional support for both medical imaging students and MRTs in the clinical setting then hopefully it will be incorporated into clinical learning settings. Following completion of my PhD I intend to both publish parts of the study in relevant journals articles and present at conferences.

### ***How was I chosen to be asked to participate in the study?***

The central focus for this study is the design, implementation and evaluation of a teaching/learning initiative in the clinical setting. It is therefore most appropriate to include MRTs who are instrumental in the teaching and supervision of students to be a part of this collaborative initiative. The implementation and evaluation of a teaching/learning initiative will provide an opportunity for MRTs to contribute their views and ideas about teaching and learning. Your contribution to this study is very valuable; therefore, I will be honouring the input of all participants.

### ***What happens in the study?***

In the initial part of the study a focus group (first meeting) will be conducted. During the focus group you will be encouraged to share your experiences of teaching and learning as an MRT who teaches and supervises medical imaging students. Aspects that may help to support you in your role (and may be included in the initiative to be developed) will also be discussed during the focus group. The duration of the discussion will be between approximately 60-90 minutes and I hope to be able to record this discussion. I will forward the transcript of the focus group discussion to you so that you can check that it accurately reflects the discussion that occurred. Following the focus group, other participants, you and I will meet regularly (potentially 1 hour, every three weeks) to discuss the design, implementation and to evaluate the initiative. Since the aim of this study is to design, implement and evaluate learning partnerships a student will be assigned to you so he/she can learn alongside you in Radiology Department in which you are employed. It is intended that once this partnership is formed in semester one in 2009, it will continue for up to twelve months. If you would like a précis of the outcomes of the study, I will forward one to you.



***What are the discomforts and risks?***

There may be some discomfort associated with exposure of your supervision and teaching approaches. Further, if you are a less experienced practitioner you may feel more reluctant to share your views.

***How will these discomforts and risks be alleviated?***

It is entirely up to you how much or little you contribute. It must be emphasised that I will not be assessing supervision/teaching performance. Further, you may withdraw your participation at any time during the discussion. If you are adversely affected by being a participant in this study you will be able to access the AUT Health and Counselling Centre for support.

***What are the benefits?***

It is likely that your involvement as a result of sharing your experiences and ideas will contribute to fostering and improving teaching and learning processes for medical imaging students. If the initiative clearly contributes to students' learning and MRTs' facilitation of students' learning then it is hoped that it may be incorporated in the clinical learning setting.

***How is my privacy protected?***

I wish to record the focus group discussion and meetings. This will be done with your consent and could be turned off at any time during the discussion. All information collected during the focus group discussion and meetings, during the design, implementation and evaluation of the process will remain confidential. Although it is unlikely that you will be identified in the study; you could be, for example, if you discuss a unique teaching approach or strategy that you employ. If this occurs I will ensure to check with you that you agree to information being included which could potentially identify you.

***Costs to the participants***

The potential cost to the participant is time, that is, 60-90 minutes of your time for the focus group outside your normal duties. Regular meetings (for example, every three weeks for 1 hour) will take place. The regularity and duration of these meetings will be agreed upon at the end of the focus group. It may be decided by participants that discussion could take place via email or by using an on-line learning platform rather than face-to-face meetings.

***Principal Supervisor***

Dr Elizabeth Smythe  
Associate Professor  
Faculty of Health & Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email: liz.smythe@aut.ac.nz

***Associate Supervisor***

Dr Marion Jones  
Associate Dean (Postgraduate)  
Faculty of Health and Environmental Sciences  
Auckland University of Technology  
Akoranga Drive  
Northcote  
Email:marion.jones@aut.ac.nz

Any concerns regarding the conduct of the research should be notified to *the Executive Secretary, AUTECH, Madeline Banda, madeline.banda@aut.ac.nz, 921 9999 ext 8044.*

Thank you very much for your time and assistance in making this study possible. If you are interested in being a participant in this study please contact me by email or phone me.

***Contact Details***

Andrea Thompson  
Email: andreathompson@xtra.co.nz  
Phone: 8154321 extn 8413

AUTECH Reference Number: 09/36



**PARTICIPANT INFORMATION SHEET FOR MEDICAL RADIATION  
TECHNOLOGIST STUDENTS PARTICIPATING IN THE STUDY (*DEVELOPMENT OF  
AN INITIATIVE TO SUPPORT THE FACILITATION OF LEARNING*)**

**DATE:**

My name is Andrea Thompson. I am a student at Auckland University of Technology, enrolled in a PhD in the Faculty of Health and Environmental Sciences. I have chosen this area for research because of my involvement in medical imaging education.

***Project title***

The teaching-learning nexus: supporting and preparing students for their role as medical radiation technologists

***Invitation to participate.***

You are invited to participate in my research and I would appreciate any assistance you can provide. In collaboration with medical radiation technologists (MRTs), clinical educators and year one students I intend to design, implement and evaluate a learning partnership programme to support both students' learning and MRTs' facilitation of the learning process respectively. While I appreciate your assistance you can offer me, you are under no obligation to participate. You can withdraw from the study at any time up to 30 May 2010.

***What is the purpose of the study?***

The purpose of this study is to implement a teaching/learning strategy with the intention to foster students' learning experiences and to provide support for MRTs who facilitate students' learning experiences in the clinical setting. Following completion of my PhD I intend to both publish parts of the study in relevant journals and present at conferences.

***How was I chosen to be asked to participate in the study?***

Since the central focus for this study is teaching and learning experiences for undergraduate medical imaging students, it is most appropriate to include students as a part of this collaborative initiative. The implementation and evaluation of a teaching/learning initiative will provide an opportunity for students to contribute their views and ideas about teaching and learning. Your contribution to this study is very valuable; therefore, I will be honouring the input of all participants.

***What happens in the study?***

In the initial part of the study a focus group (first meeting) will be conducted. During the focus group you will be encouraged to share your experiences of learning as a student enrolled in the medical imaging programme. The duration of the discussion will be between approximately 60-90 minutes and I hope to be able to audio tape this discussion. I will forward the transcript of the focus group discussion to you so that you can check that it accurately reflects the discussion that occurred. Following the focus group other participants (including MRTs) and myself will meet regularly (potentially 1 hour every three weeks) to discuss the design, implementation and to evaluate the initiative. Since the aim of this study is to design, implement and evaluate learning partnerships you will be assigned an MRT who you will learn alongside in the Radiology Department in which you undertake your clinical learning. It is intended that once this partnership is formed in semester one in 2009, it will continue for up to twelve months. If you would like a précis of the outcomes of the study, I will forward one to you.

***What are the discomforts and risks?***

Due to the fact that I am a lecturer within the medical imaging programme (although I am not currently teaching you), we know each other and therefore you may feel uncomfortable about sharing your views.

***How will these discomforts and risks be alleviated?***

It must be emphasised that no student will be involved in an experience in the research that is detrimental to their achievement in the programme. The information you provide will only be used for the purpose of the study and I definitely will not be assessing you. If you are adversely affected by being a participant in this study you will be able to access the \_\_\_\_\_ Counselling Centre for support.

***What are the benefits?***

It is likely that this initiative will foster and improve teaching and learning processes for medical imaging students. If the initiative clearly contributes to students' learning and MRTs' facilitation of students' learning then it is hoped that it may be incorporated in the clinical learning setting.

***How is my privacy protected?***

I wish to record the focus group discussion and meetings. This will be done with your consent and could be turned off at any time during the discussion. All information collected during the focus group discussion and meetings, during the design, implementation and evaluation of the process will remain confidential. Although it is unlikely that you will be identified in the study; you could be, for example, if you discuss a unique learning approach or strategy that you employ. If this occurs I will ensure to check with you that you agree to information being included which could potentially identify you.

***Costs to the participants***

The potential cost to the participant is time, that is, 60-90 minutes of your time for the focus group. Regular meetings (for example, every three weeks for 1 hour) will take place. The regularity and duration of these meetings will be agreed upon at the end of the focus group. It may be decided by participants that discussion could take place via email or by using an on-line learning platform rather than face-to-face meetings.

***Participant concerns***

Any concerns regarding the nature of this project should be notified in the first instance to the project supervisor

***Principal Supervisor***

Dr Elizabeth Smythe  
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Any concerns regarding the conduct of the research should be notified to *the Executive Secretary, AUTEK, Madeline Banda, madeline.banda@aut.ac.nz, 921 9999 ext 8044.*

Thank you very much for your time and assistance in making this study possible. If you are interested in being a participant in this study please contact me by email or phone me.

***Contact Details***

Andrea Thompson  
Email: andreathompson@xtra.co.nz  
Phone: 8154321 extn 8413

AUTEK Reference Number: 09/36



## Consent to Participation in Research

**Project title:** The curriculum as lived: the teaching/learning experiences towards preparing students for their role as medical radiation technologists.

**Project Supervisor:** Dr Elizabeth Smythe

**Researcher:** Andrea Thompson

- ☐ I have read and understood the information provided about this research project in the information sheet dated.
- ☐ I have had the opportunity to ask questions and have them answered.
- ☐ I understand that identity of my fellow participants and our discussions in the focus group is confidential to the group and I agree to keep this information confidential.
- ☐ I understand that notes will be taken during the focus group and that it will be audio-taped and transcribed.
- ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ☐ If I withdraw, I understand that it may not be possible to destroy all records of the focus group discussion of which I was a part, the relevant information about myself including tapes and transcripts and or parts thereof, will not be used.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a copy of the report from the research (please tick one):

Yes ☐ No ☐

Participant's signature: \_\_\_\_\_

Participant's name: \_\_\_\_\_

Date: \_\_\_\_\_

Approved by the Auckland University of Technology Ethics Committee on 10 December 2007

AUTEC Reference Number: 07/223



## Consent to Participation in Research

**Project title:** The curriculum as lived: the teaching/learning experiences towards preparing students for their role as medical radiation technologists.

**Project Supervisor:** Dr Elizabeth Smythe

**Researcher:** Andrea Thompson

- ☐ I have read and understood the information provided about this research project in the information sheet dated\_\_\_\_\_
- ☐ I have had the opportunity to ask questions and have them answered.
- ☐ I understand that notes will be taken during the interview and that it will be audio-taped and transcribed.
- ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ☐ If I withdraw, I understand that all relevant information including tapes and transcripts and or parts thereof, will be destroyed.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a copy of the report from the research (please tick one):

Yes ☐ No ☐

Participant's signature: \_\_\_\_\_

Participant's name: \_\_\_\_\_

Date: \_\_\_\_\_

Approved by the Auckland University of Technology Ethics Committee on 10 December 2007

AUTEC Reference Number: 07/223



## Consent to Participation in Research

**Project title:** The curriculum as lived: the teaching/learning experiences towards preparing students for their role as medical radiation technologists.

**Project Supervisor:** Dr Elizabeth Smythe

**Researcher:** Andrea Thompson

- ☐ I have read and understood the information provided about this research project in the Information sheet dated \_\_\_\_\_
- ☐ I have had the opportunity to ask questions and have them answered.
- ☐ I understand that identity of my fellow participants and observations of approaches to practice and discussions that occur in the practice area are confidential and I agree to keep this information confidential.
- ☐ I understand that notes will be taken during observations.
- ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ☐ If I withdraw, I understand that it may not be possible to destroy all records of the observation of which I was a part, the relevant information about myself including field notes or parts thereof, will not be used.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a copy of the report from the research (please tick one):

Yes ☐ No ☐

Participant's signature: \_\_\_\_\_

Participant's name: \_\_\_\_\_

Date: \_\_\_\_\_

Approved by the Auckland University of Technology Ethics Committee on 10 December 2007  
AUTECH Reference Number: 07/223



## Consent to Participation in Research

**Project title:** The curriculum as lived: the teaching/learning experiences towards preparing students for their role as medical radiation technologists.

**Project Supervisor:** Dr Elizabeth Smythe

**Researcher:** Andrea Thompson

- ☐ I have read and understood the information provided about this research project in the Information sheet dated \_\_\_\_\_
- ☐ I have had the opportunity to ask questions and have them answered.
- ☐ I understand that the identity of my fellow participants and observations of teaching and learning encounters in the classroom area are confidential and I agree to keep this information confidential.
- ☐ I understand that notes will be taken during observations.
- ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ☐ If I withdraw, I understand that it may not be possible to destroy all records of the observation of which I was a part, the relevant information about myself including field notes or parts thereof, will not be used.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a copy of the report from the research (please tick one):

Yes ☐ No ☐

Participant's signature: \_\_\_\_\_

Participant's name: \_\_\_\_\_

Date: \_\_\_\_\_

Approved by the Auckland University of Technology Ethics Committee on 10 December 2007

AUTEC Reference Number: 07/223



## Consent to Participation in Research

**Project title:** The teaching-learning nexus: supporting and preparing students for their role as medical radiation technologists

**Project Supervisor:** Dr Elizabeth Smythe

**Researcher:** Andrea Thompson

- ☐ I have read and understood the information provided about this research project in the information sheet dated.
- ☐ I have had the opportunity to ask questions and have them answered.
- ☐ I understand that identity of my fellow participants and our discussions are confidential to the group and I agree to keep this information confidential.
- ☐ I understand that notes will be taken during the focus group and meetings and that they will be audio-taped and transcribed during the process of design, implementation and evaluation of the teaching/learning initiative.
- ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ☐ If I withdraw, I understand that it may not be possible to destroy all records of the focus group discussion of which I was a part, the relevant information about myself including tapes and transcripts and or parts thereof, will not be used.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a copy of the report from the research (please tick one):  
Yes ☐ No ☐

Participant's signature: \_\_\_\_\_

Participant's name: \_\_\_\_\_

Date: \_\_\_\_\_

Approved by the Auckland University of Technology Ethics Committee on 9 March 2009

AUTEC Reference Number: 09/36



## **APPENDIX B - QUESTIONS TO GUIDE INTERVIEWS AND FOCUS GROUPS, AND OBSERVATION PROTOCOL**

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**Questions to guide focus group for student participants**

**Questions to guide focus group and interviews for MRT  
participants**

**Observation protocol**

## QUESTIONS TO GUIDE FOCUS GROUP FOR STUDENT PARTICIPANTS

### Focus Group

- Tell me about your best experiences of learning (will cue them into either academic or clinical – whatever they have not talked about)
- In what ways do you think practitioners (MRTs) contribute to your learning?
- In what ways do you think lecturers contribute to your learning?
- Think about a course such as physics. How do you make the connections between what is taught in the academic setting and what you experience in the clinical setting?
- Think about a course such as radiographic imaging. How do you make the connections between what is taught in the academic setting and what you experience in the clinical setting?
- What influence does assessment have on your learning in the academic setting?
- What influence does assessment have on your learning in the clinical setting?
- Take some time to think about the tips, suggestions or messages passed onto you by MRTs in the clinical setting that are not taught in the classroom, usually not examined, but are important for your practice? (hidden curriculum).
- What is the most important learning you feel you need to achieve to prepare you to be an MRT?

## QUESTIONS TO GUIDE FOCUS GROUP AND INTERVIEWS FOR MRTs

The majority of the questions formulated for a focus group with either lecturers or practitioners will emerge from the focus group conducted with students. However, some examples of questions may be:

- Tell me about a time you thought your teaching went really well (or not so well)
- What do you think are the challenges students face in the academic/clinical setting?
- What are some of the obvious learning strategies that students employ in the academic/clinical setting that we could support them in?
- How do you think students develop a professional identity? How can we help them do this?
- What are the characteristics of being an MRT? That is, what makes us different from other health professionals, for example?
- How do you think students develop these characteristics?

## OBSERVATION PROTOCOL

### **What observations will I be making?**

I anticipate that within both the classroom and clinical settings I will observe encounters related to the facilitation of learning, in particular the teacher/ student encounters but also student/student encounters. In the clinical setting I will observe encounters between an MRT and student during the performance of a radiographic case.

I will be observing and making notes about the following:

- The date and time of the observation
- The physical setting
- The people involved in the setting
- The interactions that occur between the people in the setting
- The types of activities the people in the setting are involved in
- Any unusual occurrences that are worth noting

Spradley (1980, p.78) has provided some more specific but simple guidelines when collecting data in the field. He highlights aspects of social situations that can be used as a guide. These include:

- Space: the physical place or places
- Actor: the people involved
- Activity: a set of related acts people do
- Object: the physical things that are present
- Act: single actions that people do
- Event: a set of related activities that people carry out
- Time: the sequencing that takes place over time
- Goal: the things that people are trying to accomplish
- Feelings: the emotions felt and expressed

Spradley (1980) identifies that initial participant observation usually involves 'grand tour observations' which means that the broad field notes documented early on provide many opportunities for examining narrower aspects of experience which become mini-tour observations.

### **The field notes**

It is intended the field notes will be accurate and thorough; however, omitting what may be trivial information.

### **Reference**

Spradley, J. (1980). *Participant observation*. Orlando: Harcourt Brace Jovanovich College Publishers.

**APPENDIX C - LETTER OF SUPPORT: TEAM LEADER AT  
DHB IN WHICH THE STUDY WAS LOCATED**

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Radiology  
Auckland City Hospital  
Park Road, Grafton  
Private Bag 92-024  
Auckland 1

Ph 09 307 4949 ext 24566#  
Fax 09 375 7049

Date 27<sup>th</sup> May 2013

Andrea Thompson  
Centre for Medical and Health Sciences Education  
University of Auckland  
Private Bag 92019  
Auckland 1142

Dear Andrea

Thank you for facilitating a series of sessions for our MRT staff related to the fundamentals of supervision and teaching in December 2012. The feedback from the sessions has been excellent and I would like to explore the possibility of you continuing these sessions later this year.

It would be great if we could meet in the near future to discuss the findings of your study in greater detail (than previous meetings). I am hoping to explore options for improving both the experience for students' learning and MRTs' teaching. I am particularly interested in the mentoring partnerships for Year One students that were introduced as a part of your study in this department in 2009. As you are aware the MRT staff (42 FTE) within our department is integral to supporting learning for MRT students. Although I have made some recent changes in the department to increase the involvement of MRTs in student teaching and assessment, to date these changes are minimal.

Could you suggest some potential dates we could meet?

Yours faithfully



Leigh Anderson  
Team Leader MRT  
Radiology  
Auckland City Hospital