

THE REFERENTIAL AND STRUCTURAL CONCEPTIONS OF GROUP WORK LEARNING

by

Shane Edward Dempsey

DipAppSci (MRT) _{USyd}, GradDipEpi (ClinEpi) _{UNewc}, GradCertHEd _{UNSW}

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School of Health Sciences
Faculty of Health
The University of Newcastle
New South Wales
Australia

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STATEMENT OF ORIGINALITY

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Within Australia, the Medical Radiation Science (MRS) professions only came to the higher education sector in the early 1990 and as such there were no research higher degree academics at the University of Newcastle when I started in 1993. There were no role models from the profession to draw from.

In the later part of the 1990s Helen Warren-Forward commenced as an academic staff member within Medical Radiation Science at the University of Newcastle. She was completing a Ph.D., and once completed, assumed roles and responsibilities, and worked at the level, of someone who I truly consider works as a university level academic. Her progression to Associate Professor is a testament to that. Helen has acted as my Ph.D. supervisor since I commenced this research, and she has drawn on her experience across a range of research positions within the University to provide me with advice that has made this research and Ph.D. better. She has offered advice about process, about structure, about statistics and the way to present data, and has provided consistent and high quality feedback in the drafts that have been presented to her. I'm glad she was my supervisor, and I thank her for her work. I'm glad she is my friend.

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LIST OF ABBREVIATIONS

AIR	Australian Institute of Radiography
ASI	Approaches to Study Inventory
BMedRadSci	Bachelor of Medical Radiation Science
CLT	Conceptions of Learning Inventory
DR	Diagnostic Radiography
HREC	Human Research Ethics Committee
MSLQ	Motivated Strategies for Learning Questionnaire
MRS	Medical Radiation Science
NM	Nuclear Medicine
NSW	New South Wales
PBL	Problem Based Learning
RAs	Research Assistants
RT	Radiation Therapy
SPQ	Study Process Questionnaire

PAPERS ARISING FROM THIS THESIS

1. Dempsey SE, Warren-Forward HM, An analysis of the professional and academic interest of medical radiation science students, Radiography (2010), doi:10.1016/j.radi.2010.11.005. (attached as appendix 8).

PRESENTATIONS ARISING FROM THIS THESIS

3. Dempsey S.E, Warren-Forward H. Students' conceptions of group work learning is strongly associated with the development of metacognitive awareness about team based learning and social competence. 13th Annual International Conference on Education, Athens, Greece, May 2011
2. Dempsey S.E, Warren-Forward H. *Assessing the content and conceptions of important and personal student learning in group work through a content analytic / phenomenographic framework.* Australian Association of Educators in Medical Radiation Science Conference, Newcastle, July 2007
1. Dempsey S.E. *Students' own assessment: the three most important things I learned.* 9TH Asian/ Australasian ISRRT Regional Conference, incorporating the 51st Annual National Conference & 18th Radiation Therapy Symposium, Darling Harbour, NSW, 2000.

ABSTRACT

The traditional context of learning in a University is that of a student engaged in learning and assessment as an individual learner (a solo learner), in a behaviorist model of teacher centered instruction. Most of the educational research undertaken which reviews students' conceptions of learning and the qualitative outcomes of learning, has been undertaken in the solo learner context, in a direct instruction model of teaching. In the mid-1980s Australian workplaces identified the need for graduates to have a wide range of skills which made them highly adaptable to the modern workplace. These skills included those associated with working in teams. By the late 1990s Australian universities were introducing group work learning as a way to provide graduates with an experience in collaborative learning and social constructivist learning contexts. However, little research has been conducted that identifies the learning outcomes of group work learning.

The research reported in this thesis is undertaken entirely in the context of group work learning. Two studies were undertaken to explore the conceptions of group work learning, and the qualitative and quantitative analysis of the structural elements of group work learning, held by Medical Radiation Science students working in collaborative teams over an extended period of time.

Study 1 was a longitudinal study (1997-2002) where students, on completion of a 10 week group work learning poster development research task, responded to an open ended short answer questionnaire which asked them to identify their three most important learning outcomes as a result of undertaking the group work learning task. The topic of the group work research task was self selected by the student groups based on their mutual shared interest for the topic of study in an attempt to engage their intellectual curiosity about their academic and professional world. The questionnaire in study 1 was analysed for the conceptions of group work learning held by students, and the associated structural elements (content) of their group work learning, as described by their responses to the questionnaire. The questionnaire was undertaken on completion of the group work task, so that students could reflect on the entire learning process associated with the task. There were 328 students enrolled and eligible to complete the group work task during 1997-2002. In total 276 questionnaires containing 818 written responses were analysed in study 1.

Study 2 was a prospective study, conducted in 2008, which used a forced choice questionnaire developed entirely from the outcomes of study 1. The questionnaire required students to nominate from the list of learning outcomes the three most important things they learned in completing the group work task. Study 2 allowed the qualitatively described conception constructs uncovered in study 1 to be tested in a prospective close ended questionnaire format. In 2008 there were a range of changes made to the group work task: these changes included reducing the time period to complete the task to 6 weeks, and loss of freedom to select the topic. Study 2 therefore allowed the research to compare any possible changes in the priorities of group work learning for students, from study 1 to study 2, when changes to the poster task were made. There were 148 students were enrolled and eligible to complete the group work task in 2008. In total 97 questionnaires containing 291 responses were analysed in study 2.

The analysis of the responses to the questionnaire in study 1 identified four conceptions of group work learning held by students. One of the conceptions was similar to conceptions of learning identified in solo learning contexts, and is associated with an 'acquiring facts' approach to learning, a surface level learning construct. The other three conceptions, 'developing meaningful interpretations', 'negotiating social structures', and 'recognising expertise and creativity' are associated with deep and meaningful learning outcomes and are strongly associated with both the process and outcomes of the social constructivist learning environment that students engaged in to complete the task. Two of the conceptions have not been formally reported previously. In terms of the analysis of the content of what students learned (structural elements of learning), five major categories of description emerged of which collaboration in learning (characterised by 5 sub-descriptions) was overwhelmingly the largest content learned. Study 1 also allowed for the analysis of the interest orientations of the students in undertaking their research project, as the topic of the task was driven by selected research group work project topic. This analysis demonstrated that students in different strands of the Medical Radiation Science professional programs (Diagnostic Radiography, Nuclear Medicine and Radiation Therapy), even with a large shared amount of academic content, develop interest orientations in line with a clinical profile of the professional degree they are enrolled in and which are significantly different from the other programs.

Study 2 identified that reducing the time to participate and complete the group work task, and removing the students' interest based choice of topic, to study to one which was selected for them, resulted in a change of learning priorities from study 1. In study 2, students indicated that they were more focussed on researching to get information to complete the project on time, and on learning about the topic, than they did in study 1. While collaboration in learning was still the number one structural element of learning its priority as a focus for group work learning was significantly reduced from study 1.

The results indicate that group work learning is a powerful learning environment which can provide learning outcomes that have been previously unidentified, and possibly unachievable, in the solo learning environment. The outcomes of group work learning are strongly associated with those graduate attributes identified as important in the modern Australian workplace.

1. INTRODUCTION

1.1 OVERVIEW

The research reported within this thesis is based on two separate studies that sought to explore the content and conception of important and personal learning held by students, when learning and being assessed in a group work or social learning environment. Most of the published educational research that reviews learning outcomes has been undertaken in the context of the solo learner and solo learning situation, ie a single student participating individually in and being assessed individually in a course or topic. The research presented in this thesis is set in the context of group learning, where students engage with other students in both learning and assessment. This research explores the experience of student learning in group work.

The first study was a longitudinal study conducted from 1997 to 2002. Each year, students participating in a group learning and assessment task, were invited to respond to an open ended response questionnaire that sought to uncover their important and personal learning outcomes associated with the group work task. The written responses of Medical Radiation Science (MRS) students (n=818) at the University of Newcastle, Australia, were qualitatively and quantitatively analysed using phenomenographic and qualitative interpretative analytical methods, in an attempt to describe both the content of learning, and conceptions of group work learning, that students associated with the group work learning and assessment task.

The second study was a prospective study conducted in 2008. From 2005 the group work learning task underwent a range of changes which included a reduction in the length of time to complete the group work project. It was therefore decided in 2008 to review the group task again against the outcomes established in study 1. A questionnaire was developed using the major categories and subcategory descriptions of important and personal learning established and validated in study 1. The questionnaire asked Medical Radiation Science students at the University of Newcastle, Australia, to rank from the list of learning outcomes uncovered in study 1, the three most important things they learned when participating in the group learning and assessment task. The responses (n= 291) were analysed using traditional quantitative methods.

While the study of the content and conceptions of learning within a group learning environment was the prime motivation for this research, as the data was analysed it became possible to extend the research to explore the interest orientation of students when given the free choice to select their topic of learning. In study one, a qualitative and quantitative analysis was undertaken on the interest orientation expressed by the research question that students asked of themselves and that guided the group learning project.

The participants of this research are students enrolled in the Bachelor of Medical Radiation Science degrees at the University of Newcastle, Australia. The group work task being evaluated in this thesis is a Conference Poster Development Task.

1.2 THESIS OUTLINE

The thesis is broken up into seven chapters that describe the research, and a chapter for references and appendices. The thesis is written in a conventional style, using separate chapters for methods and results, rather than integrating these chapters as is often done in qualitative research. The reason for this is to avoid unnecessary repetition in the description of the research and analytical methods used for various aspects of the research.

Chapter 1 Introduction: This chapter overviews the context in which the research is conducted; the research and research setting, the research purpose, aims and research questions; the scope, assumptions and limitations of the study; and concludes with the significance of the research.

Chapter 2 Literature Review: This chapter provides a review of the literature in relation to the concepts contained within this thesis. This chapter reviews the topics of group work and social constructivist learning; interest orientated learning; phenomenography; content analysis; and the research methods associated with this thesis.

Chapter 3 Methods Study 1: This chapter describes the methods used to conduct and analyse the longitudinal study conducted from 1997 to 2002 (study 1). The chapter describes the collaborative group work task that formed the basis for study in this research; the development and implementation of the open ended response questionnaire which was used to obtain the views or perspectives of students on their

most important learning outcomes associated with the group learning task; and the phenomenographic and content analysis framework used to qualitatively and quantitatively analyse the results of the questionnaire. The methods for the analysis of interest as expressed by the topics selected for study by the students is also given.

Chapter 4 Results Study 1: This chapter provides the results of study 1. Details of the responses analysed within study 1 are described; and results are provided for the assessment of content of learning, conceptions of group work, and the interest orientations of the students.

Chapter 5 Methods Study 2: This chapter describes the methods used to conduct and analyse the prospective study conducted in 2008 (study 2). The chapter describes development and implementation of the questionnaire used in study 2.

Chapter 6 Results Study 2: This chapter provides the results of study 2, and a comparison and statistical analysis of the results of study 1 to those of study 2.

Chapter 7 Discussion and Conclusion: This chapter discusses the responses of students within both the longitudinal study and the prospective study, and the relationship in the results to the research questions asked within this thesis. This chapter provides a summary and draws conclusions from the work of this research, as well as exploring avenues for further studies.

Chapter 8 References: This chapter lists all references used within the thesis.

Chapter 9 Appendices: This chapter provides important documents associated with the research.

1.3 ASSESSING QUALITATIVE LEARNING OUTCOMES

Since the mid 1900's a vast range of research has been published exploring the qualitative aspect of the student learning process and student learning outcomes. The idea of exploring the qualitative aspects of student learning can be expressed by the phrase '*what students learn.*' What students learn is seen to be a naturally qualitative phenomenon which requires the experience of students as learners to be explored and interpreted. The analysis of the student experiences with learning can include, for example, exploring issues such as the qualitatively different ways that students

interpret academic content; approaches to study; orientations of learning; the effect of teaching interventions on learning; and the broader view that students hold for their learning.

Researching the qualitative outcomes of student learning requires a shift in research and analytical methods, from traditional empirical hypothesis-deductive research models best suited to the measure of physically identifiable units, eg number of right and wrong answers (Mehrens & Lehman, 1991) – best described as a quantitative assessment of ‘how much students learn’ - to one which allows the individual and personal meaning of the learner’s experiences to be expressed by the students’ qualitative descriptors of learning outcome (Ramsden, 1992). This discovery of what students actually learn during formal and informal learning and assessment tasks, as opposed to what the planned curriculum had intended as learning outcomes, has been referred to as the hidden curriculum (Sambell & McDowell, 1998; Snyder, 1971).

To allow the experience of students as learners to be heard and told from their perspective, Marton (1981) argues that this type of educational research requires a shift in the perspective of the researcher, from a *first-order perspective* where the researcher makes observations about student learning and describes and reports the outcomes in terms of their own world view about the phenomena under study, to a *second-order perspective*, where

“we orientate ourselves towards people’s ideas about the world (or their experience of it) and we make statements about people’s ideas about the world (or about their experiences of it)” (page 178).

Marton’s (1981) description of the first order - second order perspective is similar to the etic - emic distinction found in social-cultural anthropology, psychology, linguistics and ethnography research (Glaser, 1967; Harris, 1976; Pike, 1967). The etic perspective relies upon the observation of the lived experience from the viewpoint of an outsider (the researcher) looking in, who attempts to describe the experience of the insider (in this researcher the student) from their observations and outsider perspective. The emic perspective represents the lived experience and viewpoint of the insider (the student) who attempts to explain their personal and often socially, emotionally and culturally held view or experience, to outsiders looking in.

The central argument in this discussion is that a researcher cannot, in a first-order analysis or through etic observation and reporting, interpret the experience of an individual with a phenomena (Prosser, Trigwell, & Taylor, 1994). The true interpretation of the experience of an individual can only be understood by viewing the experience from their perspective. For this reason when researching the qualitative aspect of the student learning process and student learning outcomes, it is necessary to adopt a qualitative research approach that allows the student experience with learning to be told and analysed from their perspective.

Qualitative research approaches such as that described above, whether undertaken within an educational, health or sociological context, are acknowledged as being able to reach a depth of understanding on the topic of interest that more traditional research experimental and statistically based methods cannot reach (Cresswell, 1998; Kitto, Chesters, & Grbich, 2008; Pope & Mays, 1995).

One of the largest issues to be overcome when conducting qualitative analysis research is that there are no physical and countable units of data that are naturally present and observable as there are in quantitative research. In qualitative educational research the descriptive responses of students, which may be in the form of transcribed interviews or text based surveys, need to be qualitatively analysed and units of measures interpreted and constructed from the data (Wiersma, 1995).

In the early research looking at the qualitative differences in learning outcomes, researchers and authors did not always provide a well described scientific or methodological framework for how they interpreted student's responses into qualitative descriptors of learning outcome, and hence such research was often criticised as lacking the scientific rigour found in empirically based and statistically analysed research (Angen, 2000). In more recent times researchers have recognised the need to develop a fairly rigorous and well described analytic framework when conducting qualitative research, which would allow for the assessment of validity and *trustworthiness* of the outcomes (Burnard, 1991; Walsh, 2000; Wasserman, Clair, & Wilson, 2009).

Within this research, a systematic framework for the identification and measurement of learning outcomes (the units of data), as expressed by the written qualitative

descriptors of learning provided by students and the interest orientations described within their topic of research, has been described, validated and used. The research attempts to report the experiences of students from their perspective (a second-order perspective). The learning outcomes to be assessed in this research are the referential conceptions of learning and structural content elements of learning, with the research framework being largely derived from phenomenography and content analysis methods. These learning concepts and research methods are described in Chapter 2.

1.4 RATIONALE FOR THIS RESEARCH

1.4.1 Group Work

There are many reasons for researching the 'lived experiences' of students as learners, and asking students to describe the qualitative outcomes of their learning. These include developing better understanding of how students interpret teaching and their learning, better understanding of those issues that affect learning for students, developing and modifying processes that make learning better, and developing insights into the real learning outcomes that students take from their education. Assessing the outcomes of learning is a natural quality assurance process.

Much of the pioneering and influential research on learning, learning styles (Marton & Saljo, 1976a), approaches to learning (Svensson, 1977), the environmental factors affecting learning (Entwistle & Peterson, 2004), the motivations for learning (Deci, Vallerand, Pelletier, & Ryan, 1991), and conceptions of learning (Marton, Dall'Alba, & Beaty, 1993; R. Saljo, 1979), has been undertaken in the traditional context of the individual student learning and being assessed within a *direct instruction teaching model*. It has been suggested that while this behaviourist model of teaching and learning is effective for teaching content, there is less evidence that it allows for high order cognition and independent flexibility in learning (Pallinscar, 1989).

Since the 1980s teaching and learning have gone through a social, cultural and technological revolution. Teaching and learning now includes learning situations where students work in less traditional situations and in more active learning and technology orientated situations (Ellis, Goodyear, Prosser, & O'Hara, 2006; Wilson & Fowler, 2005). These learning styles imitate society's modern day complexity, allowing for

learning in complex group information processing and learning situations. To meet the demands of the modern world business has emphasized the qualities it requires in graduates as those of knowledge creation, problem solving and communication with the *team work* based organisational structure (B/HERT, 1992).

Many universities, including the University of Newcastle, now recognise the need for students to engage with each other in their learning. Many professional programs at university have been designed in recent years to take advantage of the high order learning outcomes that *group learning* provides (Barrows, 1986; Ellis & Fischer, 1993). Group work and group learning adds a dynamic to the context of the learning and assessment environment not found in the traditional solo student learning situation. Chapter 2 presents information describing group work theory and outcomes.

This research commenced in 1997 at a time when group work theory and practice was still in its infancy within higher education. At this time several authors wrote that there was little published research looking at the student's perspectives of learning with group work.

"There is a relatively small body of research on the impact of team based learning on students, as assessed through their experience..."

"...little research has been conducted on the underlying learning process of PBL (sic group work), specifically on student's perspectives of the process in relation to their learning." (Cockrell & Caplow, 2000)

Since this time group work has been increasingly included in higher education however issues still remain as to its uptake and quality (Battye, Hart, McCormack, & Donnan, 2008; Hanson & Sinclair, 2008; Johnston & Miles, 2004; Wilson & Fowler, 2005).

The research presented within this thesis extends the boundaries of understanding on student learning and conceptions of learning from the solo learning and assessment environment to the group work learning environment. It collects and analyses the 'lived experiences' of students with their learning within a group, by adopting a methodology that evaluates each individual student's important and personal learning outcome.

1.4.2 Interest Orientated Learning

The discourse pertaining to interest orientated learning has a rich history. Early researchers staked the claim that interest orientated learning was strongly associated with positive learning outcomes (Dewey, 1913; Thorndike, 1935). Interest is considered a source of intrinsic motivation in learning (Deci & Ryan, 1985) and interested and motivated learning leads to better learning results (Kapp, 2002).

Researchers have tended to analyse interest from two different perspectives: individual interest dimensions and situational interest dimensions. Individual interest is seen to be related to the personal dispositional qualities of the learner and has an enduring quality, while situational interest is seen to be related to engagement with a particular learning activity (Hidi, 1990).

Interest is considered to have value-related and feeling-related valences: value related valences are associated with the personal significance that the learner places on learning, while feeling-related valences are associated with both positive and negative emotional states experienced when students are engaged either in a particular learning activity or learning about a particular topic (Piaget, 1981; Schiefele, 1991).

Most interest orientated learning research has been undertaken to identify the theoretical constructs of interest, for example cognitive versus affective effects, personal versus situational interest, and the characteristics that develop interest; or the qualitative outcomes of interest based learning, for example the recall of hierarchical structural elements of learning or the use of learning strategies. Much of the previous interest based research has used experimental or cross-sectional designed, text based comprehension methods, which are techniques commonly used in cognitive psychology and educational research (Kapp, 2002; Schiefele, 1991). In this type of research individual students read set pieces of work and are then asked a series of questions about the reading and their interest in the work. Interest in the reading is often evaluated in light of what can be recalled (for example does interest in a topic heighten learning?), or the stimulus provided to the student by the reading, (for example the analysis of behavior or cognitive development or modification with particular interest themes in a reading). This style of interest orientated research

provides for broad or specific generalizations to be made about the concept of interest and its effect in promoting a learning or behavior response.

The research reported here is undertaken from a natural inquiry and analysis perspective (Marton & Saljo, 1976b; Roger Saljo, 1979; Van Rossum, Deijkers, & Hamer, 1985a), rather than an experimental perspective. This study examines the interest of students working in groups, within three different professional programs, when they are given the opportunity to self select a collaborative group work project topic (Johnson & Johnson, 2003; Johnston & Miles, 2004; Livingston & Lynch, 2000; McWhaw, Schnackenberg, Sclater, & Abrami, 2003). The topics that student groups self selected for a semester based project have been analysed to identify the qualitatively different interest orientation of the students.

1.5 RESEARCH AIM, QUESTIONS AND OBJECTIVES

This research has three aims.

The first aim of this research is to investigate the effect that a group work learning and assessment task, undertaken in a university health science professional program, has on the conceptions of group work learning held by the students and the content of learning acquired by students.

The second aim of the research is to investigate the interest orientation of students when given the opportunity to freely choose, based on their academic or professional world interest, the topic of their research.

The third aim of this research is to investigate how a change in the timing of the group work task, and a change in the freedom to select a topic to research, has on the content of learning.

1.5.1 Research Questions and Objectives

To investigate the aims, two studies were conducted: for each study research questions were posed, and a series of objectives designed.

1.5.1.1 Study 1 Research Questions

Research Question 1: The Conceptions of Group Work Learning

What are the referential conceptions of important and personal learning that students develop as a result of completion of a group work learning and assessment task?

Research Question 2: The Content of Group Work Learning

What are the categories of important and personal learning that students acquire and prioritise during a group work learning and assessment task?

Research Question 3: Interest Orientated Learning

What are the dimensions of interest of students, of different health professional programs, when provided within the opportunity to freely select the topic of their learning?

1.5.1.2 Study 1 Research Objectives

The following objectives are necessary to complete study one:

- i. develop a group work learning and assessment task, based on social constructivist methods, within the MRS degree, that will allow the aims of the study to be addressed
- ii. construct a data collection method that allows individual students to describe in their own words their important and personal learning outcomes to the group learning and assessment task.
- iii. construct an interpretative analysis methodology which will allow the qualitative written responses of students own learning to be analysed. To do this it will be necessary to read all responses, and use an emergent thematic interpretation methods and/or topic categorisation, to construct major categories and associated sub-category descriptions that describe the content of learning as described by the students.
- iv. validate the major qualitative descriptive categories of group work learning. To do this, a second qualitative researcher will need to read the student responses and determine their own major conceptual categories of learning. These two

sets of major categorisations will be compared for the level of agreement to ensure the trustworthiness, reliability and validity of the categories.

- v. construct a coding scheme and code book which will be used to evaluate all the responses of students, and allow the responses to be coded into the qualitative descriptive categories of learning.
- vi. train two coders, with education and/or experience suitable to the outcome being studied, to independently code all student responses into the learning categories.
- vii. Code all responses, and develop a data base and enter all content of learning data.
- viii. assess the inter-rater (inter-coder) reliability of the coding process by assessing the level of agreement between raters for all major categories and their sub-category description coding.
- ix. assess the conception of learning held by students based on phenomenographic methods. To do this the full data set of student responses, and the developed content of learning categories of description, will be read and interpreted into conception of group work learning constructs.
- x. investigate the variation within and between conception of group work learning and content of learning outcomes, using qualitative interpretive methods and statistical analysis.
- xi. assess the interest orientations of students within different MRS degree programs. To do this it will be necessary to read the self selected free choice research questions that students developed as the basis for their group work learning task. Emergent thematic interpretation methods and/or topic categorisation will be used to construct and describe the major interest orientations of the students.
- xii. construct a coding scheme to evaluate the interest orientation of the students group work learning task, and code all poster research questions.

1.5.1.3 Research Questions and Objectives for Study Two

Research Question 4: Changes in Priorities of Learning

How does a reduction in the time frame to complete a group work learning project affect the priorities for learning?

Research Question 5: Interest Orientated Learning

How does a loss of freedom to select the topic of interest, affect the priorities for learning?

The following objectives are necessary to complete study two:

- xiii. design a questionnaire based on the major category and subcategory descriptions of group work learning uncovered as a result of study 1
- xiv. develop a participant information sheet
- xv. apply for ethics approval for the research
- xvi. recruit students to complete the questionnaire
- xvii. analyse the results of the questionnaire for the priorities of important and personal learning held by students
- xviii. analyse the results for the change in time to complete the project
- xix. analyse the results for the effect of a loss of freedom in choosing the topic of the study on the priorities of learning
- xx. investigate the relationship within and between items using categorical statistical analysis.
- xxi. summarise the analysis including validating the results of study 2 against the results in study 1

1.6 SCOPE OF THE STUDY

1.6.1 Student Cohort

This research has been undertaken on undergraduate students at the University of Newcastle, Australia. The students that form the study population are those enrolled in the Bachelor of Medical Radiation Science degrees, which has majors in Diagnostic Radiography, Nuclear Medicine and Radiation Therapy. These students participate in a program that is normally undertaken over 3 years full time study.

Diagnostic Radiography (DR), Nuclear Medicine (NM) & Radiation Therapy (RT) are three health professions that share a history of scientific, technological and clinical practice discovery and development largely based around the use of radiation for medical imaging or radiation treatment. While the specific clinical context of these three professions is different, there are many areas of clinical knowledge and practice overlap between the professions.

At those Australian universities where more than one of the three profession specific programs are taught, these programs are generally co-located in a single discipline of Medical Radiation Science (MRS). Because of the large amount of foundation and professional knowledge and skills shared by the professions, students often participate in common teaching and learning, undertake common assessment, and therefore learn in a common environment. Examples of this at the University of Newcastle, where all three programs degrees are taught, include all students doing the same:

- anatomy & bioscience in years 1 & 2
- physics in year 1
- ethics and health law, communication, evidence based practice, occupational health and safety and infection control, and library informatics and assignment writing in year 1
- imaging instrumentation and digital imaging in year 2
- psychology/sociology in year 2
- clinical decision making, critical appraisal and research methods in years 2 & 3

The students across the programs then, learn fundamental to advanced professional knowledge in a shared and common learning environment. In all of this learning there

may be general and specific academic and professional interests that are shared across the three programs.

The students will also do their program specific clinical knowledge and professional placement courses in each of the 3 years of the program. On professional placement students will develop specific professional skills and be socialised to their professional practice and culture (Sim & Radloff, 2009). These courses provide the platform for professional and specific interest to be developed.

While many of the courses and learning tasks are focussed in the development of profession specific knowledge and skills, the MRS degrees at the University of Newcastle have had a series of learning and assessment tasks introduced into the profession specific courses that are designed to equip students with a set of value added, lifelong learning skills in addition to their acquired specific professional skills. Table 1.1 outlines the generic graduate attributes learning that occurred within MRS courses at the time study 1 (1997-2002) was conducted. The author of this research thesis was the lecturer who developed and introduced each of these graduate attributes learning activities into the MRS programs.

Table 1-1: Graduate traits learning across the 3 years of the MRS program

Assignment Writing in year 1 semester 1
Critical Appraisal of the Scientific Literature in year 1 semester 2
Comparative Analysis of Clinical Methods in year 2 semester 1
Conference Poster Development and Presentation group work task in year 2 semester 2
Research Project group work task in year 3 semesters 1 and 2 *

* note: deleted in 2005 as a result of program changes

1.6.2 The Group Work Learning and Assessment Task

There are two group projects that meet the requirement for analysis within this research, the year 3 group work Research Project, and the Year 2 group work Conference Poster Development and Presentation task. The group work learning and

assessment task chosen to be evaluated within this research is the Conference Poster task. The poster task was chosen because:

1. In terms of progression through the degree this is the first group work task that the students entering the degree are asked to participate in and complete. It therefore has the potential to influence the students greatly in their views towards group work in the future.
2. Given it is their first group task the results of the study should not be influenced by other group work tasks that the students have completed earlier within the degree.

The researcher developed the task and introduced the task into the MRS program in 1997. The aims of the task are to:

- Allow students the experience of designing a poster presentation as a means of professional and academic communication, and
- Promote intellectual curiosity, inquiry skills, critical reasoning skills, self learning and collaborative learning, by requiring investigative groups to promulgate a question and provide a critically evaluated answer.

The task is undertaken in semester 2 of the second year of the program, and is undertaken in small groups comprising 4-5 students. Each group freely choose their own topic, and the topic can be related to any aspect of MRS studies or professional practice. In forming groups students individually discuss their academic and professional world interest in a variety of aspects MRS in a class forum, and from this students form groups based on a mutual interest in a topic. Topics arise from the interest of students. It is the topic and the question asked, that drives the task and students work towards gaining expert knowledge about the topic and presenting the work in a conference poster format. The task is assessed entirely by students. All work related to the task is done within a group work learning and assessment environment.

1.6.3 Sample Population

This research analyses the responses of year 2 Medical Radiation Science students who participated in the group work Conference Poster Development and Presentation learning and assessment task.

Study one was undertaken on the responses of year 2 Radiation Therapy, Diagnostic Radiography, and Nuclear Medicine students of the Bachelor of Medical Radiation Science program at the University of Newcastle between the years 1997 – 2002. Study 2 was undertaken on the similar cohort of students in 2008.

The responses provided in both studies represent the views of these students with regard to the poster learning and assessment task only. No generalisations can be made from the results of this thesis to students of other programs, MRS students of other Australian universities, or other assessment tasks students undertake as part of the MRS program.

The study focuses on a group work project and no generalizations can be made to solo learning and assessment tasks.

1.6.4 Data Collection

1.6.4.1 Study One: Longitudinal study 1997 – 2002

On completion of the entire task, students are asked to reflect on their important and personal learning outcomes that have arisen from engaging and completing the entire group work learning and assessment task. To gather personally meaningful responses from as many students as possible, an open ended question was developed. Students were asked to individually respond to the question:

“The three most important things I learnt undertaking this task were...”

To emphasize the personal nature of the responses the question took the form of the emic perspective (Harris, 1976), using the words “...***things I learnt...***” To encourage meaningful responses the question was an open ended question allowing for free choice responses (Morse & Field, 1995). Students were informed on the questionnaire that their answers could come from any aspect of the group project task.

Although the responses are given in the context of a group learning and assessment task, they represent the meaningful outcomes for individual students within the group work learning and assessment activity. It is these text responses that are analysed within the qualitative descriptive analysis framework of study one.

To allow for the exploration of the academic or professional world interest that underpinned the free choice selection of topic for the group work task, students were required to write the research question that was the stimulus for their group work task on the questionnaire. To validate the trustworthiness of the research questions as being representative of the interest orientation of students undertaking the group work task, a sample of the full poster submissions of students were analysed for their expression of interest and compared to the expression of interest contained within the poster research question.

The results of the study one analysis informed the development of the questionnaire used in study two.

1.6.4.2 Study Two: Prospective study 2008

On completion of the group work task students were invited to complete a forced choice response questionnaire. The questionnaire listed the subcategory descriptions of learning constructed in study one. Students were asked to rank in order the three most important they learned in completing the group work task.

A small range of other demographic information was collected that could be linked to the outcome.

1.6.5 Context of this Thesis

1.6.5.1 Study One: Longitudinal study 1997 – 2002

From 1997 – 2002 there were many changes to the MRS program and courses, however during the period of this study this poster task has always been implemented and undertaken by students in year 2 semester 2 of the program, over the same 10 week time frame. The part of the poster task that is analysed within this thesis has always been collected in the same way and in the same time frame by the same

person. The data was collected between 1997 and 2002, and was subject to analysis between 2006 and 2007.

1.6.5.2 Study Two: Prospective study 2008

In 2008 the questionnaire was undertaken by students completing the poster task in year 2 semester 2 of the program. Although the project was undertaken in the same semester of offer as study 1, there were two changes made to the project in 2008. The first change was that the project was only run over a 6 week time frame as opposed to a 10 week time frame. The second change was that due to large increases in the numbers of students in the programs in 2008, and the reduced time to complete the project, students did not self select the topic of their research, but rather they were allocated a topic.

1.6.6 Assumptions

As with any research study a number of assumptions have been made. The assumptions in this study include:

1. When individual students provide their responses to the questionnaire it is assumed that the responses are their own responses, and that they are not discussing possible responses with other students and reporting group responses.
2. When students provide information on their learning outcomes it is assumed that they were in fact answering in relation to the poster learning and assessment task undertaken and are not other aspects of their program of study.
3. It is assumed that the responses are the free choice responses of students and their responses are not influenced by the expectation of the academic staff involved in the poster task.
4. It is assumed that the lecturer conducting the assessment task, in this case the researcher, has not influenced the student responses by emphasizing some learning outcomes of the poster task as being more important than others.

1.6.7 Significance of the Study

Most learning research has been undertaken on solo learners. There is little to no research available that evaluates the content of learning, and conceptions of learning, held by students when they have participated in a group work task. The group work task adds a dynamic to the learning environment that may mean students have a very different learning outcome than they would have had if they had worked on their own. This research attempts to determine if the group work dynamic effects a student's learning conception.

Most content and conception of learning research has been undertaken using interviews as the means of generating data. There is a growing trend towards the use of open ended questionnaires in qualitative research which allow for a larger range of responders to be involved in the research. This research attempts to use an open ended questionnaire methodology to examine the important and personal learning outcomes of students learning in a group work environment. If this process is successful this may allow for the development of a group work content and conception of learning inventory that can be used by academics across disciplines to evaluate learning outcomes to group work tasks.

One of the significant problems with the analysis of qualitative data has been the subjective interpretation of the results by the researcher. The use of a structured qualitative analysis approach to evaluate the responses within this research provides the opportunity to increase the trustworthiness of the results of the research and reduce the researcher bias. The research also seeks to validate the dual qualitative and quantitative analysis methodologies used within this research, within higher education learning assessment, and provide academics with a new way to look at and quantify student learning outcomes in a group work environment.

This research used interpretative data analysis methods that have become popular in a range of educational and qualitative research methodologies. The methodology analysed the natural product of student learning (their learning submission) to evaluate the learning messages they contain rather than placing students into a learning experiment where answers to predetermined questions are evaluated. This method of analysis and use of data provides a new and novel method for academic staff to

assess what students learn when engaged in the learning and assessment tasks set for them.

2. LITERATURE REVIEW

2.1 INTRODUCTION

This chapter discusses the literature surrounding the research topic.

Section 2.2 presents a review of group work definitions, the suggested outcomes of group work learning, and the link between group learning and social constructivist theory. This section also discusses the rationale for group work from an industrial and education perspective.

Section 2.3 reviews the requirements of a research methodology to be used for this research, and the various types of lived experience research design and analysis that could be used in research such as that reported in this thesis.

Section 2.4 presents a review of phenomenography, which is one of two research methods used within this research. Phenomenography is a research method that examines the experience of individuals to a phenomenon. Although phenomenography reviews and analyses individual experiences, it combines and presents the experiences of the cohort of participants in a limited number of ordered, or hierarchal, qualitative descriptions of the experience. The analysis methods used are very similar and complimentary to content analysis, where the qualitatively different descriptions of the experience provided by the cohort are examined both for the manifest and deep message found within the communication, however, the context for the examination of the data in a phenomenological analysis lies with the analysis of experience. Phenomenology has been used extensively in education research where the experiences of students or academics or researchers have been reviewed.

Section 2.5 presents a review of content analysis, the method used to examine the text responses of the students. Content analysis is a systematic analysis method that can evaluate messages (in this case the text responses of the students) by analysing the words or actions, or constructs described or experienced, or the deep meaning contained within messages, and presenting the results as a series of qualitatively different descriptions of the phenomena. Content analysis can be adapted and applied to many types of interpretative research methods; however, because many interpretative research methods have strong underpinnings to a philosophical position, eg phenomenography or ethnography, the specific term content analysis may not be

used when describing how the analysis of these research methods was undertaken. However, most interpretative analysis methods are adaptations of content analysis.

Section 2.6 summarises the background to this research and provides an overview of the methods used within this research.

2.1.1 Literature Collected and Used Within this Thesis

The literature that informs this research has been undertaken across the period 1994-2011, in line with the timeframe of this research. In terms of group work theory and processes, The University of Newcastle's NEWCAT Library Catalogue was used extensively in the initial literature review, from which a series of important text references and dominant authors were uncovered. The group work process utilised in this research was developed largely as a result of the foundation information found in the text references cited in this thesis and dating from 1945-1999. Group work and social constructivist learning theory, and approaches to assessing the outcomes of group work learning, are in this thesis referenced to the writings of educational and psychology theorists in peer mainly from the period 1999-2010. This later information was uncovered via the library's journal databases relevant to education and psychology.

Nearly all the early research related to phenomenography is found in peer reviewed journals. The early work around approaches to learning (deep to superficial approaches) and conception of learning is largely derived from several dominant authors, Marton and Säljö, who formed the Gothenburg school of phenomenology in Sweden in the mid 1970s. The publications of these authors, along with the more recent text and journal writings of Bowden that described more novel and progressive methods of data collection and analysis, have been extensively cited in this thesis.

In terms of content analysis there is a rich history across of the use of the methodology across a number of disciplines. The foundation information on content analyses referenced within this research comes from definitive texts on the topic, while the examples of the use of content analysis in the field of educational evaluation come from journal articles again uncovered using dominant author and data based searching through the University of Newcastle library.

2.2 GROUP WORK

2.2.1 Defining Group Work

The term group work is an easily recognised, generic term, used within education to describe situations where a number of students ($n > 1$) work together to learn content or solve a problem or complete a project. Johnson and Johnson (2003) in presenting the definitions of the term 'groups' found in social science literature, suggest that the most common definitions of 'groups' encompass the concepts of (Table 2-1):

Table 2-1: Definitions of Groups

1. Achieving goals within the group (Deutsch, 1949; Freeman, 1936; Mills, 1967)
2. Individuals within a group being interdependent with each other (Cartwright & Zander, 1968; Fielder, 1967; Lewin, 1951)
3. Interpersonal interaction between members (Bonner, 1959; A. Hare, 1976; Homans, 1950; Stodgill, 1959)
4. Perceptions of membership and belonging to a group (Bales, 1950; M. Smith, 1945)
5. Structured relationships between group members (McDavid & Harari, 1968; Sherif & Sherif, 1956)
6. Mutual influence between members of the group (Shaw, 1976)
7. Motivation for reward due to membership of a group (Bass, 1960; Cattell, 1951)

By definition then, group work teaching and learning allows for knowledge, attitude and skill development (process and task related), in a setting of social interaction and discourse, and shared discovery (social-emotional exchange). Successful integration of both task related activities and social emotional exchange are required for a learning activity to be considered a group work activity (Ellis & Fischer, 1993; Fuller, 1999)

Educational, psychological and social theorist researchers, differentiate between types or categories of group learning. Terms frequently used in the literature to describe group work include co-operative learning and collaborative learning.

Co-operative learning is generally associated with school based group work activities. In co-operative learning, teachers 'structure' a group work activity, often leading the activity for the group and delegating tasks including leadership and reporting to group members, ensuring equity of work and responsibility among group members (Bruffee, 1995). While co-operative learning engages the students to work on a project and achieve a targeted outcome, it is often used as an activity designed to teach how groups function.

Collaborative learning on the other hand extends to students accountability for the governance and evaluation of their group, taking away authority from the teacher and giving students the authority and democracy for decision making (McWhaw, et al., 2003). Collaborative learning assumes that students with foundational knowledge and social experience can construct knowledge based on engagement, active discussion, and debate and judgement. These engaged learning activities (active discussion, and debate and judgement) mean that collaborative learning is useful in the development of higher-order lifelong learning and skills. Because of the increased level of educational and social maturity required in collaborative learning, it is generally associated with university based group learning activities rather than school based activities (Bruffee, 1995).

Group learning has evolved at tertiary level and many professional programs have adopted group work styles of learning. Problem based learning (PBL), an approach characterised by small collaborative students groups analysing and solving 'real' professional problems (Cockrell & Caplow, 2000), is an example of an approach to group work learning. PBL attempts to use learning strategies that replicate real world engagement within professional teams and learning from peers. PBL attempts to link knowledge to practical application, and PBL promotes problem solving coupled with reflective practice.

Regardless of the name given to the group work task, or the complexity of the task, group learning essentially has as its foundation, the social constructivist viewpoint.

2.2.2 Social Constructivist Learning

The social constructivist viewpoint considers that learning is structured and restructured as individuals with different knowledge and experience engage in open communication and debate, and cooperation to learn. Pallinscar (1989) writes that:

“What unifies post-modern constructivist perspectives is rejection that the locus of knowledge is in the individual; learning and understanding are regarded as inherently social; and cultural activities and tools are regarded as integral to conceptual development”

Hanson and Sinclair (2008) writing about the uptake of social constructivist teaching in Australian universities comment that:

“The basic principle of the pragmatic, social constructivist approach to teaching is that students learn most effectively by engaging in carefully selected collaborative problem-solving activities, under the close supervision and coaching of an educator.”

Group learning provides for both cognitive and socio-cultural-emotional development to take place (Leveson, 1999; Livingston & Lynch, 2000), it allows students to share experiences with each other and therefore learn through and from experience (Kolb, 1984) and it allows for the co-construction of learning between learners (Pallinscar, 1989).

2.2.3 Rationale for Group Work: Workforce Perspective

The increased interest in group work within higher education comes from several interlinked, yet different, perspectives.

From an industrial-political workforce perspective, several significant Australian reviews undertaken in the early 1990's identified the changes required for the Australian workforce to remain globally competitive. It was perceived that there was misalignment between those skills emphasised as important by graduates, employers and industry, to those taught by universities. Some of the big changes predicted at this time were the move away from specialised jobs to broadly defined work roles, the devolving of

responsibility from individuals to teams, problem solving at the local devolved level, and greater knowledge creation for the entire workforce.

The Australian Business / Higher Education Round Table surveyed business and universities about the level of emphasis given to a series of graduate characteristics (B/HERT, 1992). Business rated communication skills, knowledge and skill creation, and the ability to work within teams as their three highest characteristics required of graduates (Table 2-2). Universities however ranked theoretical knowledge and capacity in current technologies as their highest characteristics, and communication and team work skills significantly less important. This result indicated that at this time there was significant misalignment of the graduate characteristics required by industry than those developed by universities.

Table 2-2: Graduate characteristics

Characteristics	Business ranking	University ranking
Communication skills (eg writing, speaking)	1	7
Capacity to learn new skills & procedures	2	5
Capacity for co-operation & teamwork	3	8
Capacity to make decisions & solve problems	4	3
Theoretical knowledge in professional field	7	1
Capacity to use computer technology	8	2

In a 1992 review which looked the key competencies required of the modern workforce to meet the changes in demand for the workforce (Mayer, 1992), the Australian Education Council developed seven key competencies to be included in all general education (Table 2-3). The requirement for *working with others and in teams* was highlighted as one of the seven key competencies, as was communication and planning and organisational competencies which also form part of the activities required in collaborative group work.

Table 2-3: Key competencies, Australian Education Council

1. Collecting, Analysing and Organising Information
2. Communicating Ideas and Information
3. Planning and Organising Activities
4. Working with Others and in Teams
5. Using Mathematical Ideas and Techniques
6. Solving Problems
7. Using Technology

The results of the two studies above, correlate well with the findings of the research, 'Skills Sought by Employers of Graduates' (NBEET, 1992). This two phase study, reviewed job advertisements for the knowledge, skills and attitudes described within the advertisements, as well as surveying organisations employing new graduates. The findings (Table 2-4) indicated that employers seek graduates with the ability to communicate and work effectively in a range of socially orientated and team work based situations.

Table 2-4: Skills sought by employers of graduates in order of importance

1. Communication skills: oral communication was the criteria most often used to screen applicants
2. Social skills: as demonstrated by leadership, interpersonal dealings, teamwork, supervision, negotiation, liaison
3. An ability to apply academic learning to the work environment: work experience is highly regarded over academic results

While these reports were some of the earliest reports to describe the graduate qualities required by industry, more current reports still agree with outcomes of these studies and promote the concept of graduate transferable skill sets.

In the 2007 Graduate Outlook Survey (Graduate Careers Australia, 2010) employers were surveyed for the core skills they seek in their employees. The core skills described in the responses included (Table 2-5):

Table 2-5: Core skills employers seek

➤ Time management and organisation
➤ Oral and written communication
➤ Team work
➤ Creative problem-solving
➤ Initiative and enterprise
➤ Critical and analytical thinking
➤ Ability to apply discipline knowledge and concepts
➤ Information gathering, evaluation and synthesis
➤ Emotional intelligence; interpersonal skills
➤ Adaptability.

Many of the core skills desired by employers are linked to the ability to work within a team environment. In the same survey employers were asked to define what the least desirable characteristics in graduates were (Table 2-6). Many of the least desirable characteristics are associated with an inability to work within socially constructed workplaces and teams.

The Australian workforce has indicated that it requires graduates to possess skills and attributes that are associated with the ability to work effectively in team work based and socially interactive workplaces.

Table 2-6: Least desirable characteristics in graduates

1. Poor attitude/lack of work ethic/poor approach to work
2. Lack of interpersonal and communication skills (written, oral, listening); lack of leadership skills
3. Lack of drive, motivation, enthusiasm and initiative
4. Arrogance/selfishness/aggression/dominating
5. Lack of commitment/high absenteeism/lack of loyalty
6. Inflexibility / inability to accept direction, challenges or change
7. Poor or inappropriate academic qualifications or results
8. Poor teamwork skills
9. Lack of emotional intelligence, self-awareness or self-confidence

2.2.4 Rationale for Group Work: Educational Perspective

Around the same time that business was signalling to the education sector that one of the needs for the development of the Australian workforce were graduates with experience and skill in team orientated decision making and working, and perhaps as a result of the recognition by universities of this requirement, the Australian education sector began to signal the requirement for higher education to implement enhanced teaching and learning strategies that engaged with those skills that may be transferable to a range of workplace situations.

The Higher Education Council report, Higher Education, Achieving Excellence (1992), reported that:

“...graduates need more than just a deep, however meaningful, but narrow set of discipline-specific skills. Instead they need the enabling characteristics which provide graduates with tools necessary for a constantly changing professional and intellectual environment.” (p 23)

The report went on to describe generic learning, or generic graduate outcomes as,

“...skills, personal attributes, and values which should be acquired by all graduates regardless of their discipline or field of study. In other words, they should represent the central achievements of higher education as a process.” (p 22)

The National Board of Employment, Education & Training (NBEET, 1994) defined teaching methods that encourage graduates to become lifelong learners as having the following five characteristics (Table 2-7):

Table 2-7: Teaching methods that develop lifelong learners

1. They make use of peer-assisted and self-directed learning
2. They include experiential and real world learning
3. They make use of resource-based and problem-based teaching
4. They encourage the development of reflective practice and critical self-awareness
5. As appropriate they make use of open learning and alternate delivery mechanisms

The educational context was moving then at this time from the traditional solo learner and teacher directed and focussed learning models, to providing student focussed real world learning, which engaged students in experiential and social constructivist learning opportunities that provided some reality to the workplaces they would enter post graduation.

To better prepare graduates to work cooperatively within group work situations many Australian universities have, since the issuing of these reports in the past two decades, introduced group work and/or social learning as part of the student learning experience and environment. Having to work within a social learning environment is seen to aid the development of: organisational skills including delegation, leadership and time management; the promotion of communication and behavioural skills including agreement, negotiation and decision making; allowing students to work in socially,

culturally and academically diverse collaborative groups; the promotion of self and peer learning; and group work allows students to investigate a topic in greater scope and to a richer depth (Flinders University, 2010).

Many universities include collaboration with other students as part of their learning experience and graduate outcomes. In describing the learning experience that students can attain, The University of Melbourne (2010) advertises that:

“Students can contribute to the creation and maintenance of an effective learning experience by:

- *collaborating with other students in learning;*
- *contributing to the University community and participating in life beyond the classroom;*
- *developing a capacity for tolerating complexity and, where appropriate, ambiguity;*
- *respecting the viewpoints of others;*
- *being reflective, creative, open-minded and receptive to new ideas;*
- *actively participating in discussion and debate;*
- *seeking support and guidance from staff when necessary;*
- *accepting the responsibility to move towards intellectual independence;*
- *being familiar with the Graduate Attributes and consciously striving to acquire them;*
- *respecting and complying with the conventions of academic scholarship, especially with regard to the authorship of ideas; and*
- *providing considered feedback to the University and its staff on the quality of teaching and University services.”*

The first seven descriptions on this list are recognised as describing elements of collaboration and team work.

In describing the graduate attributes that students should attain as a result of studying at the University of Newcastle, the University (2010a) has developed three domains of attributes for its graduates. In each of the three domains are a range of statements that

characterise the attributes. In each is a statement or reference to working with others in teams and communities or communicating with others:

- i.* Professionalism: an attitude or stance towards work and activity.
They will have the capacity to act effectively and ethically in decision-making and problem-solving and to work both autonomously *and collaboratively*.
- ii.* Community responsiveness: an attitude or stance towards society.
Graduates will be enabled to play effective and responsible roles *as members of local, national and global communities*.
- iii.* Scholarship: an attitude or stance towards knowledge and learning.
They will be able to *communicate* their knowledge effectively.

While many universities make statements such as those above about the importance of group work learning, there is very little evidence found in the literature that demonstrates that universities integrate group work as a priority area for student experience. There is also very little evidence that looks to assess the outcomes of group work learning and the conceptions that students hold for group work learning.

The outcomes of group work need to be researched so that their impact on students learning can be assessed.

2.3 RESEARCH METHODS APPROPRIATE FOR THIS RESEARCH

2.3.1 What is Required by the Research Methodology

This research seeks to analyse the 'lived experience' that students have as learners within a group work learning and assessment task. This research has as an emphasis and an approach, the interpretation and description of the group work experience from the perspective of the student, and not from the perspective of the researcher as an observer of the student experience. To do this it is necessary to take an emic (Harris, 1976) or second order (Marton, 1981) approach to both data collection and interpretation, where the data is collected and the analysis is undertaken from the viewpoint of the participant (in this case the student).

The data to be analysed therefore are the student's own descriptions of the experience of group work learning. The descriptions of learning may come in the form of interview based data or text based data. The analysis of these personally held and content laden descriptions of learning is a naturally qualitative process, where the researcher reflects upon and analyses the manifest or latent message as described by students within their responses. The analysis of the data requires methods that allow for the qualitative descriptive analysis of the messages given by the students to be reasoned from the specific situational context (group work learning) to the general meaning (learning outcomes) (Wiersma, 1995).

There are two lived experience research approaches that could be used within this research: they are phenomenology and phenomenography.

2.3.2 Phenomenology

Phenomenology has a rich history in qualitative research, and emerges from a philosophical viewpoint (Husserl, 1964), where lived experience is not described in terms of events or a reaction to or an expression of an experience, but rather from describing the life-world essence of an experience – what it means to be human within an experience. van Manen (1990) describes phenomenology as (p11):

“...the study of lived or existential meanings: it attempts to describe and interpret these meanings to a certain degree of depth and richness....

and

“Phenomenology is a human science (rather than a natural science) since the subject matter of phenomenological research is always the structures of meaning of the lived human world...”

In terms of phenomenological research van Manen (1990, p 36) indicates that:

“Lived experience is the starting point and end point...the aim of phenomenology is to transform lived experience into a textual expression of its essence – in such a way that the effect of the text is at once reflexive re-living and a reflective appropriation of something meaningful:...”

van Manen (1990) indicates that phenomenology is not an analytical science; it cannot be used to show causality, it cannot be used to problem solve, it cannot be used to establish functional relationships between outcomes, nor draw inferences nor make generalisations from its outcomes to the experiences of others. Phenomenology is not confined to a specific focus in the way that social and cultural anthropological studies, such as grounded theory, ethnography, biography and case studies, may focus, but is more universal in interpreting the essence of an experience.

The description and meaning, leading to understanding, of the life-world experience of individuals is the goal of phenomenological research (Carpenter, 2010).

The research described within this thesis differs from the philosophical position and methods of phenomenology in several ways.

This research has a specific focus and situational context: experience in group work learning. Rather than posing a life-world question from the phenomenological perspective such as “what does it mean to learn in a group?” this research asks a question from the context specific perspective, eg “what were your learning experiences as a result of working in a group?”.

Given the specific situational context of the group work learning task, it is likely that many of the experiences that individual students describe will be also be described, and therefore shared, by other students. It is therefore likely that within this research that it will be possible to describe the learning outcomes via the development of a series of qualitatively described categories of learning that are symbolic, and hold meaning, for all students undertaking the group work learning task.

Rather than researching the life-world meaning of individual students, it is intended that the outcomes of this student experience based research will be able to be generalised more broadly to design and plan more effective group work learning tasks in a range of collaborative group work learning situations, and answer specific research questions about the nature of learning within groups.

The aims of this research, and hence the methods used within this research, are more aligned to the research methods known as phenomenography and content analysis.

2.4 PHENOMENOGRAPHY

2.4.1 Overview of Phenomenography

Phenomenography has its origins in the work of a group of researchers at the Department of Education & Educational Research, Gothenburg University, Sweden. The researchers conducted experiments where students who read or learned particular academic work were invited to participate in open ended and semi-structured interviews, which were recorded and transcribed. In the interviews the students described in their words *their experiences or their reality* with what *they learned* or how they *went about learning*. These experiences, as described by the students, were subject to qualitative interpretive analysis with a view to describing the *experiences* of the students.

Marton (1986), one of the pioneers of Gothenburg phenomenographic research, describes phenomenography as:

“a research method adapted for mapping the qualitatively different ways in which people experience, conceptualise, perceive, and understand various aspects of, and phenomena in, the world around them.” (p. 31)

Researching the experience of participants from their viewpoint is central to phenomenography, with the focus of phenomenography being qualitatively describing the *essence of the experience* with and/or subsequent perceptions of the phenomenon (Hitchcock, 2006). Where phenomenography differs from other lived experience research methods, such as case studies which describes individual participants experiences, or phenomenology which treats research subjects' interpretations of reality as individual personalised worldviews requiring individual examination and reporting (Cresswell, 1998) and has the essence (description) of the phenomenon as its focus, lies with the primary phenomenographic notion that it is assumed that there are *only a limited number of ways that an experience with reality can be interpreted and described* by participants (Marton, 1981; Saljo, 1997). This leads to the idea in phenomenography that the way research subjects describe their experiences *can be mapped or categorised into a series of qualitatively different descriptions of the*

phenomena. This analysis represents the collective view of all participants to the experience and not a specific individual participant's perception to the experience.

The examination of the categories of qualitatively different descriptions then characterises the *concept* or *conceptions* of the phenomena held by the collective research participants. The examination of the categories of description, and conceptions described by these categories, indicates differences in the way a particular phenomena is experienced and explained by a cohort of participants (Walsh, 2000). With the outcomes of phenomenography research being the construction of categories of description that do not represent a single participants experiences, but rather the *range of experiences* of all participants, phenomenography can be seen to have developed from an empirical basis rather than theoretical or philosophical basis (Åkerlind, 2005).

While the analysis of data into categories of description is a naturally qualitative process requiring matching of the linguistic markers found within the data to the category of description (Pike, 1967), there is also a quantitative element to phenomenography whereby an analysis of the frequency of the individual categories of descriptions found in the totality of the data can be determined (Ellis, et al., 2006; Nuendorf, 2002).

The basic unit of description in early phenomenographic research was termed a *conception*, however it is also described as *ways of conceptualising*, *ways of experiencing*, *ways of seeing*, *ways of comprehending* and *ways of understanding* (Marton & Pong, 2005). In more recent times researchers have used the term *perception* to describe the reaction to an interpretation of experience (Lizzio, Wilson, & Simons, 2002; Segers, Nijhuis, & Gijsselaers, 2006).

Different types of phenomenography have been described in the literature. Five forms of phenomenography often described include (Hasselgren & Beach, 1997):

1. Experimental

this style of phenomenography is viewed as the early form of phenomenography where the outcomes of interest are guided by specific situational or pre-directed learning. Students undertake specific activities and

their experiences are recorded usually in open-ended and semi-structured interviews. These activities are analysed and categorised into a limited number of categories of outcome.

2. Discursive

this form of phenomenography is not directly related to an evaluation of pre-directed learning, and goes beyond any specific content of learning to look at learning more broadly. Some authors have called this form of phenomenography 'pure phenomenography'.

3. Naturalistic

this style of phenomenology is associated with the collection of data without direct involvement from the researcher. The usual setting is observational studies in a classroom situation (the natural setting) where the researcher observes and records the experiences of students with the phenomena under study, and later uses phenomenographic analysis.

4. Hermeneutic

this form of phenomenography is associated with interpreting data that were not originally made for the purpose of phenomenographic analysis. It attempts to review the interrelatedness of what was written and how it has been interpreted.

5. Phenomenological

while phenomenography is mostly associated with the categorisation of descriptions of experience, some researchers try to consider the relations between the experience and the essence of the experience to gain a broader world view. However this form of phenomenography is associated with the categorisation of experience by a collective of people.

John Bowden (Bowden, 2000) an Australian researcher with extensive experience in phenomenographic research, makes a distinction between types of phenomenography in terms of the research interest, these being:

1. Developmental Phenomenography

Bowden describes developmental phenomenography as having a particular or specific context. Examples include the understanding the fundamental

principles of physics, or the perception to a particular assessment strategy. The exploration of these experiences within the specific context enables evaluation or change to occur as a result of the findings. Developmental phenomenography is usually set in the formal educational setting and the outcomes of the research are used to make the planning of or the learning experience better for students.

2. Pure phenomenography

Bowden describes pure phenomenology as the study of how people can see various aspects of the reality where the concepts under study are everyday life phenomena. Examples of this definition include the experience with study or exam approach and process rather than specific course material phenomena.

It would appear that Bowden's developmental phenomenography aligns with the previous definition of experimental phenomenography (Hasselgren & Beach, 1997), and his definition of pure phenomenology aligns with the previous definition of discursive phenomenography.

What binds all forms of phenomenography are the central notions:

- that the research intention is to *interpret the experience* or reality of the participants to a phenomena
- that the experience described is *related to the context* that the phenomena occurs in
- that there *are only limited number of ways* that an experience with the phenomena can be described
- that the experiences described by participants can be formed into *qualitatively different descriptive categories that characterise the structural elements of the experience, and*
- that these qualitatively different structural elements of experience, when viewed and analysed for the deeper and more global meaning found in the responses, form a range of *conceptions to the phenomena* that are held by the participants, and that these conceptions are bound by structural or functional relationships, both within a conception and between each conception developed (Åkerlind, 2005; Marton, 1986).

2.4.2 Early Examples of Phenomenography

2.4.2.1 Approaches to Learning Research

Several of the most widely reported experiments on the qualitative outcomes of learning, using what was at the time the genesis of the phenomenography methodology, were undertaken by Martin and Säljö (1976a). These experiments were designed to:

“explore qualitative differences in what is learned and to describe the functional differences in the process of learning which give rise to the qualitative differences in outcome”

In one experiment, 40 university students were asked to read a series of readings. They were subsequently asked specific questions about the readings and more generally asked to explain what the readings were about. They were asked questions on how they tackled the process of reading and asked specific questions designed to assess what had been understood.

In another experiment, 30 university students were asked to read a newspaper article dealing with curriculum reform in Sweden. They were asked in a series of questions to recall the article as well as provide a summary of the article. To study the time effect on the level of processing on retention the students attended a follow-up interview approximately 5 weeks after the initial interview where they were asked the same questions.

These interviews with students were recorded, and the researchers listened and re-listened to the recording in an attempt to describe qualitative differences in aspects of the students learning. The recording allowed the researchers to study the whole pattern of the response, including hesitations and attempts at recall of information. This research uncovered differences in how students approached their learning and assessment, and the way that students processed information. They described these learning approaches as **deep level processing**, where students process learning material through understanding and comprehending, and **surface level processing**, where students utilise reproduction and rote learning as their learning process. Much work has been done since this time to describe how the effects of instructional style,

assessment task and socio-environmental factors affect approaches to learning (Svensson 1997). This early work is some of the most highly regarded, referenced and repeated research undertaken in the study of learning outcomes.

2.4.2.2 Conception of Learning Research

In another experiment, Marton and Säljö (1976b) randomly assigned 40 university students to one of 2 groups. The students were required to undertake the same readings and be prepared to answer questions on the readings. The 2 groups of students received examples of the questions they would be asked, with one group being given questions aimed at inducing deep learning processing, and the other group being given questions aimed at inducing surface learning processing. Both groups were also required to recall and summarise the main points, and a semi-structured interview was also conducted to gather data on the effect of the experimental manipulation on the level of processing. All sessions were recorded on tape and transcribed the purpose of analysis. Categorisation classifications of responses were carried out by two independent judges according to instructions given by the authors.

The results of this research suggested that students adopt an approach to learning (deep to superficial processing) determined by their *conception* of the work required or required of their learning to complete a task. Although many students in this study were apparently capable of using deep or surface strategies they matched their learning approach to the task to the *conception of learning* they held for the task. This research noted the importance of recognising the link between learning, teaching and assessment strategies in promoting higher levels of conception of learning.

In research, the aim of which was to describe the subjective conceptions of learning amongst a group of people with very different learning experiences, and the relationship of conception of learning to the adoption of a learning strategy, Säljö (1979), analysed the experience of 90 people as learners, with a wide range of learning experience, with academic learning and/or the academic learning environment. In this research Säljö interviewed adult students about their learning experience at university, and as part of the interview, which was recorded and transcribed, he asked a range of questions including; questions about the student's own learning procedures and methods; questions related more generally to learning such as why are some students

better learners or more successful at learning than others. On completion of this wide ranging discussion Säljö asked the general question:

“What do you actually mean by learning?”

The analysis of the responses to this specific question produced five categories of qualitatively different descriptions which he denoted as the 5 different conceptions of learning held by the students.

Säljö (1979) noted that the variation in conceptions of learning had a strong resemblance to the variation in approaches to learning (deep to superficial approach), and considered the assumption that people and students adopt a learning approach based on their conception of the learning required for the task.

Further research, using similar techniques to Säljö validated these 5 conceptions of learning in a variety of learning settings (Van Rossum, Deijkers, & Hamer, 1985b; Van Rossum & Schenk, 1984), and Marton, Dall’Alba and Beaty (1993) extended the list of conceptions by adding a sixth conception. These six conceptions formed the basis for ongoing research into conceptions of learning and have been replicated and measured in many studies. The way a student individually interpreted their learning was thought to be described by one of the conceptions listed and their corresponding characteristics (Table 2-8).

These conceptions are seen as having a natural order or hierarchy of learning with:

- Conception A (*learning as an increase in knowledge*) and B (learning as memorising and reproduction) being associated with acquiring factual information from ready-made sources for the purpose of reproduction
- Conception C (learning as applying) being associated with learning as having a purpose beyond acquisition, and
- Conception D (learning as understanding), E (learning as seeing something a different way) and F (learning as changing a person) being associated with higher independent and reflective learning.

Table 2-8: **Conceptions of Learning and their characterisation**

Conception A: Learning as an increase in knowledge.
<ul style="list-style-type: none">• Characteristics - Its vagueness, taken-for-granted nature.
Conception B: Learning as Memorizing and Reproducing
<ul style="list-style-type: none">• Characteristics - Related to anticipated reproduction for control or assessment.
Conception C: Learning as Applying
<ul style="list-style-type: none">• Characteristics - Emphasis on retrieval and application, ability to apply knowledge or procedure.
Conception D: Learning as Understanding
<ul style="list-style-type: none">• Characteristics – Grasping the meaning.
Conception E: Learning as seeing something in a different way
<ul style="list-style-type: none">• Characteristics – abstraction and reality leading to change, looking with a different perspective.
Conception F: Learning as Changing as a Person
<ul style="list-style-type: none">• Characteristics – developing insights to, seeing the world differently.

2.4.2.3 Impact of the Early Phenomenography Research

The results of the research described above have been some of the most influential in education based research, with educational researchers moving to develop learning and instructional models that are recognised as promoting a deep approach to learning and/or higher order conceptions. Phenomenography has been recognised as a research method which allows the experience participants have with various phenomena to be described, generalised and tested under various conditions. Phenomenography has extended from its origins in education into new disciplines such as health care.

Examples of the use of phenomenology since its development, in a range of different situations, include:

Table 2-9: Examples of phenomenographic research

Students and research	(Marton & Svensson, 1979)
Students and study strategy and learning outcomes	(Van Rossum & Schenk, 1984)
Academics conceptions of science learning & teaching in physics	(Prosser, et al., 1994)
Exploring understanding in health care (practitioners, patients)	(Barnard, McCosker, & Gerber, 1999)
Students experience of cheating Students and academics experiences of accounting	(Ashworth & Lucas, 2000)
Students and online and face-to-face discussions	(Ellis, et al., 2006)

2.4.3 Data Collection Methods

2.4.3.1 Interviews

The most common data collection method used in phenomenographic educational research is the interview. Researchers usually ask participants or students a series of unstructured or open ended questions, and/or semi-structured questions, and the interview is recorded.

The unstructured or open-ended response questions allow students to describe in their own words their experience with or reality of some form of education. Unstructured and open ended probing questions are useful in situations where the range of discussion is unknown to the researcher prior to the commencement of the interview. Semi-structured questions allow students to comment specifically on aspects of their learning that might arise during the broader interview. Semi structured questions are useful when the researcher knows the questions they wish to ask but cannot predict the range of possible answers, and they provide direction in an interview when there is a particular issue to be addressed (Morse & Field, 1995)

Limitations of the intensive interview research methodology with regard to this current research include:

- the lengthy time taken to interview, transcribe and analyse the data, which in turn
- generally limits the sample sizes used with this method, and
- that the method does not provide for reasonably quick feedback in the teaching and learning setting.

Other limitations include:

- the anonymity of participants and responses, given that the research participants actively engage with a member of the research team in the interview,
- that responding to a question is a normal part of communication and therefore participants may respond to a question out of courtesy rather than because they have a view on the question being asked
- that consciously or subconsciously researchers may question participants in a way, or in an effort, to gain the answers the researchers were wanting from participants

2.4.3.2 Questionnaires

In more recent times there has been a shift towards using open ended questionnaires in phenomenographic research, and indeed in qualitative research methods more generally. Open ended questionnaires allow students to describe their experiences in a written response. Questionnaires generally have the advantage of being able to survey large cohorts of students and, perhaps because of that, more accurate generalizations are able to be supported from the data (Bowling, 2002). Akerlind (2005) also suggests that, in comparison to extensive interviewing, questionnaires concentrate the data into a 'pool of meaning' allowing the meaningful data to be separated and evaluated from the surrounding less meaningful parts of the transcript.

The analysis of the questionnaire responses requires the responses to be read, and the meaning given in the responses to be developed and classified into conception of learning categories. This style of analysis lends itself to coding by raters trained in the coding but blinded from the research question (Morse & Field, 1995).

Examples of the use of questionnaires in phenomenographic research include:

Crawford et al (1994) used one open-ended question to evaluate student's *conception to mathematics*. Approximately 300, year 1 students, were asked the question *"Think about the maths you've done so far. What do you think mathematics is?"*

Duke et al (1998) used an open ended questionnaire to survey nursing student's conceptions to a Problem Based Learning (PBL) curriculum within a subject, and to look at conceptions of content within a particular subject. The PBL curriculum was evaluated with the question *"What does PBL mean to you in this subject?"*, and the subject was reviewed by the question *"If you had a friend who had never done this subject before and asked you to tell them what it was about, what would you say?"*.

Ellis et al (2006) used an open ended questionnaire to evaluate the conceptions of learning and learning strategy of 50 (48% response rate) students undertaking a blended learning experience in the form of online learning and face to face. The question asked was *"What did you learn through discussions in your course?"*

2.4.3.3 Inventories

In educational research, inventories are questionnaires that provide a series of descriptive statements about an aspect of teaching, learning or engagement with learning, that students respond to using forced choice or closed ended responses. The development of the descriptive statements about the phenomena usually have arisen from previous research and analysis of the phenomena using open ended descriptive research and analysis methods, and the closed ended responses often take the form of five point Likert scale measures of agreement or disagreement with the statement. The responses of students are then related to or categorised into a series of pre-constructed categories of description of the outcome being studied.

Inventories have as their foundation psychometric methods, where the study method and analysis meets the scientific definitions for validity and reliability, and where scales and measures are subject to a range of analytical process such as factor analysis and multidimensional scaling (Meyer & Boulton-Lewis, 1999; Morrison, 1990), and the analysis of which allows for statistical modelling of student learning.

There are a wide range of inventories used in educational research. Perhaps the most frequently encountered inventories are those used to review student's cognitive, metacognitive, and motivational characteristics to learning. Examples of these include the Study Process Questionnaire (SPQ) (Biggs, 1987), the Approaches to Study Inventory (ASI) (Entwistle & Ramsden, 1983) and the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich & De Groot, 1990).

In terms of Conception of Learning inventories there are two inventories that are commonly cited, the Reflection on Learning Inventory (RoLI) (Meyer, 2004) and the Conceptions of Learning Inventory (CLT) (Purdie & Hattie, 2002)

The RoLI (version 10) has 16 subscales each consisting of five items (questions or statements) which allow for the discernment of various levels of learning conceptions. The 16 subscales, which have been derived from a range of prior studies (see reference for full details), are described by Meyer (2004) as being conceptually discrete, however, they are not conceptually independent due to the interrelated nature of the learning processes described.

The CLT is a 32 item questionnaire, the responses to which are analysed into 6 conception of learning descriptions. The categorical descriptions have been formed from previous work by the authors and correlated against conception descriptions found in the research of other phenomenographic research (Marton, et al., 1993; Tynjala, 1997).

While inventories allow for an empirical model of student learning evaluation to be implemented, the nature of the closed ended statements and responses do not provide freedom in responding to questions or statements in ways that may be different from those captured in the inventory statements. Furthermore inventories are somewhat limited in their generalisation to research situations that may be considered significantly different from the situation that they were designed for (eg group work analysis versus solo learning situations). For these reasons inventories have not been considered for use within this study.

2.4.4 Data analysis methods

Perhaps the largest issue to be overcome when conducting open ended phenomenological research, and analysing verbal and/or written qualitative messages, is that there are no physical and countable units of data that are naturally present and observable as there are in some sciences. The verbal or written messages contained within the responses need to be analysed and units of measure interpreted from the data.

In the early research publications on phenomenology there was very little description of the analysis method used to interpret the transcribed interviews into units of data or categories of descriptions. There was little to no information provided on the unitisation of data from the transcribed text that were subject to interpretation (words, utterances, sentences, whole text), how categories of qualitatively different descriptions were formed, and how these categories were interpreted into conceptions of the phenomena. When this is coupled with the perception that the phenomenographic researcher could influence the analysis and the interpretation of the results and the formation of purposefully constructed hierarchical structures based not on the emergent data but on priori expectations, phenomenology was seen to not have a rigorous methodology or reliable or valid outcomes. This is the case generally in qualitative research where issues such as the validity and reliability, and the criteria for the evaluation of qualitative research, are discussed (Angen, 2000; Hammersley, 2007; Kitto, et al., 2008).

In more recent years researchers have debated and provided a framework for phenomenographic data analysis that is housed within, and akin to, other qualitative scientific methods (Åkerlind, 2005; Marton, 1986; Marton & Pong, 2005). The data analysis methods used in phenomenography are not dissimilar to the analysis methods used in other descriptive and explorative qualitative research methods, and are designed on a framework of:

- A starting point where the researcher holds **no prior beliefs** about the possible outcomes and the analysis is **conducted with open mindedness** with the view to reporting the experiences of others.

- A **sampling framework** that is adequate to provide well informed outcomes or allow for generalisations of the outcomes beyond the sample.
- An adequate description of the **the data** to be evaluated. Åkerlind (2005 pg 327) describes two common variations in the unitisation of data within phenomenology:

“from considering the whole transcript (or large sections of the whole) related to a particular issue (Bowden, 1994a, 1994b; Prosser, 1994; Bowden & Green, in press) to the selection of smaller excerpts or quotes seen as representing particular meanings (Svensson & Theman, 1983; Marton, 1986). In the latter approach, the smaller chunks are separated from the transcript and combined for analysis in one decontextualized ‘pool of meanings’, though these segments are interpreted within the larger interview context.”

- The **search for meaning** within the data (in the responses or stories or experiences of participants). Åkerlind (2005, pg 325) describes the process as follows:

“...reading through transcripts is characterized by a high degree of openness to possible meanings, subsequent readings becoming more focused on particular aspects or criteria, but still within a framework of openness to new interpretations, and the ultimate aim of illuminating the whole by focusing on different perspectives at different times. The whole process is a strongly iterative and comparative one, involving the continual sorting and resorting of data, plus ongoing comparisons between the data and the developing categories of description, as well as between the categories themselves.”

- The **formation of categories of description** of the experience, based on the similarities and differences uncovered in the search for meaning within the responses of participants, and residing within the context of the experience. These categories of perception or conception are the results of phenomemographic research.

2.4.5 Summary of the Phenomenographic Research Process

There is a purely qualitative element to phenomenography, in that researchers ask participants to describe in their own words their experiences with reality. Researchers then need to interpret the deep personal meaning people attribute to their spoken or written word, into descriptions of the experience. This is distinctly the same as many other qualitative research models where interpretation from the perspective of the participant is the goal.

The mapping or categorisation of the different descriptions into designated meaning groupings can allow, depending on what units of data are reported on in the analysis, for weighted thematic or quantitative analysis to occur, however this is not usually the purpose of the pure phenomenographic analysis, although it is common in content analysis research.

2.5 CONTENT ANALYSIS

2.5.1 Methodological Basis of Content Analysis

There is a long history of scholars attempting to analyse recorded messages. The biblical writings and ancient historical records, for example, have all been subject to the analysis of the text contained within their documents. In more modern times, researchers have extended the analysis of messages to the newer methods of communication such as the mass media, and visual and audio media, the analysis of symbols and messages contained with art, cryptology, literature and advertising, and to examine the interfaces of communication (Nuendorf, 2002).

Content analysis is the name given to a broad range of flexible techniques and methods that can be used to analyse text and other message forms (Cavanagh, 1997).

Text (and the other message forms that contain the data to be analysed) can be analysed for the manifest content, that is, the elements of the message that are present or countable or able to be categorically described and/or grouped. Examples of manifest content include the direct interpretation of or the counting of key words or phrases contained within a message. Text (or data) can also be analysed for the latent content, that is, the concepts that are represented by the deeper meaning found in the

text or the form of the text (or message) and that are derived from the inferences contained within the message and that provide deep insight into the phenomena being studied. Examples of latent content can include the building of structural schemas that describe complex emotional or social organisation or experiences. The manifest - latent message construct is analogous to the surface – deep language construct, where some words and messages need to be interpreted quite literally, and some messages contain deeper meanings. (Gray & Densten, 1998; Krippendorff, 2004).

Krippendorff (1980), an author that has pioneered and described standardised methods for content analysis, suggests that:

“Content analysis is a research technique for making replicable and valid inferences from data to their context.”

This definition ties the analysis of the message to the context of the message or *“the conceptual environment of a text”* (Krippendorff 2004, page 33). This definition also links content analysis to the scientific method where the analysis should be reliable and able to be reproduced, and the common expectations of validity checking and trustworthiness of the results are expected.

Content analysis allows for both quantitative and qualitative interpretation and analysis, and it can be used in mixed methods research analysis allowing for phenomena to be viewed in different but complimentary ways.

In quantitative research, content analysis is used in a deductive, positivist tradition. In this form hypotheses about the phenomena under study can be established as a priori, and data is collected either retrospectively or prospectively. Random or purposeful sampling of the data, or of the cohorts from which the data is drawn, is used so that generalisations about the analysis can be made. Analysis involves either the development of coding schemes or the use of already established coding schemes that allow the data to be evaluated and outcomes to be assessed within the confines of the hypothesis to be tested. The process involves coding of categories of description, validity and reliability checking, statistical interpretation and presentation of data, and the establishment of relationships between the measures (White & Marsh, 2006).

Usually in quantitative content the goal is usually to measure the frequency with which phenomena appears in a message. Quantitative analysis can be used to count specific words or phrases, or words associated with particular meanings, in speeches and written documents; to measure the frequency of particular images or colours in presenting in visual media and advertising; to count the numbers of times a particular personality trait, or body action, or image is presented to the audience in video media such as movie and music video clips; to seek from customers their views on product images used in marketing exercises.

In qualitative content analysis the researcher focuses on humanistic phenomena, and the researcher is looking to identify patterns and/or concepts and/or themes from the qualitative descriptions contained within the data being analysed. Qualitative content analysis seeks to establish the units of measure, which may be purely qualitative descriptions, contained within a message. These qualitative descriptors may not be known prior to the analysis of the data and therefore exploratory research questions may guide the analysis (White & Marsh, 2006).

To ensure that the content analysis methodology and subsequent results meet the requirements of objectivity, reliability, validity and trustworthiness, researchers have developed content analysis frameworks that provide linearity with traditional scientific or social science research methods. A content analysis may begin either with a researcher asking a research question or developing a hypothesis about a phenomenon. The question or hypothesis may be very specific and designed around a required known or theorised outcome, or it may be an open-ended question where the goal is to determine new conceptual categories of understanding. In analysing the message the researcher looks for evidence to either support the question or hypothesis, or generates previously unknown data. Like all research the questions or hypothesis are formed with regard to the context of the researcher's background or interest, but also the context from which the message is taken.

To increase the reliability and validity of the method, content analysis is usually linked with the establishment of or use of coding schemes to code all data. The coding scheme represents a set of rules for coding and code books are often written to guide the analysis. The coding scheme may be an already established coding scheme or a coding scheme purposefully written and designed to match the hypothesis. In

exploratory content analysis it may be formed from an initial and continual analysis of the data from which interpretations emerge.

The analysis then takes the form of examining the data, and coding units of the data into qualitatively described distinct categories (Cavanagh, 1997; Gray & Densten, 1998; Krippendorff, 2004).

2.5.2 Data Analysis Methods

2.5.2.1 Building Categories of Description

In text based content analysis, such as that which forms this thesis, the researcher reads the entire data set of text or a representative sample of the data set using a saturation sampling process. With the question or hypothesis in mind they look for evidence within the text to support the question or hypothesis. This may be done by counting the number of times the phenomena under study, or words associated with the phenomena, is noted in the text (purely a quantitative analysis), or by thematic analysis where the text is evaluated and reflected upon for the themes or topics or information that emerge from the text as it is read and re-read (purely a qualitative analysis). In either case the researcher writes down and clusters important words or themes that are found within or emerge from the text to form descriptive categories of data related to the phenomena under study (Lincoln & Guba, 1985; Patton, 1987).

In clustering items into descriptive categories, two issues need to be addressed and reviewed constantly:

1/ that the categories of description that arise from the analysis need to be mutually exclusive so that an item related to the phenomena under study can only fit into one descriptive category, and

2/ all meaningful data within the text being evaluated should be able to be placed into a descriptive category.

On completion of the first round of clustering of items into categories, all data within each category are re-reviewed in their entirety to ensure that they meet the two requirements mentioned. The result of this process is usually the formation of the major categories of description and the sub-category descriptions that characterise and

describe the phenomena, or the fitting of an existing categorisation system to the analysis. In some content analysis this is where the process ends - with the establishment of previously unknown major categories of information from a text.

2.5.2.2 Coding for Frequencies

Where the goal of a content analysis is to quantify the frequencies, or rankings, or priorities of the categories and their sub-units, so that a deeper level of analysis can be applied to the data and understanding reached on the most important outcomes related to the analysis, then researchers construct a coding scheme and construct a code book to allow all variables (categories and their sub-units) to be coded, quantified and statistically analysed (Krippendorff, 2004). Coding is usually done by two coders, with qualifications suitable for the coding process, who are blinded to the research question and have been trained in the coding process. Blind coding is used to minimize or eliminate any bias the primary researcher may bring to the coding process and the research results. Pilot testing of the coding and coders is usually undertaken to ensure that the methodology yields results in line with the research questions being asked, and that there is a high level of inter-coder agreement between the coders providing for reliable results.

2.5.3 Validity Checking and/or Trustworthiness of the Data

All data is subject to validity and reliability assessment. Content and face validity of the major categories established by the researcher is assessed by having a second researcher to read the data set and construct their own major categories. Once this is done the two sets of categories are examined for level of association with each other. Where there may be items of difference between the two categorizations the two researchers discuss these differences and reach a consensus set of categories. When the research progresses to full coding of all sub-units of data construct validity and reliability of the research method is undertaken by assessing the level of agreement between the two coders.

Finally the data is subject to statistical analysis and the researcher summarises the results and makes inferences from the analysis to the research question or hypothesis posed.

2.5.4 Examples of Content Analysis Research

Caplow, Donaldson, Kardash and Hosokawa (1997) used content analysis methods to analyse medical student's conception of their learning within a PBL curriculum. The data for analysis was the evaluation of 15 student journals, video tapes of 5 PBL sessions, two focus group interviews with 15 students, two open ended questionnaires (n=14) and in depth interviews with two PBL tutors. The authors analysed the data through a process of categorisation data by the "*coherent and important examples, themes and patterns* (pg 442)" identified in the responses of students. The analysis revealed three major thematic categories of students' conceptions of learning in PBL: awareness and expectations; efficiency and expertise; and the role of the tutor.

Müller-Staub, Lavin, Needham, and van Achtberg (2006) used a thematic content analysis to systematically review and categorise the outcomes of nursing diagnostics. The data for the analysis was 36 journal articles, from a sample of 395 abstracts, uncovered in a systematic review of the Medline, CINAHL and Cochrane databases. A thematic content analysis of the journals articles was performed on four pre-defined themes associated with the research aims: the effects of nursing diagnostics on the quality of patient assessment; frequency of the documentation of nursing diagnosis; accuracy of nursing diagnoses and the inclusion of related signs/symptoms and aetiologies; coherence among reported nursing diagnoses, interventions and their effect on outcomes.

The methodology has been also been used in a range of other situations where text and text based narration needs careful and systematic analysis, including the library and information sciences (White & Marsh, 2006), in reviews of gifted children's programs (Van Tassel-Baska, 2006), and in the review of nurses' experience of caring for patients who self harm (Wilfstrand, Lindgren, Gilje, & Olofsson, 2007).

2.6 SUMMARY OF BACKGROUND TO THE STUDY

This project seeks to uncover the important content of learning, and the conceptions of learning held by students, when they engage in group work learning. Phenomenography is an appropriate methodology that will allow the experiences of students to be reviewed from their perspective. Two processes occur within the phenomenographic analysis of group work experience: the first is a qualitative analysis

of the descriptions of learning provided by the students so that the structural elements of learning and their characterisation (content of learning) can be described, and the second is a reflective analysis of the referential meaning found within the responses and the characterisations of the structural elements of learning.

Content analysis is an analytical method that can be used to thematically analyse and categorise the lived experience responses of participants. In this research it is used within the phenomenographic analysis to form categories of description of the structural elements of group work learning, and it is also used to examine the interest orientation of students when self selecting the topic for their research poster.

3. METHODS STUDY 1

3.1 OVERVIEW OF STUDY 1

Study one was a longitudinal study conducted from 1997 to 2002. The study involved the development and implementation of a collaborative group work learning and assessment task. The task was designed to provide students with the experience of working with a group of fellow students over a 10 week semester. The task allowed students to express their interest about their academic and professional world by freely choosing the topic for their group task and developing a research question which they worked as a group to answer. To gather meaningful and personal data about the student's individual learning in the group task, students were asked to describe in a series of short written responses what their important and personal learning outcomes associated with the group work were.

The data analysed within this research were the written qualitative descriptors of important and personal learning when working in a group work environment, and the academic or professional world interests described within the research question that students developed and that guided the group work task.

As no prior theories and no pre-existing analysis schemes were uncovered in the literature that would allow for the collection and analysis of student nominated important and personal learning, and the exploration of dimensions of interest, within group or social learning situations, it was necessary to design a data collection and analytical framework.

The research reported within study 1, which aims to describe the experiences of students within a group work learning and assessment task, is undertaken in a more naturalistic research setting than has previously been reported, and borrows heavily from the phenomenographic and interpretive perspective (Bowden, 2000; Krippendorf, 2004; Marton & Saljo, 1976b; R. Saljo, 1979; Van Rossum, et al., 1985b). In this study students have provided their interpretations of their experience within the group work task, and their learning outcomes and experiences have been explored and interpreted to establish the content of their learning (structural elements of learning) and the conception of learning that students hold when learning in groups (referential meaning of learning).

To explore the students' experience with group work, three separate analyses were undertaken and the method to conduct each is described within this chapter:

Analysis 1: Exploring the Content of and characterisation of Group Work Learning

Analysis 2: Exploring the Conception of Group Work Learning

Analysis 3: Exploring the Interest Orientation of Students

This chapter presents the results for Study 1.

3.2 HUMAN RESEARCH ETHICS

Approval for the development of and the initial research of the group work poster task was provided by the University of Newcastle's Human Research Ethics Committee (HREC) at the commencement of the development of the task in 1996. Further approval was sought in 2006 for the analysis of the entire student response data as part of this PhD. An application to the HREC was made and the HREC considered that the research fell into the category of Quality Assurance or Program Evaluation (Appendix 1).

3.3 THE COLLABORATIVE GROUP WORK TASK

The collaborative group work learning and assessment task, which forms the basis of this research, is known as the Poster Development and Presentation Task. The poster task requires students to work within a group of 4-5 students from their professional degree, to develop a conference poster that examines an aspect of academic or professional knowledge or practice. The students work together over 10 weeks to complete the task, and the task includes a learning phase and an assessment phase.

The learning phase involves all students discussing topics that they are interested in researching in week 1 of the task and freely choosing and developing their topic to research, with students forming collaborative research groups based on their shared interest for a specific topic. The topic is then researched from an evidence-based perspective with students firstly formulating a meaningful research question on the topic to be investigated, and then secondly collecting and critiquing a range of evidence to answer the research question. The student groups assume the responsibility for the

collection and critique of the evidence, as well as learning the requirements for effective poster design and production. The student groups have an academic staff member as a project supervisor, whose role is to ensure the group maintains focus and work towards the production of the poster. The task is designed to engage students with each other and benefit from the deeper learning that can be acquired from social constructivist learning (Hanson & Sinclair, 2008; Johnson & Johnson, 2003; Pallinscar, 1989).

The topic of the poster learning and assessment task is therefore guided by the research question students asked of themselves, which was developed from the self nominated interest students indicated that had about their professional or academic world (Deci, et al., 1991; Schiefele, 1991).

For the assessment phase, students within their groups assess the posters created by all other student groups. Students then, on reflection of the quality of the work of all other groups (Schon, 1987), assess their own work. The poster is assessed using an assessment rubric developed by the academic staff. The students are provided with the assessment rubric at the beginning of the project. The assessment focuses on the content of the poster, the presentation aspects of the poster in engaging its intended audience, and the requirements for academic presentation of information in a poster format. The mark given to each group's poster by all other groups is averaged to obtain the poster mark. Peer assessment is used to provide feedback to group members about their level of activity within the project and the peer assessment can be used if necessary to moderate the marks of individual students (Johnston & Miles, 2004)

On completion of all aspects of the poster task students are asked to complete a questionnaire that seeks to gather information about their important and personal learning (discussed in detail in section 3.5.1). It is the information provided by students on this questionnaire that is analysed within study 1.

A copy of the Poster Learning and Assessment Task, along with the assessment forms used, as provided to students, is attached as Appendix 2.

3.4 STUDY PARTICIPANTS

Study participants are students enrolled in the Bachelor of Medical Radiation Science (BMedRadSci) degrees, at the University of Newcastle, Australia. From 1997-2002 the poster task was undertaken in a year 2 semester 2 professional methods course within these degrees. To complete the task students needed to be enrolled in one of the degrees and also in the respective year 2 semester 2 professional methods course that this task sits within. The names of the degrees and the year 2 semester 2 courses are shown below:

- I. The Bachelor of Medical Radiation Science (Diagnostic Radiography)
 - 1997-2000 Diagnostic Radiography Techniques I
 - 2001-2002 Diagnostic Radiography Methods IIB
- II. The Bachelor of Medical Radiation Science (Nuclear Medicine)
 - 1997-2000 Nuclear Medicine Techniques I
 - 2001-2002 Nuclear Medicine Methods IIB
- III. The Bachelor of Medical Radiation Science (Radiation Therapy)
 - 1997-2000 Radiation Therapy Techniques I
 - 2001-2002 Radiation Therapy Methods IIB

Note: Course names and codes were changed in 2001 in line with the University direction to remove year long courses and introduce only semester based courses. In 2001, all MRS profession specific courses were semesterised into A (semester 1) & B (semester 2) components and the name Techniques was replaced by Methods. Here-under the Methods name will be used to include the earlier Techniques course.

The Diagnostic Radiography degree and the Diagnostic Radiography Methods course ran every year from 1997 to 2002. The Nuclear Medicine and Radiation Therapy degree, and their Methods courses, ran as alternate programs and courses until 2001.

This alternate program offering was due to the size of the professions at this time and the availability of clinical placements, and the numbers of undergraduate places made available at the University of Newcastle. The Nuclear Medicine degree and the Methods course were run in 1998, 2000 and 2002. The Radiation Therapy degree and Methods course were run in 1997, 1999, and 2001.

Eligible participants for this research were those students who were enrolled in one of the three degrees and the program specific year 2 Methods course, and who also completed the poster task.

3.5 DEVELOPMENT OF RESEARCH QUESTIONS

As stated previously, no prior theories existed, and the range of outcomes could not be predicted, with regard to the important and personal learning outcomes for university students working in a group work environment, or the domains of academic or professional interest for medical radiation science students. This research would require the use of data collection and analysis techniques that would allow outcomes and theories to emerge from the data. To guide the development of data collection methods and the subsequent examination of the responses a series of broad open ended questions were developed.

Research Question 1: The Conceptions of Group Work Learning

What are the referential conceptions of important and personal learning that develop as a result of completion of a group work learning and assessment task?

Research Question 2: The Content of Group Work Learning

What are the categories of important and personal learning that students acquire during a group work learning and assessment task?

Research Question 3: Interest Orientated Learning

What are the dimensions of interest of students, of different health professional programs, when provided within the opportunity to freely select the topic of their learning?

3.6 DATA COLLECTION

3.6.1 Questionnaire Design

The data to be collected and analysed, needed to allow students to express in their words the personal and important learning they had gained while working within their groups to complete the task. Although some of the broad dimensions of the students' responses could be expected, eg issues about the topic of their poster, issues about group work etc, the specific descriptions of the group work experience were unknown and could not be anticipated, and therefore it was necessary to use a data collection and response format that allowed students to provide their meaningful responses.

On completion of the project in week 10 of the semester, all study participants left the University to attend 5 weeks of professional placement in locations across the state of New South Wales (NSW) and Australia. Immediately following the five weeks of professional placement students commenced three weeks of formal end of year university exams, followed by the end of year summer vacation. This time away from campus really excluded the use of focus groups or in depth interviewing as not only were the students not present to participate in these activities, but there would be the potential for recall bias (Hennekens & Buring, 1987), where time away from the activity could lead to poor or uncertain recollection of the issues effecting the students at the time of the group work task.

There was also a very real likelihood that some of the important learning that students may nominate could include issues of negative group relationships involving conflict development and resolution. These negative and perhaps embarrassing experiences may cause participants to be reluctant to express their true feelings in a focus group or interview (Morse & Field, 1995). The issues of recall bias and possible reluctance to openly discuss negative relationship issues mitigated against the use of focus groups or interviews.

The method used to collect student feedback about their learning needed to be appropriate to the poster project, and given that the task itself was in written form and that all assessment information about the task was also in written form, it was decided to use a questionnaire.

The forced choice questionnaire, where students responded to closed ended statements, was not considered an appropriate questionnaire type given that the issues of importance to students could not be predicted and therefore meaningful questions could not be written. Forced choice responses would not allow students to express in their words their important learning.

Open ended written response questionnaires were considered appropriate as open ended responses would allow students to describe in their words their important and personal learning. Open ended responses allow for freedom in responding, and therefore the data is more personally meaningful. The open ended responses would represent the students' qualitative descriptors of learning. Two forms of open ended responses were considered:

1. Open ended free form written response questionnaire
2. Open ended short response questionnaire.

Open ended free form responses allow students to describe their learning outcomes in their own words. These response types result in sentences and paragraphs and possibly pages of information that require analysis, and while the information provided would include qualitative descriptors of learning outcomes, free form open ended responses can be time consuming to complete and may result in low numbers of responses. Free form responses are potentially difficult to analyse given the vastness of information that can be contained in the response, and therefore they do not provide a lecturer (in this educational situation) with rapid enough feedback to react to feedback and enact on issues as they arise. As with the open ended interview used in early phenomenographic research, because there are no limits on the response length you can gain multiple conceptions within a single response as well as unnecessary information in the response. Where multiple and sometimes competing conceptions are present with a lengthy response format, analysis is usually aimed towards describing the highest conception or idea held within the data rather than analysis of multiple and/or competing concepts. This then gives rise to increasing levels of difficulty in determining what really is the primary conception held for learning (Fuller, 1999).

Open ended short answer responses also allow students to write or list their learning outcomes in their own words. Short answer open ended questions can be completed

quickly and therefore may be associated with increased response rates over free form response questionnaires. Short response questionnaires can allow for the collection of several different responses from individual students, building a database of responses, allowing for deeper understanding of the overall effect of learning. Short response questionnaires are simpler than free form to analyse and they can provide reasonably quick feedback. For these reasons the decision was made to use a questionnaire designed around multiple short answer responses.

To allow students to describe in their own words the most important things they had learned during the 10 week Poster Task, a simple question was designed which required short, free choice, open ended responses. It was intended that the short answer responses would be written as a qualitative descriptor of what students considered their important and personal learning outcomes.

The question asked was:

The 3 most important things I learnt undertaking this project were...

To ensure that the question had personal meaning for students the question was written from the emic perspective (see discussion Chapter 1 page 5) with the inclusion of the words ‘...***things I learnt*** ...’. In an attempt to analyse the variation in the most important and personal experiences that students had while completing the task, students were asked to provide three responses to the question. In an attempt to avoid the responses becoming overly complex in their description of the experience and limit each response to a description of a single experience, a single line space was provided for each answer.

The questionnaire asked students to write their student number, group number (poster groups were given group numbers) and poster research question on the questionnaire. This was done for two reasons: firstly so that individual responses could be matched to the degree that the student was in; and secondly so that the responses from individual students working within groups could be collated into groups.

The text responses provided by students on the questionnaire would allow the three statements of what students described as the most important things that they learned during the group work task, to be analysed for both the content of learning (structural

elements of learning) and the conception held by the students (referential elements of learning) to the group work learning task. The poster research questions which were written on the questionnaires would allow for the analysis of the academic or professional interest contained within the research question asked.

3.6.2 Questionnaire Implementation and Recruitment of Participants

The Conference Poster Development and Presentation task outline that students received in week 1 of semester 2, indicated to the students that the questionnaire formed part of the requirements for completing the task, however completion of the questionnaire did not form part of the summative assessment for the task.

The questionnaire was made available to students once all other activities associated with the poster task had been completed, so that when students provided responses to the question they could reflect on both the learning and assessment phase of the task. This occurred at the beginning of week 10 and responses were required to be submitted by the end of week 10 of semester 2.

Students obtained the questionnaire from a box placed below the year 2 MRS notice board outside the MRS office. Students could come past at any time and obtain the questionnaire. Completed questionnaires were returned to the MRS assignment box, located outside the MRS office, in the Hunter Building, University of Newcastle. The assignment box was locked and only the researcher had access to it during the period of the study. Questionnaires were collected from the box on the first day of week 11.

3.6.3 Time Frame for Data Collection and analysis

This research was conducted from 1997 to 2002 with data collection occurring each year. The responses of the students to the open ended questionnaire were reviewed each year by the researcher, in their role as the academic who coordinates this task, as a qualitative feedback mechanism to monitor and improve the task. The analysis of interest as expressed by the research question developed by student groups commenced in 2007.

3.6.4 De-identification of Questionnaires

All questionnaires were sorted into groups using the poster question and group number written on the questionnaire by students. To allow for the anonymity of individual students responses within this research only de-identified photocopies of the original questionnaires, with the student number removed, were used during all data analysis. The original questionnaires were kept in a locked cupboard only accessible by the researcher.

The researcher used the poster question and group number written by students on the questionnaire to develop a descriptive header that was written on top of each photocopied questionnaire.

The descriptive header identified:

- the strand that the student was studying
 - DR (Diagnostic Radiography), or NM (Nuclear Medicine), or RT (Radiation Therapy)
- the year the student completed the task
 - 97 (for 1997), 98 etc up until 02
- a number that represented the group project within the year
 - 1 (for group 1), 2 (for group 2) etc
- consecutive numbering to identify the individual questionnaires of students within a group
 - 01 (for the first student within the group), 02 (for the second student within the group) etc

Examples of the header written on the questionnaires include:

1/ DR – 97: 1/01

This questionnaire represented a response from a Diagnostic Radiography student, from 1997, who was a member of research group 1, and who's questionnaire was read first (1/01).

The next questionnaire from a member of this group would have their questionnaire headed as DR – 97:1/02.

Another example is:

2/ RT – 97:3/03

This header represented the third questionnaire read from a student in Radiation Therapy group 3 (3/03) in 1997.

The descriptive header was written on the top of the de-identified photocopies of the original responses. The de-identified questionnaires therefore contained the descriptive header, the poster question and the three statements of important and personal learning. Only these de-identified questionnaires were used during the data analysis.

3.6.5 Questionnaire Inclusion & Exclusion

The questionnaires were examined for completion of information. A questionnaire was deemed acceptable for inclusion in the study if:

1. a group number or poster title was written on the questionnaire so that it could be clustered with the other questionnaires from the same poster group
2. the questionnaire contained at least one readable response.

A questionnaire was deemed unacceptable and excluded from the study if:

1. a response on the questionnaire contained personally identifiable information about the responder
2. the response identified any group member or person involved within the task in an offensive or inappropriate manner
3. all responses could not be accurately read.

3.7 DATA ANALYSIS OVERVIEW

3.7.1 Analysis Methods

There were two sets of data to be initially analysed within this study, these were:

- The short answer open ended responses to the questionnaire, which would be analysed in an attempt to describe the content of learning and the conception of group work learning of the students, and
- The written poster questions, which would be analysed in an attempt to describe the students' academic or professional interest.

The researcher separated the reading and analysis of the responses of students describing their important and personal learning, from the reading and analysis of the poster research questions that described their interest. This allowed both sets of data to be read, reflected upon and analysed without confusion or conflict between the data sets. The analysis of learning found in the responses of the students was completed prior to the analysis of the interest dimension described within the poster research question.

As indicated previously, the methods of data analysis used to examine the open ended responses align with phenomenographic methods. In this research, the entire data set of short open ended responses formed the 'initial pool of meanings' held by students to be reviewed and analysed. This 'initial pool of meanings,' represented the expression of the lived experience of the student cohort with the group work task.

An interpretative thematic content analytic method of data analysis was used to identify the content of learning (structural elements of group work learning) that students described within the initial pool of meanings (their responses). The structural elements of group work learning were identified through examination and association of the descriptive characterisations of learning found in the responses of students to the questionnaire, using linguistic markers such as words and/or phrases and/or expressions that represented the similarities or differences of 'what' was learned or 'how' something was learned (Bowden, 2005; Marton, et al., 1993; R. Saljo, 1979; Tynjala, 1997). These structural elements of group work learning were formed into

major content of learning categories of description, with each category having a range of descriptive characterisations associated with it.

A larger 'pool of meanings' was then formed which now included the entire data set of responses of the students, and the content of learning categories and descriptions. This larger set of data was read and re-read, reviewed and considered, in light of the deeper, global and referential meaning to be found in the larger pool of meanings (Bowden, 2000; Marton, 1981). A highly reflective, and interpretative thematic, data analysis method was used to explore the referential meaning contained both within and between the student responses and the characterisation of the structural elements of learning. These deeper referential meanings were constructed into the conceptions of group work learning held by the students. Figure 3-1 demonstrates this two stage analysis.

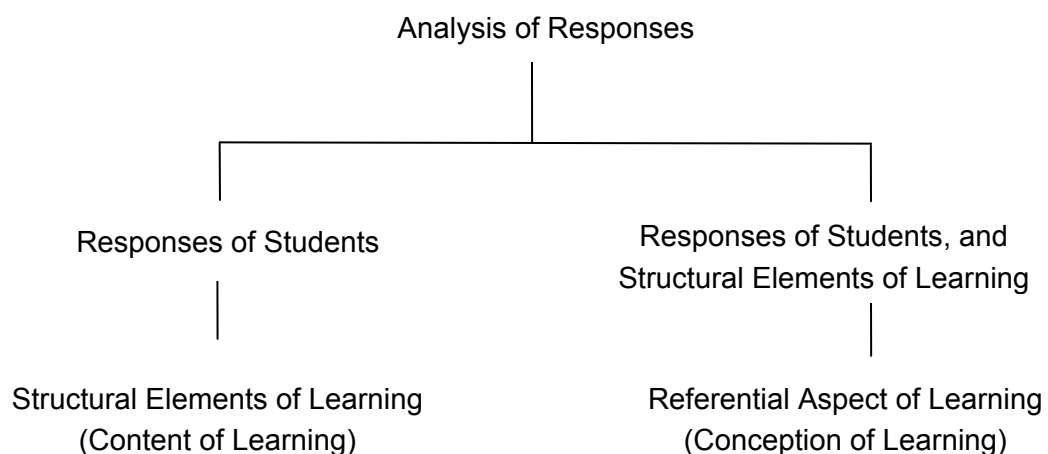


Figure 3-1: The Process of Analysing the Content and Conception of Group Work Learning

The poster questions, as expressions of interest of the topic to be researched, were analysed in line with typical mixed methods (qualitative and quantitative) content analysis methods (Krippendorff, 2004; Morse & Field, 1995; Nuendorf, 2002) where categories of description were formed that described the recurring themes contained within the questions.

Separate coding schemes and code books were developed for the analysis of the content of learning and interest dimension. The open ended responses of important and personal learning were coded for the structural features of learning (content of learning) by two independent coders trained in the use of both coding schemes. The referential conceptions of learning were constructed by the researcher with independent review of the results by a second researcher. The poster questions were coded by the researcher with the same two coders independently reviewing the results of the researcher's coding.

3.7.2 Manual or Computer Coding

At this point it is necessary to comment on the process of manual coding used within this research. The coding and qualitative descriptive analysis of data can be done using manual methods or computer-based methods. Manual methods are characterised as those associated with paper and pen based research, where the research and coders analyse and log all analysis using a written coding scheme and process. Manual coding is usually done where the data collection method is also a pen and paper based exercise (Krippendorff, 2004). Where appropriate within the research methodology, results from manual coding and qualitative data analysis can be entered into computer-based statistical packages to allow for statistical analysis and graphical representation of the data to be carried out.

Computer-based coding and data analysis methods, using programs such as NVivo 8 (QSR International Pty Ltd), are commonly used these days by qualitative researchers. Computer based data analysis allows for the direct entry of the data into software programs. Computer data bases provide the capability for data management, statistical analysis and the graphical presentation of results. Computer based code and retrieve systems free researchers from manual clerical coding (Richards, 2002). Computer based descriptive analysis uses dictionaries of terms which are constructed from the categories and category descriptors, and the computer looks for evidence of these terms in the text.

Prior to the development and application of computer based qualitative analysis techniques in new research areas, there needs to be fundamental work completed to develop the framework to measure the phenomena under study. The validation of the

open ended questionnaire approach coupled with the analysis of the data using a structured dual qualitative and quantitative analysis framework, provides the ground work for the development of computer based systems that reads text or forced choice responses and matches these to categories and descriptors of categories dictionaries.

As Bazeley (2007) indicates:

“The use of a computer is not intended to supplant the time-honoured ways of learning from data...” (page 2)

This research is based on manual data collection and therefore manual coding and data exploration and analysis has been used. The researcher as a PhD student wanted to use a ground up, manual first principles approach to the research analysis, and keep the natural data (questionnaires and coding and analysis) as part of the tools to be used in the research. The researcher also thought that the best personal learning for them would also come from firstly developing skills in using manual coding and analysis, prior to extending future work to computer methods.

3.7.3 Experience and Bracketing of the Researcher

The researcher is an MRS academic more than 17 years academic experience in both MRS and health science teaching and research. The researcher undertakes their own research, and supervises research students (undergraduate, honors, masters), that regularly require interpretative methods of data analysis. To ensure that that the researcher was staying true to the data, the researcher regularly met with the researcher's higher degree supervisor and checked or bracketed any personal developing assumptions about the study (Fischer, 2009).

The analysis of the poster research questions, as has been done in this research, in this research had not been part of any previous evaluation and therefore the analysis of interest described within the poster questions represented a new analysis of which there were no pre-conceived outcomes held by the researchers. Indeed no such analysis or similar study was found in any literature to influence the view of the researchers.

There is a however a reasonable amount of published literature on the process and outcomes from phenomenography research. Mostly this research looks to evaluate the conceptions of learning in solo learning situations, in a traditional teacher-learner context. While important to have this as background knowledge and understanding, a point of departure from what has been reported previously is that the research reported within this thesis is about group work learning in a social constructivist context. The researcher was at all times careful to ensure that the developing research outcomes within the context of this group work / social constructivist research setting were not confounded by the results of other research.

3.7.4 Gaining a Feel for the Data

Even though all of the responses had previously been read at the end of the respective year that the data had been collected (as part of the quality review of the outcomes each year), in commencing this full analysis of the data the student responses and the poster research questions were read, and re-read, in their entirety starting chronologically from the 1997 data. This allowed the researcher to gain a feel for the range and variation of the written responses and poster questions.

The iterative reading and reflection of the students responses, which formed the 'initial pool of meanings', and the poster research questions, provided the researcher with a rich understanding of the perspective of the student, with respect to:

- the learning outcomes they wrote about, and how they described them
- the deeper meaning contained within the responses, and
- the interest expressed by the poster research questions asked.

3.7.5 General Principles for Establishing Measures or Categories of Data

The researcher thematically examined:

1. the students' responses in the questionnaire to identify the manifest or latent message (words, phrases, expressions) in the responses that described the students' important and personal learning, with the intention of developing a range of categories of description that described and represented the

qualitatively distinct structural elements of group work learning (content of learning)

2. the students' structural elements of group work learning categories and their characteristic descriptions with the intention of describing the referential relationship and meaning (conceptions of group work learning) found within and between the categories
3. the poster questions developed by the students, with the intention of developing a range of categories that described and represented the qualitatively distinct domains of interest expressed by the students in the group work task.

These categories of descriptions would form the measures to be coded.

Two general rules were constantly considered while reviewing all sets of data and establishing the measures and constructing categories and sub-category descriptors:

- i. that the measures and/or categories being developed within both the separate content of learning analysis, and the interest domains of students analysis, were mutually exclusive from other categories within each analysis so that a response only can fit into one measure and category
- ii. that all student responses were able to be coded into a category.

A phenomenographic analysis, leading to the development of conceptions of the phenomena under study, has as a principle that there are only a certain number of ways that collectives of responders will describe the phenomena under study. This gives way to the idea, and indeed the requirement in phenomenography, that the development of conceptions of the phenomena under study should demonstrate a conceptual or functional relationship between the conceptions or themes or categories of description (Marton & Pong, 2005; R. Saljo, 1979). This idea that qualitative analysis should attempt to better describe the functional relationships between categories of description has now extended to other qualitative research methods such as grounded theory and ethnography (Wasserman, et al., 2009)

To accommodate this principle one further rule was included in the analysis of the conceptions of learning outcomes, which was that;

- iii. in developing the conception of group work learning categories of description the researcher attempt to consider the conceptual and functional relationship of the categories of conception being developed to each other.

3.8 THE CONTENT OF AND CONCEPTION OF GROUP WORK LEARNING

3.8.1 Method to Analyse the Content of Group Work Learning

To begin the process of interpreting the students' responses and forming categories of description of group work learning, the researcher commenced the process of re-reading and analysing the open ended responses of the students.

The first response from the first student questionnaire was read by the researcher and the main structural element of group work learning to be described or emerge from the first response was manually written at the top of a blank page. The second response was then read and if the response represented a qualitatively different category of outcome or learning from the first response then it was written at the top of a different page. If the second response when read was considered to describe fundamentally the same content of learning or message as the first response, but it was said or described in a fundamentally different way, it was written underneath the already existing category. If the learning outcome described was identical or highly similar to, or strongly associated with, a previously listed item then it was not recorded. The third response was then read and recorded as above.

The researcher then read the next student's three responses and once again recorded their descriptions of content of personal and important learning, either recording them under previously described data, or creating new data descriptions, or not recording them as they have already been described. The process described above was used to record all responses.

Examples of the learning outcomes described in the responses of students that were required to be analysed into their structural elements of group work learning included:

*"the importance of yours and other peoples roles
in making the group work" (1997)*

"presentation is as important as content" (1998)

"the radiological signs of child abuse" (1999)

"responsibility sharing as a team member" (2000)

*"to research articles, critique them and then sift through them to find the
most relevant information" (2001)*

"try to think from the viewpoint of the patient" (2002).

Methods Note: Full details on the data collected and analysed within this part of Study 1 is given in Chapter 4 Study 1 Results. However it is necessary at this point to indicate in the Methods section that there were 276 questionnaires and 818 responses returned and analysed.

On completion of the reading, interpreting and recording of the 818 responses, the researcher had five separate pages of qualitatively distinct categorical descriptions of students' important and personal learning. The five separate pages of descriptions represented the developing structural elements of learning described as important by the students.

From the analysis of the 818 responses, there were in total 74 different descriptive statements written on the five pages, with these 74 statements characterising or describing the variation of learning both between and within the five developing structural elements of learning categories.

These five pages of descriptions, and the 74 characteristics of learning, were then read and reviewed, and reflected upon with constant reference back to the context of the experience with the phenomena under study, ie group work learning and assessment

task, from which the statements emerged. The researcher continued to review and reflect on the five categories developed according to the criteria that the categories of description were mutually exclusive from each other, that the students' statements of learning could only fit into one category, and that there was some form of functional relationship between the categories of description being developed.

On completion of this analysis five major categories of content of learning had been developed by the researcher and each was assigned a content of learning category name.

3.8.2 Validation of the Content of Learning Categories of Description

To assess the credibility and trustworthiness (Lincoln & Guba, 1985) of the interpretation and development of the responses into content of learning categories of description by the researcher, all responses were subject to an independent review. A qualitative researcher (herein called the reviewer) with extensive experience in thematic analysis and based at the University of Newcastle, and who was fully independent from the researcher and the study, was asked to review the responses of the students with a view to forming their own qualitatively distinct categories of description. These two sets of outcomes would eventually be discussed and compared to assess the level of agreement between the categories of description and the credibility of the data in representing and being able to measure what the research purported to represent and measure. To minimise the effect of responder or agreement bias the reviewer was not provided with the researchers own categorisation or the research questions being asked within the study. They were however made aware of the context of the research and the rationale for the research so that they could consider the student responses in light of the rationale for the research and with regard to the situational context of the students in providing their responses. The reviewer took four weeks to read, consider and categorise the responses into conceptually different categories. Once this was done the researcher and the reviewer met and discussed each others' interpretation of the data into the two sets of categories developed.

On completion of their analysis, the reviewer had constructed four emerging categories of description. The five categories of the researcher and the four categories of the reviewer are listed in Table 3-1.

Table 3-1: Comparison of the Content of Learning categories developed by the researcher and reviewer

Researcher	Reviewer
1. Collaboration / Team work	1. Team dynamics / Communication / Time management
2. Poster Development	2. Technical skills – poster
3. Topic Knowledge	3. Content Knowledge
4. Research Skills	4. Technical skills – research
5. Self-Assessment/Self Awareness	

Strong similarities were found between four of the categories, both within the bracketing of the individual statements of student learning by the researcher and reviewer into larger categories of description, and by the characteristic names given to the developing categories. The main difference between the two groups of categories was that the researcher had constructed a category called self-assessment/self awareness. This category was characterised by the researcher as including those statements, whether reflective or descriptive statements, relating to the individual's perspective of themselves working within aspects of the group work task. The reviewer indicated during discussion that they had included these statements as a natural part of the category that they referred to. As an example, if the students talked about themselves or reflected about their thoughts or actions when describing the development of the poster, the reviewer placed the comment within the technical skills – poster category, whereas the researcher placed the comment into the self assessment category.

Examples of these types of statements included:

"Criticism of our own efforts in comparison to the other groups was constructive experience" (1997)

"How much you do learn with self learning projects when you work well as a team" (1998)

"How other people rely on me as part of the team" (2001)

Our poster seemed to go into too much depth. We needed to clarify major ideas and summarise better for future tasks (2001)

After much discussion it was agreed to keep the fifth category, self assessment, as a separate category, for two reasons. Firstly the description and reflection of self within this project, and indeed in other qualitative research, is a personally deep and meaningful construct that leads to notions of higher order reflection on learning. It was agreed that by placing the self assessment comments into a poster/technical category (within the example given above) or any other category of description, that there could be a loss within the research of these type of high order characterisations of learning where a learner describes a change in perspective or change in a person (R. Saljo, 1979). Secondly it was agreed that given the responses of students were to be coded by independent coders, that this ultimately would decide the strength of association of the fifth category within the research.

It was agreed by the researcher and reviewer to keep the five categories of learning as discussed as they appeared to well represent the outcomes of the students responses, and to use these to develop a framework which to describe, codify and assess the data within the research.

The next process involved reviewing the 74 developing characterisations of learning that were listed underneath the five major categories describing the content of learning. It must be remembered that up until this point these 74 sub-category characteristics had not been subject to formal independent review as had the major categories of content. The reading and interpretation of the 74 sub-category characteristics into the major categories had only been done by the researcher in the initial process to develop major categories of description from the data, and discussed as part of the meeting between the researcher and reviewer.

The next part of the interpretative analysis process therefore involved reviewing the 74 descriptive sub-category characterisations against the criteria that:

- the characterisations of learning described within each major content of learning category were mutually exclusive from all other characterisations formed within that major content of learning category or within another major content of learning category
- that all the responses of students were able to be coded into at least one characterisation of learning.

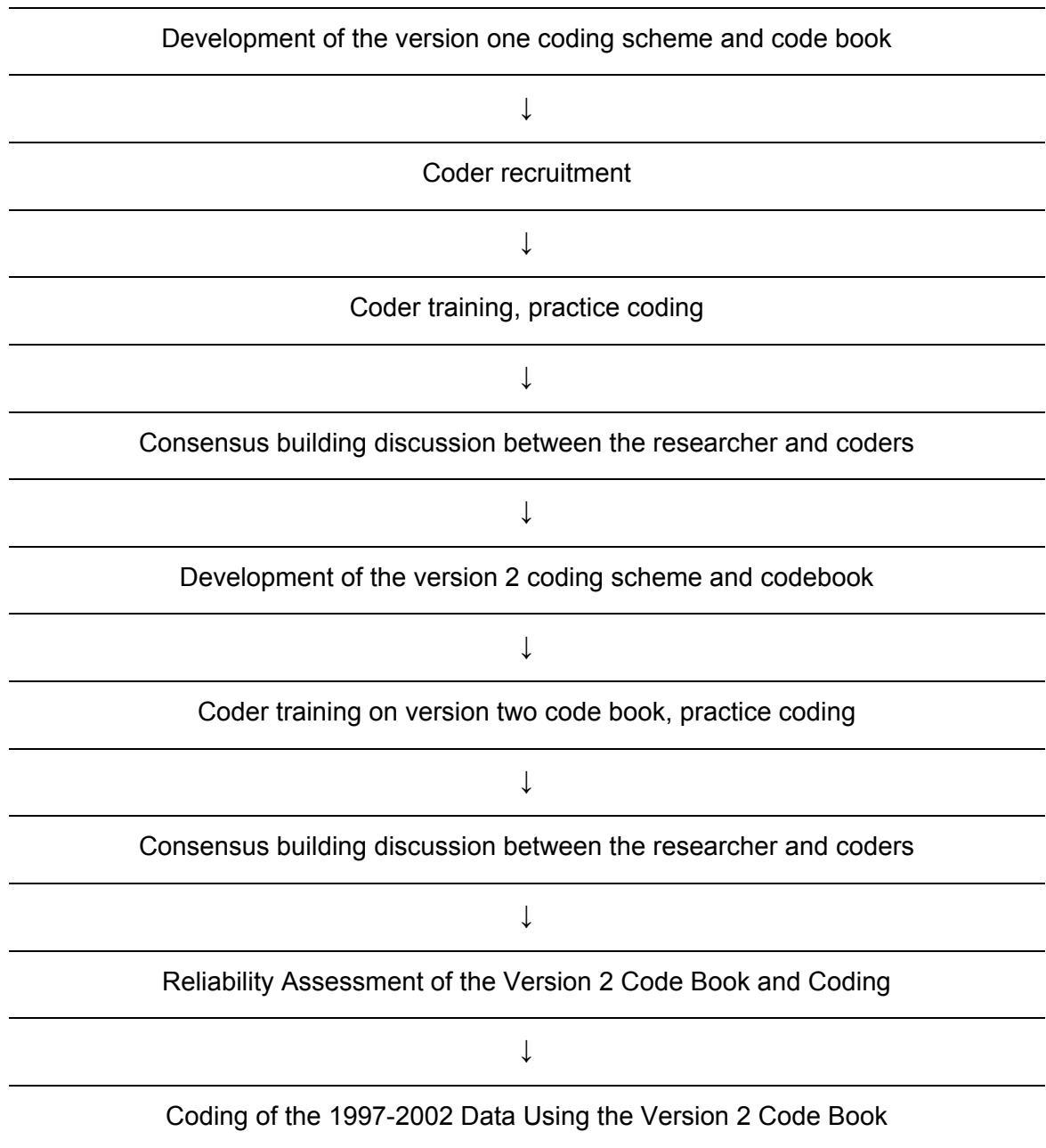
To do this analysis, two coders were recruited and trained to read, interpret and code the 74 sub-category characterisations of learning against the responses of students. This process included the development of explicit and consensus driven coding schemes, the training of coders and practice coding, and the identification through a series of coding trials any overlapping (non-mutually exclusive) characterisations.

Table 3-2 outlines the process that was followed from the initial development of the version one coding scheme and code book, through to the final coding of all data. These processes are described in the sections following the table.

3.8.3 Development of the Version 1 Coding Scheme and Code Book

The code book was developed by the researcher as an instruction manual that would provide the coders with an unambiguous guide to coding the units of data (the responses of students) into the defined measures (the major categories and subcategory characterisation descriptions). The purpose of a codebook was to increase the reliability of the coding scheme and minimise the differences between coders when assessing the data. Increasing reliability is important as it demonstrates that the assessment of the responses and inferences made from the measures obtained, are independent of the researcher and coders and are based on the categorical descriptions contained within the code book (Krippendorff, 1980; Morse & Field, 1995; Nuendorf, 2002).

Table 3-2: Development of the Process for the Coding of Responses into Content of Learning Categories



The coding process involved coders, after training, reading the responses of students and attempting to code each response into a major category and a sub-category characterisation. Coders can through careful reading and consideration of the characteristic of the statement align the statement with a category of description. The coding process may need to be done several times and the coding scheme and code

book adjusted as problems, such as being able to code statements into more than one category, arise.

The version 1 codebook was developed as a written document with a series of instructions for coders at the start of the book describing the process to be followed. This was then followed by five separate tables, each one listing a major content of learning category and their corresponding sub-category characterisations.

In the version 1 code book there were:

- 30 characterisations of learning listed in the Collaboration category
- 16 characterisations of learning listed in the Poster category
- 3 characterisations of learning listed in the Topic category
- 11 characterisations of learning listed in the Research category
- 14 characterisations of learning listed in the Self-Assessment category.

Each major category was given a code and each sub-category characterisation was given a sub-code. It is these codes that are used within the coding process. The version 1 code book is given in Appendix 3.

3.8.4 Coder Recruitment

Two coders were required to assist the continued development of the coding schemes and the coding of students responses within this part of the research. To ensure that the coders had appropriate cognitive abilities to perform the task two Medical Radiation Science (MRS) degree graduates were recruited. As coders, these graduates would have specific knowledge of the language used within MRS and the specific task and therefore would be able to understand and interpret the messages found in the responses. This was important as the language used within MRS can include technical jargon that may not be understood and may be misinterpreted by non-MRS qualified researchers. Both graduates undertook the poster task and poster assessment as part of their studies, however in a different semester of offer than the cohorts reviewed in this research, and as such neither their work nor the work of their colleagues was used within this research.

Both coders were working in clinical practice within the Newcastle area, and both coders lived in close proximity to the University. This meant that they could attend training sessions without too much difficulty and they were accessible to the researcher in terms of coming to the University to participate in the research before and after work.

Prior to agreeing to participate as coders in the research, the researcher described the involvement of the coders in the research and they were shown examples of what was required to be completed. The two coders knew each other and as part of agreeing to participate they were made aware that they could not talk about the coding of the responses. The two coders originally approached agreed to participate and no coders others than the two trained coders coded any responses within this part of the research.

Both coders were paid to attend all training sessions associated with the research, and to code the data, and enter their coded data into a computer spread sheet. The coders were paid as 'research assistants' according to University enterprise agreement.

3.8.5 Coder Training and Practice Coding - Version 1 Code Book

The coders met with the researcher at the University and discussed the requirements of the coding task and reviewed examples of the text responses to be interpreted and coded. The time frame for the coding and the format of the coding was discussed. To reduce responder and detection bias, where coders look for the answers they think the researcher seeks or the research questions ask, the coders and the researcher never discussed the possible outcomes of the project or the views of the researcher toward the coding outcome. During all coder training and final coding, the coders coded independently of each other and never coded together.

The version one coding scheme and codebook was reviewed and discussed in depth by the researcher and coders. Each of the five major categories and the 74 descriptive statements were discussed and consensus reached on the interpretation of the items. Discussions followed about how to code the responses in line with the instructions given within the code book.

Practice coding was undertaken on a convenience sample of responses. The sample responses were those of the 2004 cohort who had undertaken the poster task but

whose responses are not included in the main part of this research. The 2004 responses were quarantined from the main study data so that practice coding could be completed on data not drawn from the main study data. The researcher read and analysed all 2004 data to ensure that it was representative of the 1997-2002 data prior to its use as practice coding data.

Twenty questionnaires from a total of 83 returned questionnaires from the 2004 cohort were used for the practice coding. The 20 questionnaires were drawn at random from the entire set of questionnaires. These 20 questionnaires contained 60 responses. To assess the degree to which the 74 sub-category characterisations were mutually exclusive from each other, and were clear and unambiguous enough to ensure that all responses of students could be coded, the coders were asked to code each student response into as many sub-category descriptions as they thought possible.

Nuendorf (2002) indicates that it is appropriate to code in the medium that the messages (responses) have been received and that human text coding works best with hard copies of the text. For these reasons the coding was written on the questionnaires alongside the response.

The two coders followed the process of:

- reading the first response on the first questionnaire,
- identifying the main descriptive message to emerge from the written response,
- matching the descriptive message to one or more of the established categories
- writing the code or codes that best described the response in the page margin of the questionnaire beside the response,
- repeating this procedure for responses two and three on the first questionnaire and then moving onto the next questionnaire.

Each coder was given one week to independently code the 60 responses.

3.8.6 Consensus Building Discussion Between the Researcher and Coders

On completion of this activity the coders met with the researcher and the results were discussed. The coders identified that while the major content of learning categories were mutually exclusive when coding the responses (ie they felt that could differentiate easily between these categories), that there were however a large number of overlapping sub-category characterisations in all major categories. The coders indicated that they were able to code student responses into more than one current existing subcategory characterisation. The coders also identified a small range of responses that could not be coded into any category.

The researcher and the coders used consensus building as the method to agree on changes to the codebook. The researcher and coders reviewed and discussed the 60 responses coded by each coder and bracketed overlapping subcategory descriptions into new single subcategory descriptions (Appendix 4).

3.8.7 Development of the Version 2 Coding Scheme and Codebook

The researcher developed a version two codebook based on the feedback from the consensus building discussions. As a result of the high number of overlapping sub-category descriptions, the number of sub-category characteristics was reduced to 26, and on advice from the coders the new subcategory descriptions were supplemented with a range of quality descriptors. On advice from the coders the version two coding scheme and codebook included a subcategory description of 'Other' within each major category as a sub-category characteristic to allow for the coding of those responses that could not be coded for into an existing subcategory description. The types of responses that may fit an 'Other' category were those responses where significant spelling mistakes or poor grammar did not allow the accurate interpretation of the response.

The version two coding scheme and codebook included (Appendix 5):

- 6 characterisations of learning listed in the Collaboration category
- 5 characterisations of learning listed in the Poster category
- 4 characterisations of learning listed in the Topic category

- 5 characterisations of learning listed in the Research category
- 6 characterisations of learning listed in the Self-Assessment category.

3.8.8 Coder Training - Version Two Code Book

The researcher and coders met and reviewed the version two coding scheme and codebook. Once again the subcategory descriptions were discussed in detail. A consensus building exercise was undertaken and agreement was reached on the definitions of terms used within the version two coding scheme and codebook. Both coders, with the experience of the previous coding, discussed the new sub-category characterisations and the improvements made to the codebook.

A second round of practice coding, using the version two coding scheme and codebook, was undertaken. The responses analysed were the full set of returned questionnaires from the 2004 cohort who had undertaken the poster task including new unmarked copies of the 20 questionnaires used in the first round of practice coding.

In 2004, 90 students completed the poster group work learning and assessment task. These students were enrolled in one of three MRS programs. There were 83 returned questionnaires, representing a 92% response rate (Table 3-3).

Table 3-3: Student enrolment in the Poster Task by program in 2004

No. of students enrolled			No. of Returned Questionnaires			Response Rate (RR %)			Total		
DR	NM	RT	DR	NM	RT	DR	NM	RT	Enrolled	No of Returned Questionnaires	RR %
40	17	33	40	11	32	100	65	97	90	83	92

Based on 83 returned questionnaires, 249 responses could be expected. Five returned questionnaires only contained two responses, thus the coders coded 244 responses (Table 3-4).

Table 3-4: Nos of poster groups and responses per group in 2004

DR = Diagnostic Radiography

RT = Radiation Therapy

NM = Nuclear Medicine

Program	No of Returned Questionnaires	Expected No of Responses	Total No. of Responses (%)
DR	40	120	117 / 98%
NM	11	33	33 /100%
RT	32	96	94 / 98%
Total	83	249	244 / 98%

The coders were asked to follow the same process as the previous practice coding. They were again asked to assess the degree to which the subcategory descriptions were mutually exclusive from each, and were clear and unambiguous enough to ensure that all items could be coded.

Each coder was given one week to independently code the responses.

3.8.9 Consensus Building Discussion between the Researcher and Coders

On completion of this activity the coders met with the researcher and discussed the results. Each coder indicated that they were able to code each response into only one of the major category descriptions. Each coder indicated that they were also able to code all items into only one subcategory description. Each coder indicated that the instructions on the codebook and in the coding scheme were explicit and assisted the coding. Each coder gave their completed coding to the researcher.

3.8.10 Reliability Assessment of the Version 2 Code Book and Coding

As a result of the confidence expressed by the coders in the version 2 coding scheme, an analysis of the inter-rater reliability (level of agreement) of the coders when using the coding scheme was performed. Cohen's Kappa statistic was used to assess the level of agreement beyond chance agreement.

Coding of the two sets of responses was entered into the Intercooled STATA 9.2 for Windows data base (StataCorp LP, Texas, USA). This was done by the researcher.

Data was entered separately for the diagnostic radiography, radiation therapy and nuclear medicine responses. The data was also combined so that the level of

agreement for the coding of all responses could be assessed. Table 3-5 provides the coding agreement, the expected agreement, the Kappa Statistic and probability statistic, for the analysis of reliability for the version 2 coding training.

The coding agreement, and the Kappa statistic, for the major content of learning category and sub-category characterisations, was extremely high for all analyses. Coding agreement was slightly higher for the major categories coding than the sub-category coding on each analysis, however this was an expected outcome given the smaller range of choices for the coding of the major categories than their subcategory descriptions.

The coders were able to agree at an extremely high level when coding the responses for each of the 3 programs. This result provides support for the development and use of the version 2 coding scheme and coders in completing the final coding of all 818 responses.

Table 3-5: Inter-Rater Reliability Assessment of the coding scheme and coders stratified by strand and overall

	Expected Agreement	Coding Agreement	Kappa	Std. Err.	Prob > Z
Diagnostic Radiography responses					
• Major categories	36.8%	97.4%	0.96	0.05	< 0.0001
• sub-category characterisation	12.2%	94.0%	0.93	0.03	< 0.0001
Nuclear Medicine responses					
• Major categories	64.5%	100%	1.000	0.14	< 0.0001
• sub-category characterisation	24.7%	93.9%	0.92	0.08	< 0.0001
Radiation Therapy responses					
• Major categories	36.7%	97.9%	0.97	0.04	< 0.0001
• sub-category description	13.8%	92.5%	0.91	0.04	< 0.0001
Total Responses					
• Major categories	36.7%	97.9%	0.97	0.04	< 0.0001
• sub-category description	11.7%	93.4%	0.93	0.02	< 0.0001

3.8.11 Coding of the 1997-2002 Data Using the Version 2 Codebook

The final coding involved coding all 818 responses from the 1997 to 2002 returned questionnaires. The 2 coders were each provided with a copy of the final codebook (the version 2 codebook) and a de-identified set of the questionnaires, with the documents in order from 1997 to 2002. This final coding was again done by the coders independent of each other and the researcher. The two coders again followed the process previously described. The coding for each response was written on the questionnaires alongside the response.

The coders were given four weeks to code all responses. Manual coding of all responses occurred during December 2006. On completion of the coding each coder entered their data into a purposefully designed Excel spreadsheet. The two sets of coded questionnaires and two spreadsheets were returned to the researcher in early January 2007.

The researcher undertook a quality assurance checking exercise on 10% of the returned data to determine whether there was any systematic coding or data entry errors problems. The researcher selected, at random, 30 questionnaires representing 90 responses from each coder's returned documents. The questionnaires checked came from a range of years from the 1997 to 2002 returned coded documents.

The written coded responses on the questionnaires were checked to ensure that:

- the coders had coded all responses on the questionnaire
- the coders had only recorded one code per response
- that the codes used were those described within the code book, and
- that the coding could be read and interpreted.

The data entry of the coded responses into the spreadsheet was checked to ensure that:

- the coders were able to understand the organisation of the spreadsheet and enter their coding into the spreadsheet correctly

- the code as written on the questionnaires next to the response was recorded correctly in the spreadsheet
- all responses coded had been entered into the spreadsheet, and
- that no mistakes had been made in transcribing the code as written on the questionnaires into the spreadsheet

3.8.12 Coding Agreement: Final Coding all Responses

The now coded responses were analysed to assess the level of agreement (inter-rater reliability) between the coders, using the coding scheme. Inter-reliability assessment included the analysis of the coding of all responses by major content of learning category codes, and by the sub-category characteristics codes.

The coding agreement for the major content of learning categories ranged between 97.4% – 89.3%, Kappa 0.95 - 0.85 ($p \leq 0.001$ all analysis).

The coding agreement for the sub-category characterisation descriptions ranged between 84.1 % - 73.1 %, Kappa 0.82 - 0.70 ($p \leq 0.001$ all analysis).

These results show very high levels of agreement between the coders for the use of the coding scheme (see Table 3-6).

When consideration is given to the process that included:

- the major content of learning categories having been reviewed by a second qualitative researcher for their credibility within the research and agreement reached on the categories, and
- the sub-category characterisations of learning having been subject to two phase analysis and refinement using coding, consensus building and agreement,

The highly significant coder agreement results indicate that the major content of learning categories and their descriptive characterisation sub-categories are highly trustworthy as representing the outcomes of learning within the context of this Poster Group Work Learning task.

Table 3-6: Inter-Rater Reliability Assessment for the coding of all responses stratified by Year

Major and sub-category coding by Year		Coding Agreement	Expected Agreement	Kappa	Std. Err.	Prob>Z
1997	• Major categories	96.6	37.2	0.95	0.06	< 0.0001
	• sub-category description	73.1	10.3	0.70	0.03	< 0.0001
1998	• Major categories	89.3	28.7	0.85	0.06	< 0.0001
	• sub-category description	77.3	8.71	0.75	0.03	< 0.0001
1999	• Major categories	94.5	35.3	0.92	0.06	< 0.0001
	• sub-category description	77.4	10.8	0.75	0.03	< 0.0001
2000	• Major categories	97.3	43.7	0.95	0.05	< 0.0001
	• sub-category description	84.1	13.4	0.82	0.03	< 0.0001
2001	• Major categories	94.1	32.8	0.91	0.05	< 0.0001
	• sub-category description	83.5	13.3	0.81	0.03	< 0.0001
2002	• Major categories	97.4	4.6	0.96	0.05	< 0.0001
	• sub-category description	83.3	12.7	0.81	0.03	< 0.0001

The outcomes of the development of the content of learning categories of description, is given in chapter 4, section 4.3. The distribution of the descriptive categorical variables as determined from the qualitative analysis, was undertaken using chi-square test for independence using GraphPad InStat version 3.00 for Windows 95, GraphPad Software, San Diego California USA, www.graphpad.com.

3.8.13 Method to Analyse the Conceptions of Group Work Learning

To develop the conception of group work learning categories of description, the researcher read and reflected upon:

- I. the entire data set of responses of students to the questionnaire
- II. the major content of group work learning categories of description, and
- III. the characterisations of the content of learning categories.

The three sets of data listed above formed the 'pool of meanings' to be evaluated for the conceptions of group work learning held by the students. Rather than focussing on the structural learning outcomes (content of learning), the data was reflected on and analysed for the deeper referential meaning or deeper referential learning found within

the words, phrases and expressions (the linguistic markers). The development of the conception of group work learning categories of description parallels the work completed in developing the structural elements of learning. The analysis and construction of conception of group work learning categories of description was made easier due to the work already completed in developing the content of learning categories.

In developing conception of group work learning categories, the researcher constantly explored the variation of meaning found both within and between the student responses (Patrick, 2000) and the content of learning categories (Åkerlind, 2005; Dahlin, 2007). By doing this the researcher attempted at all times during the analysis to keep the entire set of responses and the content of learning categories within the framework of the analysis (Bowden, 2005; Green, 2005).

In developing the conceptions of group work learning categories the researcher read and reflected upon the nature of conceptions of learning previously developed in a wide range of solo learning situations (Caplow, et al., 1997; Crawford, et al., 1994; Duke, et al., 1998; Ellis, et al., 2006; Tynjala, 1997). The researcher also considered the methods and outcomes described within pure phenomenography descriptions (Marton, 1986; Prosser, et al., 1994; R. Saljo, 1979) and developmental phenomenographic descriptions (Bowden, 2005; Green, 2005; Patrick, 2000).

In developing a series of conception of group work learning categories of description the researcher again attempted to ensure that the categories of description were mutually exclusive from one another, and that there was a developing functional relationship between the conception of group work learning categories.

The outcomes of the development of the conception of group work learning categories of description, is given in chapter 4, section 4.4.

3.9 THE INTEREST ORIENTATION OF STUDENTS

3.9.1 The Validation of the Poster Questions as Reflective of the Poster Content

To analyse the interest orientations of the students, the researcher intended to analyse the poster research questions that students asked of themselves and their group. To

ensure that the poster research question, as the unit of data to be analysed, did in fact represent the content of the poster, and therefore the interest expressed within the poster, a validation study was undertaken.

Ten (10) posters developed as part of the group work poster project in 2003 were reviewed. Each poster was read in its entirety, from introduction to conclusion, and the content that was described in each poster and the expression of interest as described by the content, was compared to the poster research question asked and the expression of interest as described by the poster research question. Table 3-7 provides an example of the analysis conducted for one of the 10 posters.

Table 3-7: Example of the analysis of the orientation interest of a poster research question and the poster content

Poster Question: What are the roles of 3-D CT images in facial surgery

Interest Orientation: The poster question focuses on the roles of 3-D CT technology. Although facial surgery is mentioned in the poster question the question is not asking questions about issues related to facial surgery such as, pre or post imaging patient treatment or patient care, or surgical technique in facial surgery. The interest orientation of the poster question is guided towards the role of technology and the use of technology.

Content of the Poster: The poster describes three central roles of 3-D CT in facial surgery, these being pre-surgical planning, surgical simulation and post surgery evaluation. All three are described with reference to the pathologies of malignancy, congenital abnormalities and trauma. The poster describes the role of CT and the process of CT within each of these pathologies with reference to image reconstruction, volumetric measurements and CT displayed anatomy.

Interest Orientation: The central message given within the content of the poster is a description of the role and use of technology.

Summary: the Poster question and the poster content are reflective of a single interest orientation, with the expression of interest orientation guided towards technology.

The review of the 10 posters by the researcher confirmed that in each poster examined, the poster research question was highly reflective of the interest and content expressed within the poster, and therefore the poster question was a representative of the expression of interest contained within the poster.

To further assess the credibility of the poster question as being representative of expression of interest contained within the poster, the two coders from the content of learning analysis coding were asked to also complete the validation study undertaken by the primary research. The coders and the researcher met and discussed the comparative analysis of one of the 10 posters that the researcher had completed. As with the previous content of learning study, agreement was reached between the researcher and coders on how to conduct the study, as well as the specifics of where would the coders complete the study given that they had to access the posters which were stored at the university, and the time frame for the study to be completed by.

Due to work commitments only one of the coders was able to complete the validation study within the time frame required. The coder was given one working week (five days Monday to Friday) to come to the University and read the 10 posters and to complete the same analysis that the researcher had completed. The coder was provided with a quiet room to complete the work in as well as the ten de-identified posters. The coder took around 10 hours to complete the review of the posters.

On completion of the coder's review, the coder and the researcher met to discuss the findings. The coder reported that the poster research questions, in all 10 posters reviewed, were highly reflective of the content of the paper, and that the poster question and content of the paper both reflected a single interest orientation. The coder indicated that they felt that the methodology was trustworthy in inferring the interest orientation of the poster from the poster research question. It was not the intention of the validation study for the researcher and the coder to agree on the single interest orientation identified within the posters reviewed, as this would be assessed within the coding of all poster research questions into interest orientation categories.

As a result of the finding of the two validation studies described above it was decided that the poster research question asked by the students was indeed reflective of the interest orientation captured by the content of the posters.

3.9.2 Evaluation of the 1997-2002 Poster Questions

The same iterative process used for the evaluation of the student responses to the questionnaire was used to evaluate the interest as expressed by the poster question. The researcher began the analysis of the poster questions by again reading all poster

questions, which were written at the top of each questionnaire, once again in chronological order starting with the 1997 responses. This time the researcher examined the manifest or latent message contained in or expressed by each poster question, with the intention of developing a range of categories that represented the qualitatively distinct differences of academic or professional interest described within the poster question. These categories of interest would form the measures against which all poster questions would be coded.

The analysis process involved the reading of the first poster question from the first student group, and the main topic of interest to be described or emerge from the poster question was manually written at the top of a blank page. The second poster group question was then read and if the response represented a qualitatively different topic of interest from the previous question reviewed then it was written at the top of a different page. If the second poster question when read was considered to be associated to the previous question of interest recorded it was written underneath the previous response. This process was followed for all poster questions, with poster questions being recorded either under previously described data or by the creation of a new qualitatively different description of interest.

Examples of the poster questions that were required to be analysed included:

"What are the clinical indications for imaging in acute ankle injuries?" (2000)

*"Can Positron Emission Tomography be used to diagnose
natural born killers" (2000)*

"How do you identify depression in cancer patients?" (2001)

*"Does scatter radiation from mobile Chest X-Ray radiography pose a threat to the
allied health care team? If so how can it be minimised?" (2002)*

On completion of this work the researcher had three pages of qualitatively distinct categorical descriptions of student interest as expressed by the poster questions. These three pages were reviewed by the researcher according to the criteria that the categories and sub-category descriptions were mutually exclusive from each other and that the responses could only fit into one category. After this review the three bracketed pages of interest descriptions remained, and these then formed the major interest

orientation categories as expressed by the students. The researcher then reviewed all the poster questions that had been listed under each major interest category with the intention of developing a range of characteristics that described the interest orientation category.

To further ensure the credibility (validity and reliability) of the interest orientation categories and their descriptive characteristics as being representative of the actual interest orientation of the students, all poster questions were subject to a further coding process, using a purposefully designed coding scheme.

3.9.3 Developing the Coding Scheme and Codebook for Interest

The codebook described each of the three interest categories by the interest category name, the descriptive characterisation of each interest category, and examples of poster questions that fitted the category. For ease of coding each interest category was given a code (Appendix 6). The primary researcher coded all poster questions using the coding scheme, writing the code at the top of each questionnaire.

The two coders, who were trained to code all questionnaire responses in the larger content and conception research project, were recruited to independently review the coding of the poster questions into interest orientation categories. As in the content of learning coding process, the primary researcher and two coders met several times to discuss the codebook and coding process. Due to the coding training that was undertaken coding during the validation study it was felt by both coders no in-depth coder training was required.

The two coders were provided with the set of de-identified questionnaires that each had used during the content of learning coding. They were asked to use the coding scheme and write the code at the top of the questionnaire. The two coders and the researcher met and discussed the coding that each had assigned to each research poster question. Where differences occurred between the coders the two coders and the researcher used consensus building discussions to reach agreement on the coding to be assigned to each research poster question. On completion of this process all poster questions had been coded against one of the emergent themes.

The results of the analysis of the interest orientation as expressed by students in their poster research questions is given in chapter 4, section 4.5. The distribution of the descriptive categorical variables as determined from the qualitative analysis, was undertaken using chi-square test for independence using GraphPad InStat version 3.00 for Windows 95, GraphPad Software, San Diego California USA, www.graphpad.com.

4. RESULTS STUDY 1

4.1 OVERVIEW OF THE RESULTS OF STUDY 1

This chapter presents the results for Study 1.

Section 4.2 describes the participants whose responses form the data analysed within this thesis. The numbers of participating students and the numbers of questionnaires returned and responses analysed are described.

Section 4.3 provides the results for the analysis of the **Content for Learning** as described within the responses of students.

Section 4.4 provides the outcomes for the development of the **Conceptions of Group Work Learning** categories of description, as described within the responses of students and within the content of learning categories of description.

Section 4.5 provides the outcomes for the analysis of the **Interest Orientation** of students.

4.2 THE PARTICIPANTS, QUESTIONNAIRES AND RESPONSE INFORMATION

In total there were 234 diagnostic radiography students, 58 radiation therapy students and 36 nuclear medicine students (328 students) enrolled to complete the task during the period 1997-2002 (Figure 4-1).

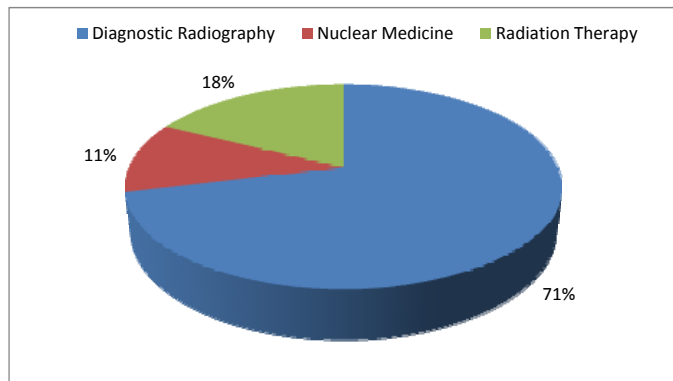


Figure 4-1: Students / Participants by Program

Table 4-1 describes the participants enrolled to complete the task by year and by program. The diagnostic radiography program was offered every year by the University, with the intake into the program growing each year across the period of this study from around 35 in 1996 (representing the 1997 participants) to around 55 by 2001 (representing the 2002 participants). The nuclear medicine and radiation therapy programs were only offered every alternate year due to limited opportunities for clinical placements at this time. Both programs had an intake of around 18 students during the time of this study.

As shown in Table 4-1, out of 328 expected questionnaires there were 279 questionnaires returned during the study, representing a response rate of 85%. The questionnaire response rate per year was greater than 90% in 4 of the 6 years of the study.

Table 4-1: Student enrolment in the Poster Task by program and year, and questionnaire response rate

Year	No. Enrolled			No. of Returned Questionnaires			Response Rate (RR %)			Total		
	DR	NM	RT	DR	NM	RT	DR	NM	RT	Enrolled	No of Returned Questionnaires	RR %
1997	30	-	12	30	-	12	100	-	100	42	42	95
1998	35	12	-	22	3	-	63	25	-	47	25	53
1999	38	-	16	21	-	16	55	-	100	54	37	69
2000	41	13	-	41	11	-	100	85	-	54	52	96
2001	43	-	17	43	-	16	100	-	94	60	59	98
2002	47	11	13	47	4	13	100	36	100	71	64	90
Total	234	36	58	204	18	57	87	50	98	328	279	85

Prior to the analysis of the questionnaires, the questionnaires were reviewed for acceptability according to inclusion and exclusion criteria (see Chapter 3.6.5). After exclusion criteria were applied there were 276 questionnaires available for analysis (Table 4-2).

Two questionnaires (marked *) could not be read with certainty (written in pencil and smudged and unreadable) and these were excluded from the analysis, and one questionnaire (marked **) contained inappropriate and offensive comments and was excluded from the analysis.

Table 4-2: Numbers of questionnaires meeting inclusion and exclusion criteria

Year	DR Questionnaires	NM Questionnaires	RT Questionnaires	Total
97	28 *	-	12	40
98	22	3	-	25
99	21	-	16	37
2000	40 **	11	-	50
2001	43	-	16	59
2002	47	4	13	64
Total	201 / 234 (86%)	18 / 36 (50%)	57 / 58 (98%)	276 / 328 (84%)

Table 4-3 shows the number of questions returned and meeting the inclusion criteria, the expected number of responses based on three responses per questionnaire, and the total number of responses analysed as part of the final study coding.

There were three questionnaires returned that only provided two responses (not three), and four questionnaires returned that provided only one response (10 responses in total marked as # in the table).

These 276 questionnaires and the 818 responses became the data to be analysed within the analysis of the Content of Learning.

Table 4-3: Expected Number and Total Number of Responses included in the final data analysis

Program and Year	No of Returned Questionnaires	Expected No of Responses	Total No. of Responses
Diagnostic Radiography			
1997	28	84	84
1998	22	66	66
1999	21	63	63
2000	40	120	120
2001	43	129	123 #
2002	47	141	141
Total	201	603	597

Nuclear Medicine			
1998	3	9	9
2000	11	33	32 #
2002	4	12	12
Total	18	54	53

Radiation Therapy			
1997	12	36	35 #
1999	16	48	47 #
2001	16	48	47 #
2002	13	39	39
Total	57	171	168

Overall	276	828	818
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4.3 CONTENT OF GROUP WORK LEARNING

4.3.1 Major Categories of the Structural Elements of Group Work Learning

The first analysis undertaken was the description of the content of learning that students described within their 818 responses. The analysis of the responses of the 1997-2002 data revealed that students described five major content of learning categories (Table 4-4).

Table 4-4: Content of Learning Major Categories

Collaboration

Topic of the Study

Poster Development

Research skills

Self Reflection and Self Awareness

The coding of all 818 responses allowed the frequencies of the responses to be evaluated. Students indicated that learning about collaboration was the most important thing they learned, representing 54.8% (n = 448) of all responses. Learning about collaboration was described nearly three times more frequently than learning about the topic of the study (19.3%), which was the second most frequent learning outcome, and three and one half times more often than learning about poster development (15.5%), the third most reported item (Figure 4-2).

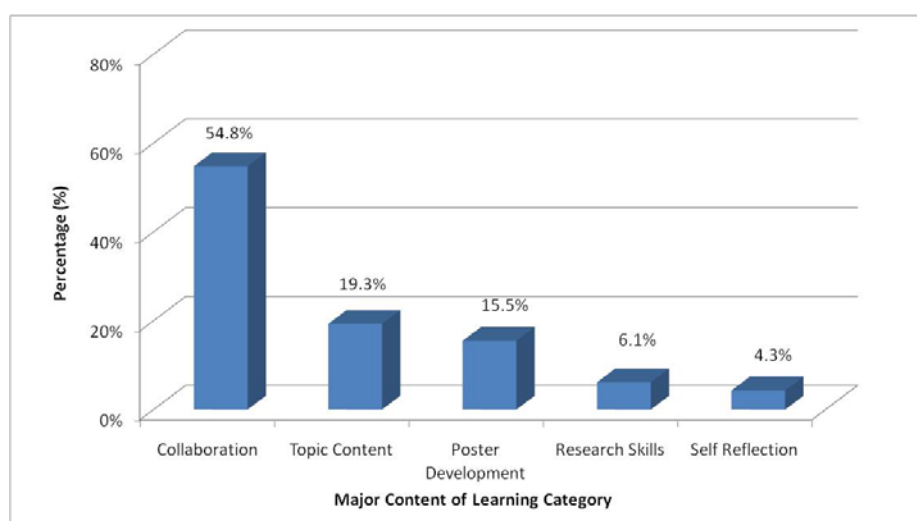


Figure 4-2: Content of Learning Categories identified as important by students

4.3.2 Sub-category Characterisation of Structural Elements of Group Work Learning

The variation of the learning characterisations within and between the five major structural elements of learning categories was described by 21 characterisations (Table 4-5 to Table 4-9).

4.3.2.1 Collaboration

The content of learning category 'Collaboration' comprised five sub-category descriptions and associated characterisations (Table 4-5).

Table 4-5: Sub-category Characteristics and Variation of Collaboration

Sub-category	Characterisation	Variation
1. Organisation	requires planning, meeting deadlines, importance of leadership, setting objectives, time management, flexibility	36%
2. Effectiveness	commitment, reliability, contributing equally, easier to achieve goals in a team, co-operation, contributing effectively, teamwork / group work,	27%
3. Decision making	within group communication & discussion, respect for others opinions, resolving problems, listening skills, compromising differences, reaching agreement	16%
4. Difficult	complexities arise, patience required, time out - need breaks to be alone, time consuming, group dynamics, don't like group work, easy to drift off into conversation (other discussion)	12%
5. Positive	good to get other members views, need for different personalities, work with people you like, get on with, working with different personalities, group work makes it fun	7%

4.3.2.2 Topic of the Study

The content of learning category 'Topic of the Study' comprised three sub-category descriptions and associated characterisations (Table 4-6).

Table 4-6: Sub-category Characteristics and Variation of Topic of the Study

Sub-category	Characterisation	Variation
1. Specific Topic Learning	specific information about topic	92%
2. Question Design	ask small questions	3%
3. As An Educational Tool	educating others through the poster	1%

4.3.2.3 Poster Development

The content of learning category 'Poster Development' comprised four sub-category descriptions and associated characterisations (Table 4-7).

Table 4-7: Sub-category Characteristics and Variation of Poster Development

Sub-category	Characterisation	Variation
1. Design Skills	design skills, colour schemes, creativity, use of computers in design, web design skills, formatting, editing (cutting down)	56%
2. Presentation	importance of presentation, vision of poster, requirements for effective communication, quality assurance of info	23%
3. Difficulties	difficulties with the medium, time consuming, expenses	13%
4. Creating	creating a poster, how to make	7%

4.3.2.4 Research Skills

The content of learning category 'Research Skills' comprised four sub-category descriptions and associated characterisations (Table 4-8).

Table 4-8: Sub-category Characteristics and Variation of Research Skills

Sub-category	Characterisation	Variation
1. General or Specific Skills	experimental skills, research skills, analytical skills, communication in research	38%
2. Information Gathering	informatics skills, information gathering, good communication with experts, places to look for info	33%
3. Application	critical appraisal skills, collating ideas, objectivity in research, expenses, referencing skills, meeting deadlines	27%
4. Planning	planning research effectively	2%

4.3.2.5 Self Reflection / Self Awareness

The content of learning category 'Self Awareness / Self Reflection' comprised five sub-category descriptions and associated characterisations (Table 4-9).

Table 4-9: Sub-category Characteristics and Variation of Self Reflection and Self Awareness

Sub-category	Characterisation	Variation
1. Awareness	self learning and self responsibility, important to answer questions	46%
2. Workload	hard work pays off, putting a lot of knowledge together, research skills, the most effort doesn't always produce the best poster	29%
3. Assessing	assessing others work, comparative analysis of own work against others	14%
4. Positive Feedback	need others to critically appraise your ideas, valuable to have other people's input, peer reviewing	8%
5. Accepting Negative	accepting criticism, inputting more personally, swallowing your ego	3%

4.3.3 Statistical and Comparative Analysis of the Major Categories

4.3.3.1 Analysis of the Difference between the three Programs

The difference in the distribution of the content of learning categories between the three programs was compared (

Figure 4-3). Four of the five content of learning descriptions appear to be reasonably equally proportionally distributed between the three programs.

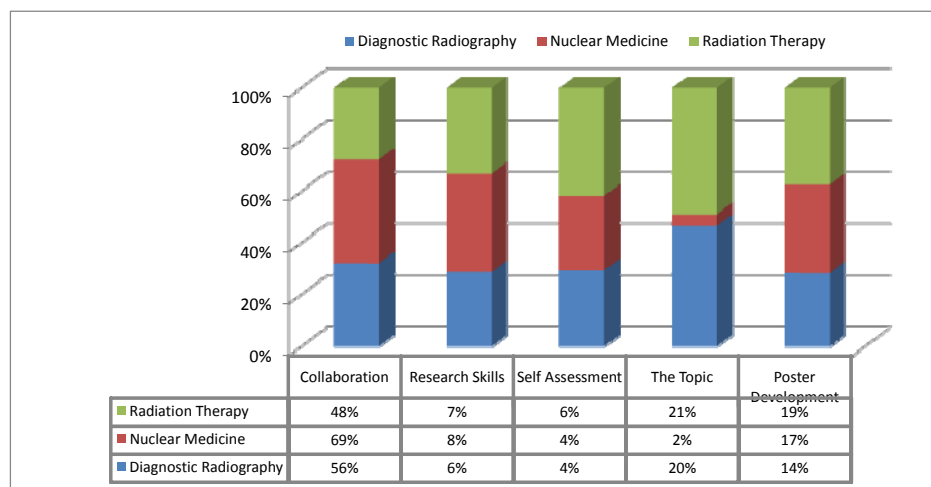


Figure 4-3: Frequency of Content of Learning by Program

A chi-square test was conducted on the data to assess the statistical difference between the three programs for the distribution of the five major categories with the analysis demonstrating a statistically significant between the three programs ($p=0.048$). The one category that appeared different was within the nuclear medicine program, and was related to nuclear medicine students indicating that learning about the topic of the research project was of less importance to them than other elements of the group work task. When the learning about the topic category was removed from the analysis there was no difference between the three programs ($p=0.57$), and when nuclear medicine was removed from the analysis there was no difference between the remaining two program's distributions (diagnostic radiography and radiation therapy) ($p=0.35$).

4.3.3.2 Analysis of the Difference across the 5 years of the Study

The variation in the content of learning categories was reviewed across the 5 years of this study (Figure 4-4). Although the distribution of learning outcomes looks fairly stable across time, a chi-square test of the differences between the years was significant ($p=0.01$). Removing the 2001 and 2002 data individually from the analysis produced a non-significant result ($p=0.21$), indicating that there is a variation in the distribution of the 2001 and 2002 data compared to the other years.

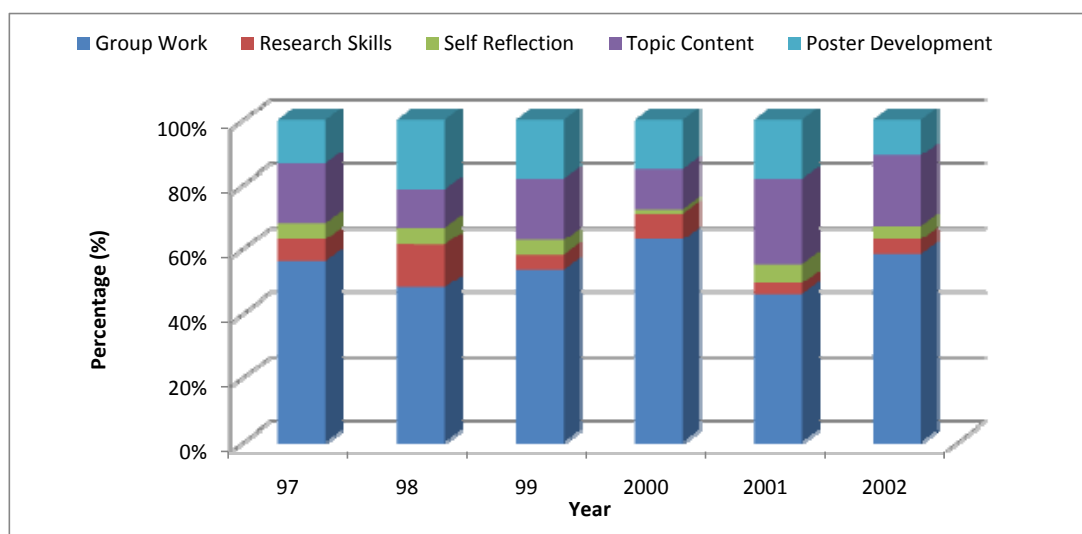


Figure 4-4: Differences in Content of Learning by Year

4.4 CONCEPTION OF GROUP WORK LEARNING

4.4.1 Major Categories of the Referential Conception of Learning

On examination and reflection of the entire 'pool of meanings', which included the 818 collective responses of students, and the five major categories and 21 characterisations of content of learning descriptions, four conceptions of group work learning emerged from the data (Table 4-10).

Table 4-10: Conception of Group Work Learning categories

Conception A – Acquiring Facts

Conception B – Developing Meaningful Interpretations and Applications

Conception C – Negotiating Social Structures

Conception D – Recognising Expertise and Creativity within Individuals and Groups

These conceptions demonstrate a hierarchical and functional relationship between adjoining categories and across all categories, from a surface learning fact acquisition conception (A), to progressively deeper learning cognitive and meta-cognitive awareness and interpretations of the conception of group work learning (B, C &, D). The conceptions are listed and described below.

4.4.1.1 Conception A – Acquiring Facts

Conception A is the description of group work learning as an increase in factual knowledge and is analogous to a surface approach to learning. All words, phrases, expressions and characterisations used by students when describing learning outcomes were related directly to the ‘topic’ of the poster project. The words used in conception A were devoid of critical interpretations of fact or engagement of the facts with higher order processing of knowledge. In conception A there were no descriptions of acquiring knowledge about the group work process or self awareness of any of the other structural elements of learning or the project.

Representative words and expressions used by students that describe the development of conception A include:

*The **effects of** radiation ... **basics of** (technology, procedure) ... **things to look for in** (patient presentation, referral) ... **properties of** (technology) ... **technical knowledge** (the topic)... **information about** (the topic)*

In this group work learning project, conception A was the least described conception. Although the ‘Topic of the Study’ content of learning category represented around 19% of the structural elements of learning, the majority of the descriptions were not aligned

with fact acquisition but rather they described the value of knowledge and its application (see conception B).

4.4.1.2 Conception B – Developing Meaningful Interpretations and Applications

Conception B is largely related to group work learning as providing ‘meaningful interpretations,’ able to be ‘applied’ in practice, ‘given value’ and made useful in their clinical and academic world. While the conception largely focuses on topic specific knowledge and learning gained as a result of the project, rather than being about an acquisition of fact, students have described learning in groups as transforming their learning through discussion and critical review by the group members, evoking a heightened consciousness about the value and use of the knowledge gained.

Conception B is associated with the use of value laden nouns, adjectives and synonyms to add an affective dimension to learning not found in the characterisations used to describe conception A. The value and affective dimension is added to descriptions of both the ‘topic of the study’ and interaction with group members. Conception B is very much aligned with deep learning, and the affective dimension described in this conception has not been found or discussed in any previous ‘solo’ learner conceptions of learning research and therefore represents a new learning outcome arising from the effect of group work learning.

Representative words and quotations from students that describe the development of conception B include:

*The **value in** having the parent in the room for a paediatric examination ... breast reconstructive surgery **is very effective for increases** in Quality of Life for post mastectomy patients ... the **importance of reducing dose** in scoliosis imaging **to minimise the cancer risks** ... what **can be done** to increase infection control ... **key considerations** for diagnostic radiographers in elderly health care*

***Accommodating** other people’s suggestions and ideas and learning to work with different personalities ... I **learnt the importance of listening** to other peoples’ ideas, **discussing them** and **compromising** on what is the best idea ... that you need to **respect other people’s opinions** ... group*

*work **opens up new channels** of communication ... you **need other people to critically analyse** your ideas and suggestions ... **criticism** of our own efforts **in comparison** to the other groups was a **constructive experience***

There is a hierarchical relationship between conceptions A & B in that conception A describes a surface approach to the gaining of information, which is the same type of learning outcome that could occur in a 'solo learning' situation, whereas conception B is related to deeper level understanding and application of the knowledge that has arisen through engagement in learning with others and has a strong affective element.

4.4.1.3 Conception C – Negotiating Social Structures

Conception C reflects the social complexity of group learning. In Conception C group work learning is described in terms of the behavioural and metacognitive awareness needed to negotiate a successful team and outcome. The words and expressions of students are value laden and again an affective element of learning was strongly present in conception C. The words used to describe collaboration are synonymous with negotiation of personalities and individual traits with teams, however they also include positive affective outcomes such as is described by the response: *'it's fun working with people who share a positive attitude'*. The expressions used to characterise group work were those of organisation that is agreed, explicit and maintained, but that has positive outcomes for the group.

Representative words and quotations from students that describe the development of conception C include:

*Learnt **how to deal with personality differences** ... How to **work in a team with people you haven't worked with before** ... **Got to know the group members better** as I hadn't had a lot to do with some group members previously*

*How **important team work is** and **how much easier this project was** to complete when **each team member contributed evenly** ... **it's fun working with people that share a positive attitude***

*Development of organisational skills ... **work was made easier** from the outset by **defining then assigning** the goals for the task ... **well defined group meeting agendas** are very important ... for a group to work effectively **clear objectives and schedule should be decided and followed***

*How to **manage time effectively** ... **how important time management is** when working on the project ... organisation of time ... **meeting agreed deadlines***

There is a functional relationship between conceptions B & C. Where-as in conception B knowledge has been gained and modified as a result of working with others as part of a learning group, conception C directly addresses the learning outcomes acquired from working within a socially constructed learning environment. These learning outcomes are not associated with a gain in or transformation of knowledge, but rather they embrace an understanding of the culture of organisation and the behavioural and affective (emotional) dimension required to succeed when working in groups.

4.4.1.4 Conception D – Recognising expertise and creativity in learning

The focus of Conception D is dualistic: part of the conception being the recognition that groups have an expertise and creativity that may not be present if the group were not present, and from which the group can benefit and from which individuals can learn; and part of the conception concerns the creativity that can be expressed, and the creativity learned, when engaged in active group learning activities where the format of the presentation of knowledge is a previously unlearned form of presentation (ie in the poster format).

Conception D is related to the content of learning elements of group work, the poster task, research learning and self reflection and awareness, however there is little to any direct description of the topic of the task described in this conception. Like the previous conception, conception D also has a meta-cognitive and/or affective element where learning is seen to be associated with an increased awareness and acceptance of the variation in how learning can be acquired and presented.

Representative words and quotations from students that describe the development of conception D include:

*Working as a team everyone has areas that they excel in and **the finished product is better than if you were to do it on your own ... to work with people whose skills, abilities and limitations are different than mine ...***
*How to **present** informative research **in a creative manner ... to design, construct and develop and present a poster ...***

There is a hierarchical relationship between conceptions C & D. While conception C directly addresses the group work learning environment, conception D now describes the creative benefits from working within a successful socially constructed learning environment. Conception D allows students to see the value in working with others and it provides a mechanism for students to learn from each other.

4.5 ANALYSIS OF INTEREST

4.5.1 Numbers of Posters Analysed

There were 77 separate posters developed by the student groups between 1997-2002 (Table 4-11: **Numbers of poster groups by program and year**). It is these 77 poster research questions that were reviewed in this research.

Table 4-11: Numbers of poster groups by program and year

Year	No of Groups			
	DR	NM	RT	Total
1997	6	-	4	10
1998	9	2	-	11
1999	6	-	4	10
2000	11	3	-	14
2001	11	-	5	16
2002	12	1	3	16
Total	55	6	16	77

4.5.2 Categories of Interest

Three qualitatively different categories of student group interest emerged from the content analysis of the poster questions (Table 4-12).

Table 4-12: Categories of Interest

Clinical Procedures and Clinical Skills

Patient Management and Patient Care

Technology and Technology Assessment

The distribution of the three interest categories in each of the three MRS programs is shown below (Figure 4-5).

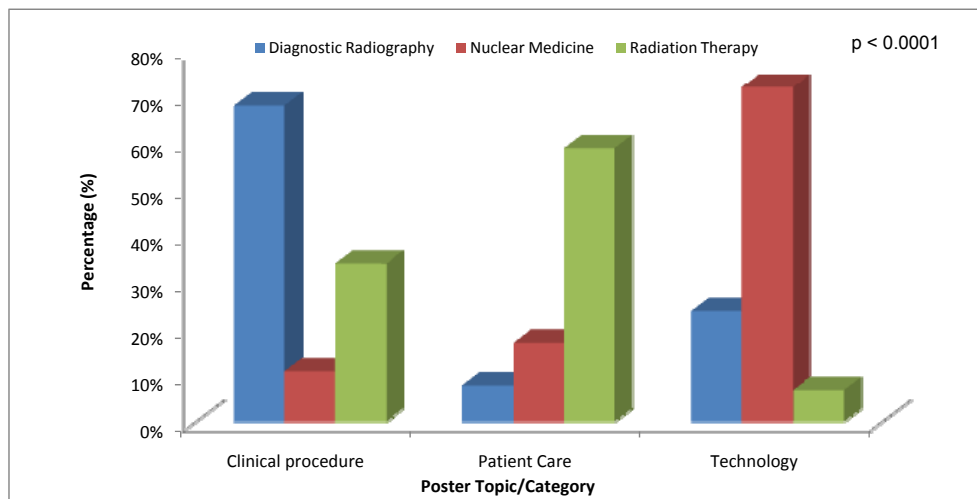


Figure 4-5: Interest by program

A chi-square analysis of interest demonstrated that within each of the 3 degrees there was:

- a high level of interest on a single interest category expressed by most students of that degree, and
- a statistically significant difference ($p \leq 0.0001$) between the interest of the three degree groups of students.

In terms of the self selected poster questions they asked of themselves, diagnostic radiography students asked questions that expressed more interest in clinical procedures and clinical skills (68%), nuclear medicine students expressed more interest in technology and technology assessment (72%), and radiation therapy students indicated more interest in patient management and patient care (59%).

Rather than the remaining two categories of interest being equally divided within each of the three degrees, each of the degrees expressed quite relatively low interest in one the 3 interest dimensions. Diagnostic radiography students indicated that they were less interested in patient management and patient care (8%), nuclear medicine students indicated that they were less interested in clinical procedures and clinical skills (11%), and radiation therapy students indicated that they were less interested in technology and technology assessment (7%).

The stability of interest over time was assessed by undertaking a chi-square test on the diagnostic radiography responses from 1997-2002. Only the diagnostic radiography responses were done as there was reasonably a reasonably number of responses per year, and data was available for each year of the study period. The result was remarkably stable (Figure 4-6), with clinical procedures and clinical skills the dominant category of interest researched every year by radiography students. This result was statistically significant ($p=0.0006$).

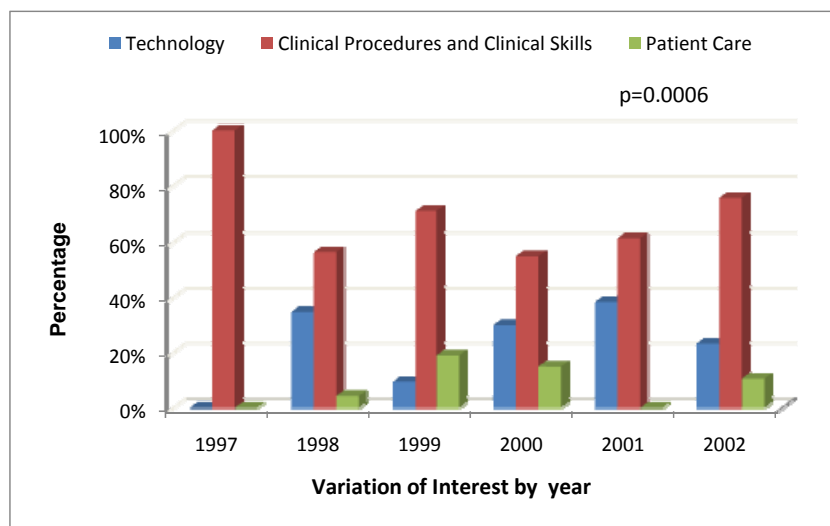


Figure 4-6: Interest by diagnostic radiography students over time

5. METHODS STUDY 2

5.1 OVERVIEW OF STUDY TWO

In 2008, the group work Conference Poster learning and assessment task underwent two changes that had the potential to significantly alter the learning outcomes for students within the group work learning task. The first change related to the time taken to complete the group work task. Rather than being conducted over a 10 week period the task was reduced to a 6 week task. This occurred as a result of the need to change the professional placement period for students within the 3 medical radiation science programs in semester 2. The result of the change to the clinical placement period in 2008 meant there would only be a 6 week period where all three cohorts of MRS students would be on-campus together. To provide equity between the three programs it was decided that the work should be completed while all students were on campus together. This decision reduced the time that students would have to work together as a group.

The second change that occurred in 2008 was due to the reduction in time to complete the task, and the lack of time students had to develop a free choice topic to research. The process of selecting a topic generally took about 2 weeks of the 10 week task, and there was not enough time to allow this to happen in 2008. As a result of this in 2008 students were not given the freedom to choose their own topic, but rather academic staff nominated the topics that student groups would research. These were the only two changes made to the group work task in 2008. All other aspects of the group work learning task were kept exactly the same as completed in study 1.

To assess the impact of the reduction in weeks, and the removal of the freedom to self select based on interest the topic of the poster research project, on the outcomes of learning in the poster learning and assessment task, a new study, study 2, was proposed and designed. Where study 1 utilised an open ended response questionnaire that sought to elicit qualitative descriptors of learning, study 2 used a forced choice response questionnaire that asked students to rank in terms of importance the 3 most important things they learned in completing the group work learning task. Study 2 also allowed the qualitative outcomes uncovered in study 1 to be tested in a prospective closed ended choice questionnaire.

5.2 HUMAN RESEARCH ETHICS

An application was made to the University of Newcastle's Human Research Ethics Committee in 2008 for this study 2 research. Appendix 7 provides the ethics approval, letter of invitation to participate, and the questionnaire used, in the study 2 research.

5.3 THE COLLABORATIVE GROUP WORK TASK

Largely the poster group work learning and assessment task was undertaken in exactly the same way as described in Section 3.3 of Chapter 3. There were though three changes to the way the task was undertaken and completed.

The first change was that the task was completed over 6 weeks and not 10 weeks. The diagnostic radiography and nuclear medicine students submitted the poster task at the end of week 6 and went on placement weeks 11-14 and the first week of the exam period (5 weeks). Radiation therapy students completed the poster task at the end of week 6, and they attended placement from week 7 to 11 (5 weeks), and they returned to university for weeks 12-14.

The second change was that staff selected a range of topics for student groups to complete. This removed the interest orientated learning approach used in study 1.

The third change was that the questionnaire evaluating the content of group work learning acquired from the project did not form part of the assessment of the poster project.

5.4 STUDY PARTICIPANTS

The study participants are students enrolled in the Bachelor of Medical Radiation Science (BMedRadSci) degrees, at the University of Newcastle, who in 2008 undertook the Conference Poster Task in semester 2 of year 2 of the Bachelor of Medical Radiation Science degrees.

Eligible participants for this research were those students who were enrolled in the degree and course, and who also completed the poster learning and assessment task.

The students who undertook the poster learning and assessment task in 2008 did so in the same semester of offer and in the same equivalent program and course as

students who completed the poster learning and assessment task between the periods 1997-2002 as part of study one.

5.5 DEVELOPMENT OF RESEARCH QUESTIONS

As stated in the overview to this chapter, this study was designed to evaluate whether the change in the amount of time available to students to undertake the poster learning and assessment task, and the removal of the opportunity for students to select their topic based on their interest, affected the learning outcomes of students.

To guide the development of data collection methods and the subsequent examination of the responses a series of broad open ended questions were developed.

Research Question 4: Changes in Priorities of Learning

How does a reduction in the time frame to complete a group work learning project affect the priorities for learning?

Research Question 5: Interest Orientated Learning

How does a loss of freedom to select the topic of interest affect the priorities for learning?

5.6 DATA COLLECTION

5.6.1 Questionnaire Design

The questionnaire used in study 2 was a modified version of the final code book developed and used in study 1, and was developed from the content of learning categories of description developed in study 1.

The questionnaire was constructed using the 5 major content of learning categories of description, and under each major category were sub-category descriptions.

In total there were 21 sub-category descriptions used in the questionnaire:

- 5 subcategory descriptions items for Group work,
- 4 subcategory descriptions for Poster,

- 3 subcategory descriptions for Topic,
- 4 subcategory descriptions for Research, and
- 5 subcategory descriptions for Self-Assessment.

For the study 2 questionnaire, the sub-category description of “other” was not used due to it being a category required in study 1 to code problematic responses.

The letter of participation and the introduction to the questionnaire included a brief explanation of study 1 research that had been completed by previous students, and instructions for students who chose to participate and complete the questionnaire. The questionnaire was expected to take 10 minutes to complete, and students were asked not to write anything that could identify them on the questionnaire.

The study 2 questionnaire asked students to consider and answer the same question that had been asked of the previous students:

The 3 most important things I learnt undertaking this task were ...

The questionnaire asked the students to read through the 21 sub-category items and descriptions which appeared under the 5 main category headings, and after reading the items and descriptions select the 3 items that best described the most important things they learnt. The instructions indicated that the 3 items may all come from one category or from several different categories.

The instructions asked students to provide their responses in rank order where:

1 = most important thing you learnt, 2 = 2nd most important, and 3 = 3rd most important

The final instruction repeated to students the instruction that:

‘The most important thing is that your answer represents your answer to the following question’:

The 3 most important things I learnt undertaking this task were ...

Students wrote their rankings in the column next to the items they chose.

At the end of the questionnaire were a series of questions that sought to find out what strand of MRS the students were from, whether they were male or female, and what the title of the poster was.

5.6.2 Questionnaire Implementation and Recruitment of Participants

Unlike study 1, the questionnaire did not form part of the requirements for completing the Poster task; rather it was presented to students as a research project. To reduce the effect of recruitment coercion by the researcher, a short presentation on the research and the letter of invitation to participate, along with the questionnaire, was presented to the students by an academic staff member not involved in the research. This short presentation was during a regular class at the beginning of the week which was also attended by the normal academic lecturer of that class (also not involved in this research).

The letter of invitation to participate and the questionnaire was made available to students when all other activities associated with the poster task was complete, so that when students provided responses to the question they could reflect on both the learning and assessment phase of the task. The diagnostic radiography & nuclear medicine students were provided the short presentation and research material in a class in week 10 of semester. The radiation therapy students were provided the short presentation and research material in a class in week 12 of semester.

5.6.3 Time Frame for Data Collection and Analysis

Students were provided a sealed envelope to place their completed questionnaires in and they were given one week to complete the questionnaire. Students could complete the questionnaire immediately following the presentation in class and place the sealed envelope in a box left at the front of the class room, or complete the questionnaire at a later date and return it to an assignment box located outside a staff office (the PhD supervisor). Questionnaires returned in class were provided to the PhD supervisor to pass onto the researcher by the class lecturer. The assignment box was emptied on the Monday of week 11, to collect DR & NM responses, and the Monday of week 13, to collect RT responses. Analysis of the data commenced in April 2009 and was completed in June 2009.

5.6.4 De-Identification of Questionnaires

Students were asked not to write their name or any identifying information on the questionnaire. All completed questionnaires were reviewed prior to analysis to ensure this. No questionnaires were found that contained identifying information.

For the purposes of data entry and analysis only photocopies of the original questionnaires were used. The original questionnaires were kept in a locked cupboard only accessible by the researcher.

5.6.5 Questionnaire Inclusion & Exclusion

The questionnaires were examined for completion of information. A questionnaire was deemed acceptable for inclusion in the study if:

1. a poster title was written on the questionnaire so that it could be clustered with the other questionnaires from the same poster group (this was done for ease of data entry only)
2. the questionnaire contained at least one readable response

A questionnaire was deemed unacceptable and excluded from the study if:

1. the questionnaire had been completed in an incorrect manner rendering the interpretation of the responses inaccurate
2. the questionnaire contained personally identifiable information about the responder
3. the questionnaire identified any group member or person involved with the task in an offensive or inappropriate manner

5.7 DATA ANALYSIS

5.7.1 Data entry

The data to be analysed within this study were:

- the ranked forced choice responses to the questionnaire which described the important and personal learning of the students, and
- a range of demographic information which was responded to in a forced choice response format, eg tick either Female or male.

The data from the questionnaires was entered into a purposefully designed Excel spreadsheet. Two research assistants (RAs) entered all data into the Excel spreadsheets. The RAs were each provided a set of photocopied questionnaires and both RAs entered the data separately from the other. The two sets of coded data were compared by the researcher for data entry disagreements and errors. No errors were found in data entry.

5.7.2 Data analysis

The distribution of the descriptive categorical variables as determined from the responses to the questionnaire, was undertaken using chi-square test for independence using GraphPad InStat version 3.00 for Windows 95, GraphPad Software, San Diego California USA, www.graphpad.com.

The results of the analysis are given in Chapter 6.

6. RESULTS STUDY 2

6.1 OVERVIEW OF THIS CHAPTER

This chapter presents the results for Study 2.

Section 6.2 describes the participants whose responses form the data analysed within this thesis. The numbers of participating students and the numbers of questionnaires returned and responses analysed are described.

Section 6.3 provides the results for the analysis of the **Content for Learning** as ranked by responses of students to the questionnaire in study 1. Two sets of analyses are presented, i/ the distribution of responses into the major content of learning categories, and ii/ the distribution of the responses into the subcategory descriptions of learning.

Section 6.4 provides the comparison of the results of study 1 (1996-2002) to study 2 (2008). The comparison compares the difference in the distribution of the major content of learning categories, and the sub category descriptions, as described by students in study 1 (1997-2002) and as ranked by students in study 2 (2008).

6.2 THE PARTICIPANTS, QUESTIONNAIRES AND RESPONSE INFORMATION

In total there were 107 diagnostic radiography students, 24 nuclear medicine students, and 17 radiation therapy students (148 students) enrolled to complete the task during 2008. Of the possible 148 questionnaires to be completed by students, there were 110 questionnaires returned during the study, representing an overall response rate of 74% (Table 6-1).

Table 6-1: Student enrolment in the Poster Task by program and year, and questionnaire response rate

DR = Diagnostic Radiography program RT = Radiation Therapy NM = Nuclear Medicine

Year	No. Enrolled			No. of Returned Questionnaires			Response Rate (RR %)			Total		
	DR	NM	RT	DR	NM	RT	DR	NM	RT	Enrolled	No of Returned Questionnaires	RR %
2008	107	24	17	78	21	11	73%	88%	65%	148	110	74%

The questionnaires were reviewed for acceptability according to inclusion and exclusion criteria (see Chapter 5.6.5). Of the 110 returned questionnaires one student failed to provide a response on their returned questionnaire, and while students were asked to provide only their top three ranked items 12 students all provided three ranked items under each of the 5 major category headings (15 responses each in total) making their responses unusable. This left 97 returned questionnaires that met the study's inclusion criteria as having been completed correctly (Table 6-2). All 97 questionnaires had three responses, therefore there were 291 responses to be analysed within study 2.

Table 6-2: Numbers of questionnaires meeting inclusion and exclusion criteria

DR Questionnaires	NM Questionnaires	RT Questionnaires	Total Questionnaires / Responses
67	20	10	97 / 291

To ensure that the included questionnaires (and hence responses) were representative of the proportion of students from the three programs completing the task, the proportion of students from each of the three programs completing the task in 2008 was compared to the proportion of questionnaires by program meeting inclusion into the study (Figure 6-1). The analysis indicates that the included responses represent the three group of students for whom the outcomes will be generalised.

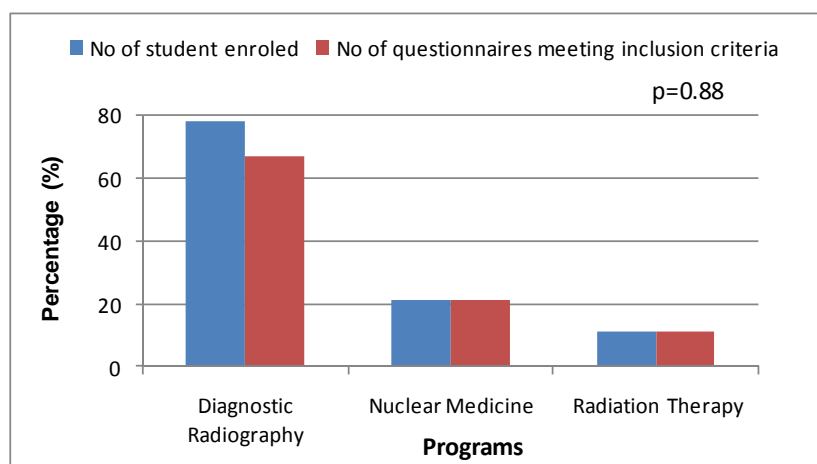


Figure 6-1: Comparison of students enrolled to questionnaires meeting inclusion criteria

6.3 CONTENT OF GROUP WORK LEARNING

6.3.1 Analysis and Variation of the Major Categories of Group Work Learning

The first analysis undertaken was an evaluation of the distribution of the 291 responses into the five major content of learning categories as described on the study 2 questionnaire (Figure 6-2). The distribution of responses indicates that all items were ranked, there were no major categories considered unimportant to the student's learning, and that therefore all categories had validity for students in terms of being important outcomes of learning. In terms of the frequency of ranking, collaboration was ranked the most important major category of learning, with research skills and poster development the second and third most ranked important learning outcomes.

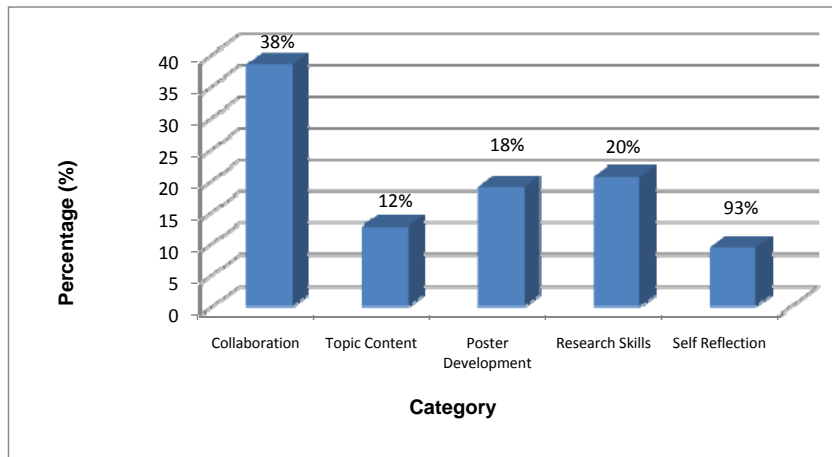


Figure 6-2: Overall ranked major content of learning categories

The distribution and variation of the student's 1st, 2nd and 3rd rankings of the major content of learning categories was analysed (Figure 6-3). The analysis indicated that all major categories received rankings as a 1st, 2nd or 3rd important learning outcome, ie they were considered in all ranked positions. Collaboration was ranked highest in all three ranking positions (1st = 53%, 2nd = 29% and 3rd = 34%), and all three rankings for collaboration were higher than the next major category's highest ranking.

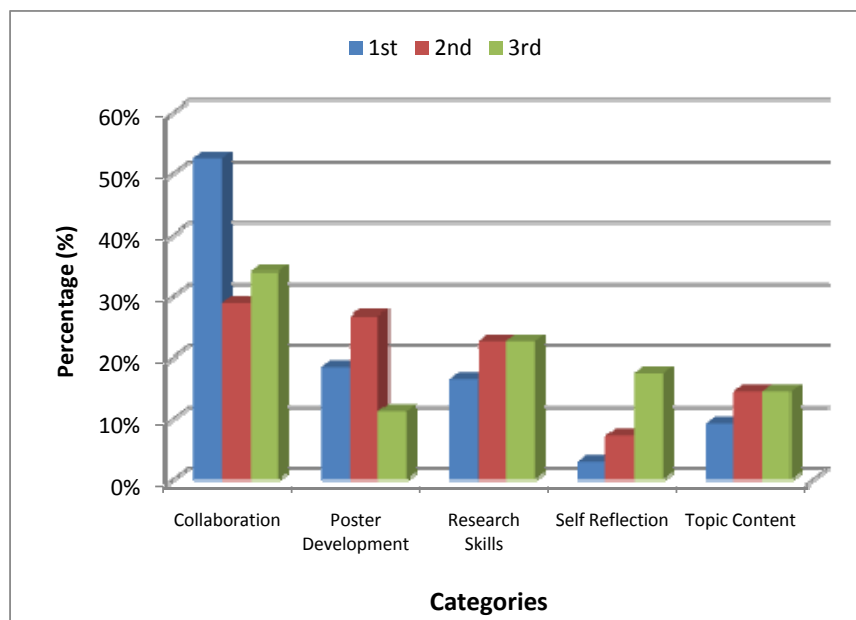


Figure 6-3: Ranked order of the content of learning major categories

6.3.2 Analysis and Variation of the Sub Category Descriptions

An analysis of the variation in the rankings of the 21 sub category descriptions of content of learning, as described in section 4.3.2 (page 4-104 to 4-106), indicated that all 21 items were ranked by students (Figure 6-4). Five items did not receive greater than 5% rankings individually, however even these small ranked items received a ranking and contributed to the rankings of the major content of learning categories.

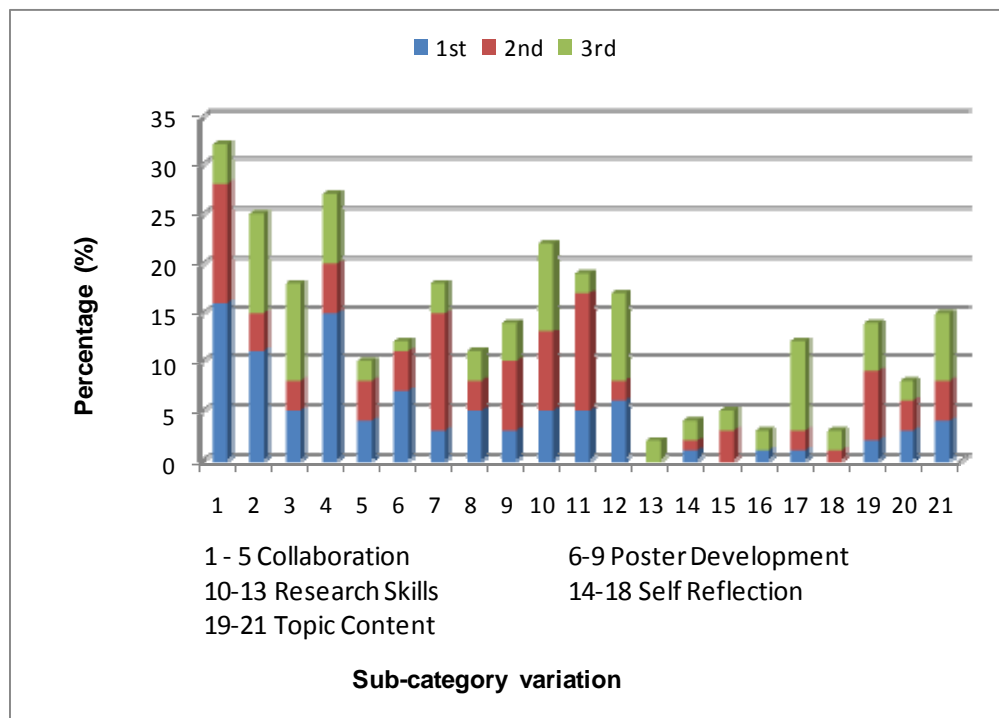


Figure 6-4: The 21 sub category descriptions: overall and ranked

6.4 COMPARISON OF THE CONTENT OF LEARNING BETWEEN STUDY 1 & 2

6.4.1 Comparing the Major Content of Learning Categories

The variation of the major content of learning categories as described by students in study 1 (undertaken over 10 weeks), and as ranked by students in study 2 (undertaken over 6 weeks) was compared (Figure 6-5: Variation of Content of Learning categories: study 1 v study 2). Chi-square analysis of the distribution of the content of learning

categories between study 1 and study 2 demonstrated a significant difference ($p < 0.0001$). In comparison to study 1, students indicated that in study 2 their important learning was more about research skills and developing their presentation (the poster) rather than learning about collaboration or learning about the topic. Students in study 2 also indicated that they had increased self reflection and self awareness within the project more than study 1 students.

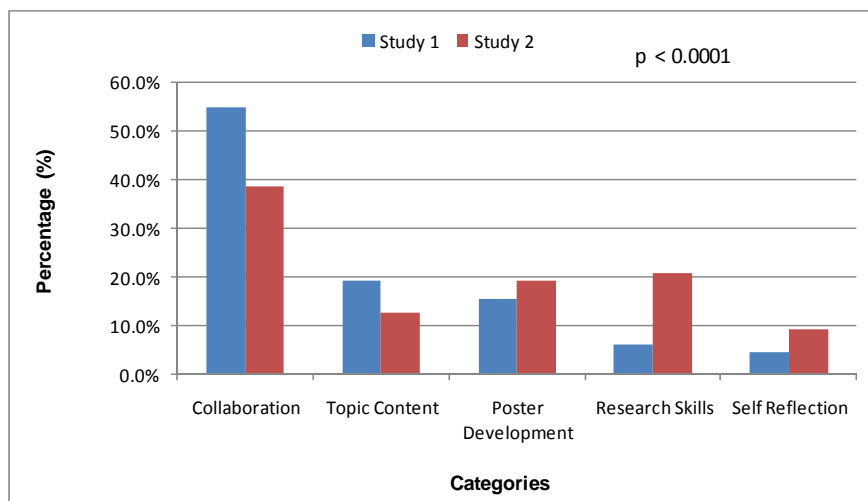


Figure 6-5: Variation of Content of Learning categories: study 1 v study 2

6.4.2 Comparing the Subcategory Descriptions

The following analysis compares the distribution and variation of the subcategory descriptions within each of the major content of learning categories between study 1 and 2. The process of analysis is the same for each of the 5 major content of learning categories, and therefore the analysis is introduced here rather than in each section below.

6.4.2.1 Comparing the Distribution of Collaboration

The distributions of the subcategory descriptions of 'collaboration' as described in study 1, and as rated in study 2, are shown in Figure 6-6. Chi-square analysis of the distribution of the subcategory descriptions between study 1 and study 2 demonstrated a significant difference ($p=0.03$). The results indicate that study 2 is associated with

decreases in learning about organisation, decreases in the effectiveness of the group, and increases in the difficulties negotiating collaboration.

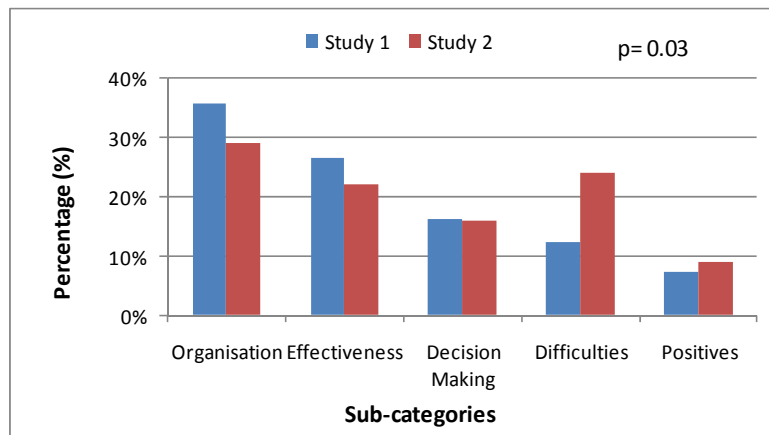


Figure 6-6: Comparison of the subcategory descriptions of collaboration

6.4.2.2 Comparing the Distribution of Topic Content

The distributions of the subcategory descriptions of ‘topic content’ as described in study 1 and as rated in study 2 are shown in Figure 6-7. Chi-square analysis of the distribution of the subcategory descriptions between study 1 and study 2 demonstrated a significant difference ($p < 0.0001$). The results indicate that study 2 is associated with decreases in learning about the topic, and increases in time spent designing the poster research question and learning how to use the topic as an educational tool.

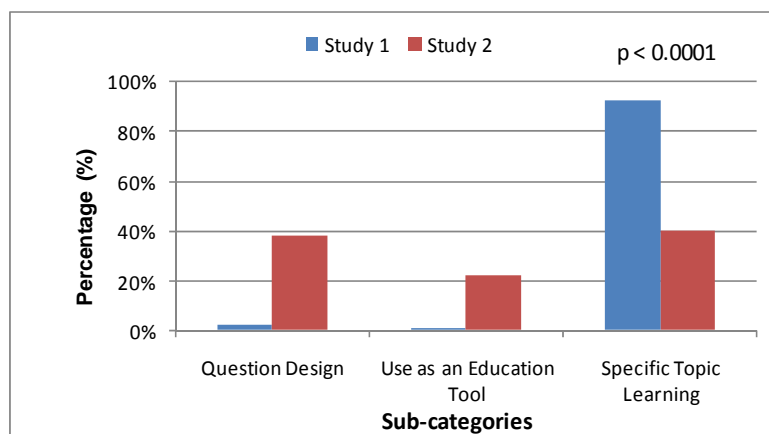


Figure 6-7: Comparison of the subcategory descriptions of Topic Content

6.4.2.3 Comparing the Distribution of Poster Development

The distributions of the subcategory descriptions of 'poster development' as described in study 1 and as rated in study 2 are shown in Figure 6-8. Chi-square analysis of the distribution of the subcategory descriptions between study 1 and study 2 demonstrated a significant difference ($p=0.006$). The results indicate that study 2 is associated with decreases in learning about design skills, and increases in the actual creating the poster and increases in difficulties with the poster development.

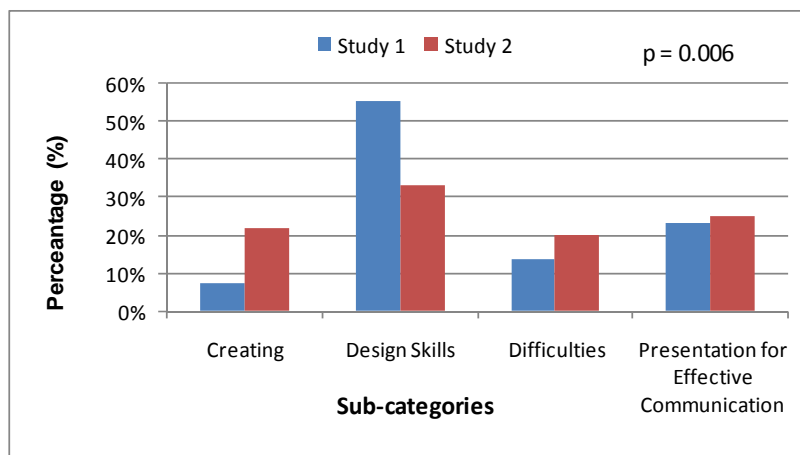


Figure 6-8: Comparison of the subcategory descriptions of Poster Development

6.4.2.4 Comparing the Distribution of Research Skills

The distributions of the subcategory descriptions of 'research skills' as described in study 1 and as rated in study 2 are shown in Figure 6-9. Chi-square analysis of the distribution of the subcategory descriptions between study 1 and study 2 demonstrated a significant difference ($p<0.0001$). The results indicate that study 2 is associated with decreases in learning general research skills and increases in planning the research.

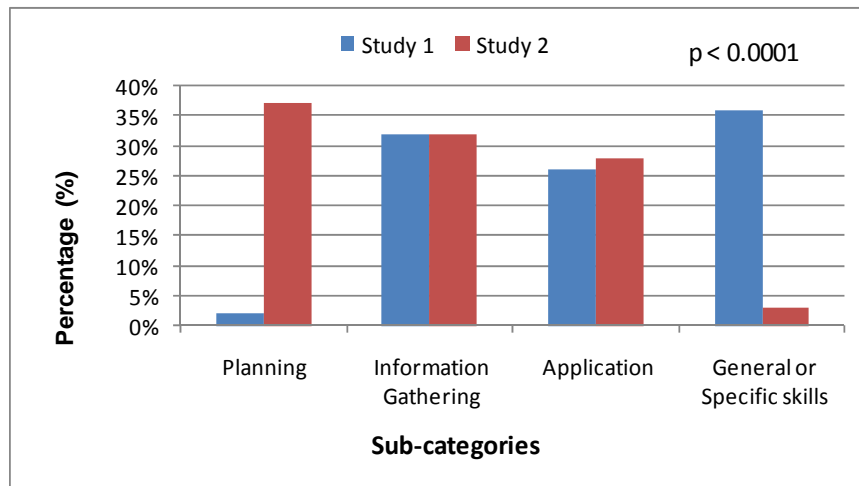


Figure 6-9: Comparison of the subcategory descriptions of Research Skills

6.4.2.5 Comparing the Distribution of Self Awareness

The distributions of the subcategory descriptions of collaboration as described in study 1 and as rated in study 2 are shown in Figure 6-10. Chi-square analysis of the distribution of the subcategory descriptions between study 1 and study 2 demonstrated a significant difference ($p=0.04$). The results indicate that study 2 is associated with increases in learning in all subcategory descriptions except in self-awareness of own role where there were large decreases in learning.

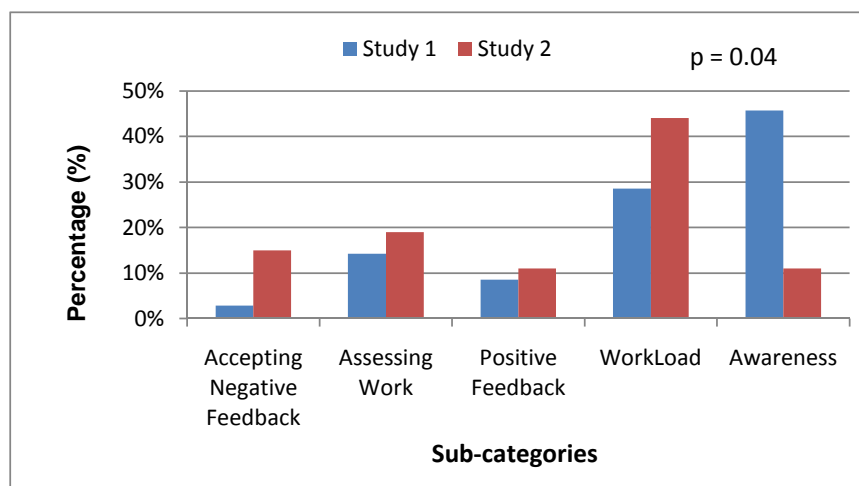


Figure 6-10: Comparison of the subcategory descriptions of Self Awareness

7. DISCUSSION AND CONCLUSION

7.1 OVERVIEW OF DISCUSSION CHAPTER

This chapter presents discussion arising from the results of study 1 and study 2, with reference to the four research questions asked within this research. The methods and results chapter both described the methods and analysis of content of learning prior to the conception of group work learning analysis. This was done to demonstrate the development of the larger, more descriptive data set, the 'pool of meanings', to be analysed for the conceptions held. In this discussion chapter the conception of group work outcomes arising from study 1 are discussed firstly because this is the typical order in conception of learning research publications (conception of learning categories described by the content of learning) and secondly because the results arise solely from study 1. The structural elements of learning that assist the development of the conceptions are then described and compared between study 1 & 2. The discussion arising from the analysis of interest is then given.

7.2 CONCEPTION OF GROUP WORK LEARNING

7.2.1 Discussion Arising from Study 1

The conception of learning held by students to a learning or assessment task has the potential to affect the learning orientation adopted by students and the learning outcomes achieved by students. Entwistle and Peterson (2004), Purdie and Hattie (2002) and Van Rossum and Schenk (1984) all describe the relationship that exists between the conception of learning held by students and the learning approaches adopted by students. The relationship is one where conceptions described as reproducing and applying knowledge are associated with surface processing and learning, and where conceptions that describe a seeking for meaning or change in understanding and practice are associated with deep level processing and learning.

Table 7-1 provides an overview of the conceptions as first described by Säljö (1979) and the associated learning orientation of the conceptions, as well as the same summaries of conceptions and learning orientations research undertaken by other authors in different learning settings.

Table 7-1: Conceptions and learning orientation from published studies

(R. Saljo, 1979)	
Learning as A: an increase in knowledge B: memorising C: the acquisition of facts, procedures, etc, which can be retained and/or utilised in practice	Learning as Reproduction = Surface learning
D: Learning as the abstraction of meaning E: Learning as an interpretive process aimed at the understanding of reality	Learning as Seeking Meaning = Deep learning
(Crawford, et al., 1994) – conceptions of maths	
Learning (maths) as: A. numbers, rules and formulae B. numbers, rules and formulae which can be applied to solve problems	Learning as Reproduction = Surface learning
C. a complex logical system; a way of thinking D. can be used to solve complex problems E. provides new insights used for understanding the world	Learning as Seeking Meaning = Deep learning
(Duke, et al., 1998) – conceptions of PBL (nursing)	
Learning as: A. process only – <i>“finding out how to find the answer to problems all by yourself”</i> (pg 63) B. process/purpose – <i>“using own initiative to learn all the techniques and procedures...using problem solving to decide what technique to use when”</i> (pg 63)	Learning as Reproduction = Surface learning
C. process / purpose (Understanding) / contextualising D. ...contextualising/ applicability/ personal objectives	Learning as Seeking Meaning = Deep learning
(Ellis, et al., 2006) – online and face to face discussions (not group work)	
Learning as: A. acquiring ideas B. checking ideas	Learning as Reproduction = Surface learning
C. challenging ideas D. developing ideas	Learning as Seeking Meaning = Deep learning

The first three conceptions (A - C) as described by Säljö are related to the accumulation of facts and knowledge for the purpose of reproduction when needed,

and hence are associated with surface level processing and learning. The latter two conceptions (D and E) are associated with a qualitative change in learning where learning has meaning and provides development, and hence conceptions D and E are associated with deep processing and learning. It must be remembered that the context of Säljö 's original study was that of the solo learner learning in a teacher orientated behaviourist environment.

Research has since identified the effect a change in the learning environment or learning context has on learning outcome, and conception of learning research has been undertaken in a large range of different contexts. These contexts include specific academic and professional fields of learning, eg maths (Crawford, et al., 1994), and specific aspects of instructional models, eg elements of problem based learning (PBL) (Duke, et al., 1998), and online and face to face discussion (Ellis, et al., 2006). While the descriptions given to the resultant conceptions arising from the various research settings are different (but matched to the context evaluated), the results of all studies are similar, showing elements of surface or deep learning orientations matched to reproducing or meaning conceptions.

While it is recognised that learning can be strongly affected by the social context of learning (Hanson & Sinclair, 2008; Pallinscar, 1989) very few studies have ever given consideration to the effect of group work on the development of conceptions of learning. Hence, one of the aims of this research was to answer the research question:

Research Question 1: The Conceptions of Group Work Learning

What are the referential conceptions of important and personal learning that develop as a result of completion of a group work learning and assessment task?

The outcomes of study 1 demonstrated four conceptions of group work learning, of which only one, 'Conception A: Acquiring Facts', is linked to a 'learning as reproduction' orientation. The remaining three conceptions (B-D) are all described in terms of a change of meaning and understanding as a result of the group work learning, and are related to a deep approach to processing and learning (Table 7-2). In this group work learning context conception A was the least described conception, indicating that students considered group work learning required more than a 'learning as

reproduction' approach. The majority of the responses of students, and the largest proportion of structural elements of learning, described learning in groups as a changing of meaning and development of understanding of, and as a result Conceptions B-D were the most frequently described conceptions developed in study 1.

Table 7-2: Study 1 conceptions of group work learning matched to learning orientation

Study 1	
A – Acquiring Facts	Learning as Reproduction = Surface approach
B – Developing Meaningful Interpretations and Applications C – Negotiating Social Structures D – Recognising Expertise and Creativity within Individuals and Groups	Learning as Seeking Meaning = Deep approach

In terms of the relationship of conception A to the structural elements of learning, Conception A emerges almost entirely from learning about the specific poster topic content, where facts and knowledge can be accumulated about the topic. An increase in knowledge is an expected outcome of all learning, and is an outcome uncovered in all solo learner context studies (Table 7-1). In this sense the development of conception A in this research is an outcome which aligns with previous research.

Conception B is associated with topic specific factual knowledge transformed through listening to others who may bring alternate and complimentary research and discussion to the group learning environment, leading to a new way of viewing the information for group members. Again it is a similar conception to that found in other research where meaning and understanding is reached. However the difference in this research is that the transformation of knowledge to a level of understanding and new interpretation which provides for application of the knowledge in new professional situations, is brought about not only through a self-reflection and self-awareness process, but also through engaged group work learning with peers who interpret and apply

understanding in ways that are different to the individual learner and which assists further individual development of meaning. Conception B is a more complex process of developing understanding that is found in solo learning, with a strong social constructivist element.

Conceptions C (negotiating social structures) and D (expertise and creativity) are new conceptions of learning descriptions not described in detail, or as a significant outcome, in previous published research. This is a significant outcome for this group work learning research. Conception C is concerned only with the structures, process and outcomes of learning in collaboration with others. Conception C emphasizes increased awareness about personal and team organisation, commitment to a team, goal setting and recognising achievements within a team. Conception C is related to the issue of social competence.

In terms of socially constructed or engaged conceptions of learning, only two studies, both undertaken in a solo learner context, have briefly discussed either a conception of learning related to learning as an interactive process, or learning as social competence. Tynjala (1997) analysed 62 essays of 31 educational psychology students who wrote an essay titled "My conception of Learning" before and after a course which reviewed writing as a learning tool. Seven conceptions about learning were described by the group of which one described a conception of 'learning as an interactive process'. Although the course included student discussions as a learning tool, this conception was described as being bound by the interactive process between teacher and student.

Purdie et al (1996) reviewed differences in the use of self-regulated learning strategies between Australian and Japanese high school students. Again the context was that of the solo learner. Nine conceptions of learning were developed with the first six being typical of the work of (Marton, et al., 1993) (see Table 2.8, pg 2-43), with the remaining three conceptions being previously unreported conceptions, these being: vii/ learning as a duty, viii/ learning as a process not bound by time or context, and ix/ learning as developing social competence. With regard to learning as social competence the authors indicated that this was a:

"minority category ... almost exclusively the preserve of the Japanese students..." (pg94),

where the Japanese students placed value on operating as a member of a society and the skills to be socially competent.

Conception C, (negotiating social structures) in this research was a very large outcome of this research, reflecting the group work learning context of this research and the differences of group work learning to those of solo learning.

Conception D in this research was the development of a conception of group work learning that is informed and improved by the expertise and creativity that individuals bring to the team and the enhanced group work processing that occurs because of that. It was a reasonably large finding that described how groups contained increased expertise and creativity that assisted the development of research skills and information gathering, the interpretation and presentation of research results about the topic, and the development and presentation of the poster. Students learned that group work learning allowed for expertise and creativity beyond their own, and they learned the skills that others brought to the group.

Only the work of Tynjala (1997) has identified a conception of learning as a creative process, however in this work the author states that it (creativity) was

“not a common finding” (pg 288)

with only two of 39 students describing learning in terms of creativity, with one student describing learning as,

“a creative activity guided by individual thinking and operational models”
(pg 288).

In this research conception D was directly related to the group work learning environment which allowed for group discussion and reflection.

Conceptions C and D have strong elements of emotional engagement with learning and learning outcomes, and both have strong elements of meta-cognitive processing leading to increased awareness about learning in groups. Only one study to date describes the possibility of a conception of learning with links to an emotional engagement with learning. Ellis et al (2006) reviewed students conceptions to learning and approaches to learning when learning in a psychology course which included

online or face to face discussions as part of the learning and assessment requirements (see Table 7.1 for the four conceptions developed). The course and learning was not a group work learning task and all learning and assessment was an individual task. The researchers comment that an unanticipated response was the highlighting of responses by students that demonstrated feelings about their experiences of learning through discussions. They did not do any further review of this unanticipated response, although they indicated that this area:

“may be important to investigate in relation to conceptions and approaches in the future” (pg 250) .

7.2.2 Importance of this Work

In considering the responses of students and the structural elements of learning identified in study 1 of this research, group work learning has evoked a perception in students that their learning is transformed through engagement with others into ‘meaningful interpretations’ able to be ‘better applied’ to real world situations. Learning in groups has allowed students to develop conceptions and an awareness of, and have experience with, *socially constructed group and team work processes* that they will be involved with in the real world workplace. Students’ have developed conceptions of *creativity* and *a broader world view* in the ways that information can be gained, processed and transmitted, when working as part of a team.

The analysis has produced a series of conception of group work learning descriptions not described in previous research. Learning in groups has been shown to be strongly related to the adoption of a series of deeper learning outcomes related to social competence and engagement. These outcomes have not been described in solo learning research (Ellis, et al., 2006; Marton & Saljo, 1976a; Purdie & Hattie, 2002).

7.3 CONTENT OF GROUP WORK LEARNING

7.3.1 Discussion Arising from Study 1

Although generalisation have been made about the outcomes of group work learning in terms of what students learn (see section 2.2, pg 2-23 for a full review), most of the research about what students learn in groups has been undertaken from an outsiders

perspective (the researcher) of learning within the group and not, as has been done in this research, from a the students' insider perspective. Group work research has often been undertaken to identify the psycho-social dynamics of the team or learning environment (Forsyth, 1999; Hanson & Sinclair, 2008; Pallinscar, 1989; Pintrich & De Groot, 1990; Wilson & Fowler, 2005), or to exam group learning assessment methods and assessing contributions to group work (Battye, et al., 2008; Gatfield, 1999; Johnston & Miles, 2004). There is no research available which seeks to identify the structural elements of group work learning, ie 'what students learn', from the viewpoint of the student (a second order phenomenographic perspective) when learning and being assessed within a group work learning context.

To explore the results of study 1 for the structural elements of group work learning, the following research question was posed:

Research Question 2: The Content of Group Work Learning

What are the categories of important and personal learning that students acquire and prioritise during a group work learning and assessment task?

The results of study 1 indicate that students identified five important categories of group work learning:

1. learning about collaboration (55% of responses)
2. learning about the topic of the study (19%)
3. learning how to develop a poster (15%)
4. learning research skills (6%), and
5. learning about self-awareness within the project (4%).

An analysis of the subcategory descriptions demonstrates that students prioritised as most important:

1. learning about collaborative structure and organisation (20% of all responses)
2. learning in depth information about the topic (18%)
3. learning what makes collaborative work effective or not (15%)

4. learning to make decisions within a collaborative team (9%)
5. learning to identify and negotiate group work difficulties (7%)
6. learning the positive benefit of collaborative work and learning (4%)

Items 1 and 3-6 are all subcategory descriptions from the learning as collaboration major category (the highest ranked major category outcome) and these outcomes are not about an increase in specific topic knowledge, a regular and expected outcome of learning, but rather they are all associated with an increase in awareness about the group work learning process. They are all associated with the process of knowing and/or learning about learning, which is known as metacognition or metacognitive learning (Flavell, 1979). Metacognition has been shown to extend beyond the academic periphery (ie knowledge gathering) and is associated with the ability to monitor and calibrate one's performance, effective leadership and excellence in the workplace, academic success and problem-solving ability, and achieving life goals (Coutinho, 2006). Metacognition includes dimensions of self-knowledge and task knowledge (Biggs, 1988). Meta-cognition can also extend from individual awareness and regulation, to an awareness of what group members know and don't know, and how individuals and group members can share their skills for the cognitive benefit (learning) of all group members and the resultant task (Anderson, Thomas, & Nashon, 2009; Tindale, Meisenhelder, Dykema-Emgblade, & Hogg, 2004).

Many students lack the metacognitive processes to be able to self regulate what they know from what they need to know and how to go about solving social or academic problems, and individual or solo learning often does not provide an avenue for discussion about the learning process. To assist the development of students who are able to better able to self-regulate their learning, students need a learning environment that allows for reflection on their own experiences and the experiences of others (teachers or peers). The outcomes of this research suggest that group work learning allows for this metacognitive development to take place.

Item 2 on both lists above, learning about the topic of the study, is the only item on the list concerned with an increase in specific topic knowledge. In this research it is considered that the importance placed on this item by students is directly associated

with their ability within this project to self select the topic for their research based on their interest. This result is therefore discussed in the discussion of 'Interest' which is in section 7.4 (page 160) of this chapter.

7.3.2 Discussion Arising from Study 2

In study 2 the time to complete the project was reduced from 10 weeks to 6 weeks. The effect that this change had on learning was guided by the research question:

Research Question 4: Changes in Priorities of Learning

How does a reduction in the time frame to complete a group work learning project affect the priorities for learning?

It would appear from the data that the change in time has significantly affected all of the five major content of learning major categories (Figure 6-5, pg 6-131). The reduction in time has reduced the students' evaluation of the importance of (study 1 v study 2):

- learning about collaboration (55% v study 38%), and
- learning about the topic of the study (19% to 13%).

The reduction in time has increased the student's evaluation of the importance of:

- learning how to develop a poster (15.% to 19%)
- learning research skills (6% v 21%), and
- learning about self-awareness with the project (4% v 9%).

In terms of subcategory descriptions the shorter time reduced the importance of four of the top five learning priorities identified in study 1 (study 1 v study 2):

1. learning about collaborative structure and organisation (20% to 11%)
2. learning in depth information about the project (18% to 5%)
3. learning what makes collaborative work effective or not (15% to 9%)
4. learning to make decisions within collaborative team (9% to 6%).

The decreased time frame also reduced the importance of:

5. learning poster design skills (9% to 6%)

In terms of the subcategory descriptions, the shorter time to undertake the project increased the importance of the following learning outcomes (study 1 v study 2):

- a focus on creating the poster (1% to 4%)
- a focus on developing the question to be answered (0.5% to 5%)
- a focus of workload (completing the task in the time frame) (1% to 4%)
- planning the research methods to complete the task (0.1% to 8%)
- a focus on research information gathering (2% to 7%)
- a focus on the application of research uncovered (2% to 6%)
- increased workload (1% to 4%)
- accepting negative feedback (3% to 15%)

The remaining 10 sub-category descriptions not listed above all had less than a 3% variation and were considered non-meaningful in terms of a significant variation. In terms of the subcategory descriptions there is a pattern among the responses that demonstrates the shorter time period to complete the poster project required students to focus more on completion of the associated task activities (eg searching for answers, putting together a poster, prioritising workload issues) to develop the product of the task (ie the poster) within the reduced time frame, rather than learning about organised and effective team processes, and research and design skills. It appears that the short time frame has required students to take on specific tasks and present these to the group so that the task could be completed. The shorter time frame has reduced the opportunities for the group to discuss and reflect on their developing work, and make decisions to move forward.

This change in the approaches to learning and learning outcomes from study 1 to study 2 is associated with a shift from **collaborative** learning outcomes towards **cooperative** learning processes. The differences in these outcomes aligns well with the definitions of Panitz (1997) where he describes:

“Collaboration is a philosophy of interaction and personal lifestyle where individuals are responsible for their actions, including learning and respecting the abilities and contributions of their peers;”

and

“Cooperation is a structure of interaction designed to facilitate the accomplishment of a specific end product or goal through people working together in groups.” (page 1).

The reduced time frame has not provided the metacognitive opportunities that the longer time frame provided, and it would appear that students may not have learned or be as aware of the issues to do with team work and social competence.

7.3.3 Importance of this Work

This group work learning research has demonstrated that given sufficient time to work in teams, students will develop significant awareness and skills about group work relationships and processes allowing them to acquire high order cognitive and metacognitive learning outcomes that are transferrable to the future workplace. Many of these outcomes would not be achievable in a solo learning situation. This research also identified that given limited time to work as part of a team students will change their priorities from collaborative learning processes, and engaging in discussion and decision making on the process and outcomes related to the group work task, to a process of delineation of tasks to group members and themselves to achieve outcomes more associated with completion of a task within the limited time frame. These latter outcomes are not dissimilar to that which would have been achieved if working as a solo learner.

These outcomes are important in the context of educating MRS professionals who can actively engage with clinical and research teams over their careers. The implication is that all programs of study should include a major group work task that provides students with an opportunity to develop important collaborative awareness and skills which are sought after in the workplace and that are transferable throughout their careers.

7.4 INTEREST

7.4.1 Interest and Study 1

Interest in an academic program of study plays a significant role in increasing the retention of students in a program, and also in the selection of students suitably matched to particular career choices (Krause, Hartley, James, & McInnes, 2005; Rickson & Rutherford, 1995). In recent years Australian universities have investigated and implemented projects, such as guided and transitional year 1 experiences and courses (Scott, Shah, Grebennikov, & Singh, 2008; Surjan, et al., 2010), in an effort to better match students to programs, improve satisfaction with courses, and decrease attrition rates. In Australia it is estimated that attrition from university programs has a cost of around Aus \$1.4bn dollars (£0.84bn, € 1bn) with the rate of attrition of students from programs across a number of Australian universities ranging between 10% – 24.2% (J. Hare, 2010).

One of the aims of this research was to investigate the interest orientation of students when given the opportunity to freely choose, based on their academic or professional world interest, the topic of their research. The exploration the interest dimensions of the topics selected by students in study 1 was guided by the research question:

Research Question 3: Interest Orientated Learning

What are the dimensions of interest of students, of different health professional programs, when provided within the opportunity to freely select the topic of their learning?

The dimensions of interest expressed by students in their poster research questions appears to be strongly influenced by the profession specific practitioner role and function, which the students experience during periods of professional practice and they learn about in their academic studies. Although up to year 2, when this task was undertaken, the three groups of students shared a large percentage of common learning, the results of this research indicate that they do not share a strong overlapping or mutual interest in a specific dimension of MRS practice but rather that they have aligned their interest with the specific professional degree they are studying.

Diagnostic radiography is an imaging profession that makes use of a large variety of technologies (for example: x-ray, CT, MRI, sonography, digital and computed technologies) to image a large range of acute trauma and chronic illness in a wide range of patients (for example: musculoskeletal imaging, cardiovascular and respiratory imaging, neurological imaging, adults, paediatrics and neonates) in a large range of clinical situations (for example: in private and public; in metropolitan, rural and regional centres; in wards, theatres, accident and emergency; specialist procedures). The role of the radiographer varies greatly between centres in Australia. Some larger centres have the support of other health and medical staff in the triage and referral of patients, they have radiology specialist who undertake the diagnostic interpretation of the acquired images, and the radiographer's role is a traditional one of accepting a referral and completing an imaging examination. In other centres, which may lack inter-professional imaging or patient support, such as in rural imaging centres, the role of the radiographer may include patient triage, communication with non-radiology medical staff regarding the appropriateness of medical imaging requests, image interpretation and post procedure patient management and referral (Australian Institute of Radiography, 2009 1a, 2009 1c; A. Smith & Baird, 2007). Imaging pathways are at times complex and multiple (Bairstow, Mendelson, Dhillon, & Valton, 2006), and judgements about a patient's imaging need to be made considering the presentation of the patient, the technology available to the department, the availability of specialist imaging radiography staff, and the role that radiographer plays in that department. Most imaging procedures are undertaken over a short time frame, with little time to develop a significant patient rapport.

Diagnostic radiography students within this research have asked questions of themselves that characterised their interest as wanting to examine and rationalise the complexity of modern clinical diagnostic imaging practice. Issues researched within the clinical procedures and clinical skills category included:

- the clinical indications for imaging
- protocols for imaging
- the necessity for imaging in specific clinical situations
- radiography ethics and health law, and

- advanced radiography roles, image interpretation, and increasing clinical autonomy.

Radiation Therapy is a cancer treatment based profession. The role of the radiation therapist includes imaging to acquire detailed multi-dimensional patient anatomical information (simulation), the accurate mapping of all tumour and non-tumour organs and systems within the body and the design and planning of high energy radiation beams placed strategically throughout the body using advanced software programs, and the daily treatment of cancer patients over 6-8 weeks using a limited range of treatment technologies. A diagnosis of cancer and its ensuing treatment can have physical, functional, emotional and social effects on a patient (Cella & Tulsky, 1993; Donovan, Sanson-Fisher, & Redman, 1989), and radiation therapists have a large role in monitoring the quality of life of their patients and adopting strategies to improve their daily lives (Halkett & Kristjanson, 2007). The role of the radiation therapist is highly patient care focussed and this is acknowledged internationally (Australian Institute of Radiography, 2009 1b; Mitchener Institute for Applied Health Science, 2009).

Radiation therapy students within this research have asked questions of themselves that characterised their interest being concerned with:

- patients
- patient outcomes, and
- increasing support for patients.

When discussing clinical procedures or technology radiation therapy students do so within the realm of improving patient outcomes rather than contrasting treatment technologies.

Whereas diagnostic radiography has a focus on the visualisation of normal and abnormal anatomy, nuclear medicine uses radiopharmaceuticals, to image the function or physiology of organs or body systems (British Nuclear Medicine Society, 2010; Society of Nuclear Medicine USA, 2010; Victorian Society of Nuclear Medicine, 2010). The role of functional and molecular imaging is growing and plays an important role in skeletal, neurological, oncology, and cardiac imaging. Nuclear medicine has the ability to demonstrate the presence of cancer cells and cancer spread much earlier than may

be detected with other diagnostic imaging modalities, and nuclear medicine is playing an increasing role in cancer staging and tumour volume rendering. The technology, and the use of technology, is growing and there are now hybrid technologies, such as PET/CT, that integrate anatomic and functional imaging into a single system (Piperkova, et al., 2007; Schimdt, et al., 2008).

While the number of nuclear medicine student groups participating was small (n=6), and caution should be taken in generalising these results, within this research the nuclear medicine students characterised their interest as wanting to compare and contrast the role of current and emerging nuclear medicine technologies in modern practice. There was a focus of interest in:

- recognising nuclear medicine imaging technologies as an alternative or adjunct to mainstream diagnostic imaging methods.

This interest appears to be far greater than the interest in debating clinical practice procedures or skills, or the post imaging management of patients.

The dimensions of student interest reported in this research by diagnostic radiography and radiation therapy students aligns well with the descriptions of advanced practice within each profession in recently released professional documents. In the Australian of Radiography's report entitled 'Discussion Paper: A Model of Advanced Practice in Diagnostic Imaging and Radiation Therapy in Australia' (Advanced Practitioner Advisory Panel, 2010), diagnostic radiography advanced practice roles are titled in relation to clinical examinations, for example clinical specialist in Fluoroscopic and Interventional Imaging, Ultrasound Imaging, Computer Tomography, Magnetic Resonance Imaging, where-as radiation therapy advanced practice roles are titled in relation to patient presentations or patient management, for example clinical specialist in Paediatric Radiotherapy, Palliative Radiation Therapy and Treatment Review.

7.4.2 Interest and Study 2

In study 2 students did not get the opportunity to freely choose the topic of their research, rather topics were provided by academic staff to student groups. The following research question was posed to investigate the effect of this change from study 1:

Research Question 5: *Interest Orientated Learning*

How does a loss of freedom to select the topic of interest affect the priorities for learning?

The loss of freedom to select the topic, and be engaged in a topic that has personal interest for the students, appears to have affected two outcomes in particular.

The first outcome is the reduction, from study 1 to study 2, in the importance placed on learning about the Topic Content major category compared to other categories of learning. Overall the Topic Content category fell from the second most important major content of learning category to the fourth most important category, with the percentage of importance of learning falling from 19% in study 1 to 13% in study 2 (Figure 6-5, pg 6-129).

The second result of the loss of freedom to select the topic of the project is the statistically significant sub-category variation within the Topic Content category between study 1 and study 2 (Figure 6-7, pg 6-130). In study 2 students prioritised as more important (study 1 v study 2):

- the designing of the question to investigate the topic (3% v 38%), and
- ensuring that the topic could be designed as an education tool (1% v 22%).

Students in study 2 prioritised lower:

- the importance of investigating specific learning about the topic (92% v 40%).

These results appear to indicate that students who choose the topic of their learning (study 1) choose to research the specific details of the topic so as to develop greater understanding of the topic, whereas students who do not choose the topic of their learning turn their attention away from the researching the topic to managing process issues about the topic within the context of the poster task, such as constructing a question or developing the topic as a teaching or learning tool. This outcome appears to conform to the previously published research (Deci, et al., 1991; Kapp, 2005; Pintrich & De Groot, 1990) that indicates that students who hold interest in a topic of learning will engage with it in more depth as it holds personal interest for them.

7.4.3 Importance of this Work

There are two important results arising from this 'interest orientated' research. The first is related to the increased learning outcomes achieved when the topic of study holds personal interest for the students, and the second is related to the use of a new and novel method to analyse the dimension of student interest.

Medical radiation science programs, and most health professional programs, have a highly professionally specific and content laden curriculum that is directed to achieving specific and core knowledge and skills outcomes. Within this program structure most of the teaching and learning methods are directed toward covering the core curriculum and there is often little opportunity for students to engage in learning based on their specific interest about parts of their academic and professional world. Some university programs now include elective courses which are designed to allow students a free choice of course. At the University of Newcastle the MRS programs are organised within a 'Fully Integrated Single Degree Program' structure, with 220 of 240 units of study being core courses, with students having two (2 x 10 unit) free choice elective courses (The University of Newcastle, 2010b).

This work has identified that it is possible to provide students of highly structured and content laden degrees with the opportunity to freely choose the topic of research within the core course content, and that being able to choose a topic of study based on personal interest does increase the depth of students' investigation of the specific topic of interest compared to having a topic given to them.

This work pioneered a new method for the analysis of interest. Rather than ask students why they thought something was interesting or not, and seek through their answers for the reasons, this research thematically analysed the self selected topics that students freely chose to study. Three outcomes of interest were established which appeared to align well with the professional role of the students. This type of interest analysis can be extended to other interest based activities to derive what it is that students find interesting. By finding out what students find interesting academic institutions will gather another source of evidence (the dimension of student interest) for the decisions that they make when designing or modifying curriculums of study.

While not directly measured within this research, this research is suggestive that perhaps some students, based on their personal interests, are more suited to one particular health profession than another, and that student selection for professional programs could be made better by considering the interest and motivation of applicants for a program of study and career. This does support previous published work in evaluating the personal qualities required for effective professional practice in the various disciplines of medical radiation science (Bore, Lyall, Dempsey, & Powis, 2005).

7.5 LIMITATIONS OF THIS RESEARCH

7.5.1 Further Work to be completed

This research is the first reported research to investigate the conception of group work learning. The results therefore are unable to be validated against the outcomes of other group work learning conception studies and while there is some linearity with solo learning studies, care must be taken with the results of this research until they have been replicated in other group work learning studies. Further research should include studies using students of other academic and/or professional disciplines, and/or students engaged in similar or other collaborative group work learning and assessment tasks.

This research has been collected on year 2 students undertaking medical radiation science programs at the University of Newcastle, Australia. This work is really only generalisable to students of similar experience in medical radiation science programs undertaking a similar group work learning and assessment task. To increase the generalisability of the results there needs to be replication studies undertaken on MRS students at other universities to see if the generalisations made in this research hold true in other settings.

7.5.2 Limitations in the Analysis of Conceptions and Content of Learning

Rather than ask the direct question “what did you learn?” or “what is learning in groups?”, as has been usual in pure phenomenographic research which looks to investigate conceptions of and approaches to learning (Marton, 1986; Marton & Pong, 2005), study 1 made use of qualitative interpretative analysis methods to interpret the open ended responses of students to an indirect question related to the conception of

learning, a method more in line with the experimental phenomenography methods described by Bowden (2005) and Patrick (2000). No prior analytical or coding schemes were identified in the literature that were able to be used in the research, therefore a purposefully designed analytical method was required to be developed to analyse the responses. The development of analytical methods and coding schemes by the researcher lends itself to the possibility of bias in the interpretation of the data and the categorisation of the data (Hennekens & Buring, 1987). To reduce the possibility of bias the researcher bracketed pre and developing conceptions of outcome (section 3.7.3, pg 3-72) so that the results reflected the emerging conception of group work learning constructs.

To evaluate the conception and content of group work learning, this research analysed students' single line responses, to a single question, rather than a full transcript of recorded interview data. Students were asked to provide three answers to the question "*the three most important things I learned were...*" While there is a move toward the use of questionnaires to increase the pool of responders in such research, the use of a series of single line responses has the potential to limit the qualitative descriptors available for analysis. To increase therefore the likelihood of capturing an adequate number of quality responses students were asked to provide three answers. The use of short responses did reduce the amount of data (words, sentences, paragraphs) to be analysed and therefore it is possible that the data provided did not contain all the descriptions of learning that were possible. Alternatively the direct and limited nature of the question and response required may have limited the generation of unwanted 'noise' and the collection of useless data (Meyer & Boulton-Lewis, 1999).

In study 2 students responded to a forced choice questionnaire developed from the outcomes of the analysis of study 1. In assessing the variation in the content of learning acquired between study 1 and study 2 a direct comparison has been made between the results. It is possible that the variation in outcomes between the studies is a result of the different methods of data collection, however the methods reflect the often cited development of quantitative inventories from initially developed and collected qualitative research studies (Biggs & Collis, 1982; Meyer, 2004; Meyer & Boulton-Lewis, 1999).

7.5.3 Limitation in the Analysis of Interest

There are two main limitations of the analysis of interest. The first is that the results will be influenced by, and reflect, the learning and teaching environment of the University of Newcastle's MRS programs. It is quite possible that students in programs that are located in other Faculties and Universities, or in other countries where MRS is practiced differently, will have academic and professional influences different from those within the University of Newcastle program, and therefore the results of the analysis of interest may be different.

The second limitation is that it is possible that the outcomes generated were biased by the researcher's world view of MRS education and practice. To minimise this influence a coding scheme was developed and all results were reviewed by two independent coders, and the researcher attempted at all time to bracket their views from the analysis of the data. The results of the analysis were also compared to a descriptive analysis of the profession's views of the practice of the profession.

7.6 CONCLUSION

7.6.1 Conception of Learning Research

As a result of the changing nature of the workplace, universities in recent years have begun to engage students in learning activities that provide an opportunity to not only learn content, but also provide value added outcomes such as research literacy, communication skills, and team work skills. The research reported within this thesis investigated the qualitative learning outcomes that students acquire when learning and engaging in group work. Group work and socially engaged learning has been recognised as an under researched area of teaching and learning practice.

The research used interpretative data analysis methods that have become popular in a range of educational and qualitative research methodologies. The methodology analysed the responses of students to their learning and the natural product of student learning to evaluate the learning messages they contain. This methodology was able to be used to explore and categorise the referential and structural conceptions of group work learning, and the dimensions of student interest as described by the group work learning research topic. This method of analysis and use of personal learning

outcomes data provides a new and novel method for academic staff to assess what students learn, and what they find interesting (and don't find interesting) within their curriculum of study.

In this analysis, learning in groups has evoked a perception (conception) in students that their learning is transformed through engagement with others into 'meaningful interpretations' able to be 'applied' in practice, which allows for 'creative development' and 'a broader world view of learning'. The structural elements of group work learning are identified as being strongly aligned to the development of metacognitive learning, focussing on the multifaceted dimensions of 'social competence'. These outcomes are those suggested as important for graduate workplace competence, and the self regulation required to engage in lifelong learning.

The research identified that for group work to provide meaningful outcomes for students, that the cycle of collaboration needs to be over an extended period of time so that students can develop awareness and skills in a range of team work and social competence outcomes to make group work, and group relations, more effective. Reducing the time for group work meant that students reduced their collaborative learning and moved towards cooperative learning, where they focussed on completion of the duties associated with the task rather than learning issues related to social competence.

The research strongly supports the use of group work learning within programs of study so that students have an experience with team based learning and team based decision making. Group work learning offers opportunities for students to develop both skills and an increased awareness of the roles and structures of socially engaged learning so that they can participate more successfully in the socially engaged, team based workplace. This research also identified that group work learning allows students to see the expertise and creativity of team members and how these attributes increase the potential of the group to achieve better outcomes that may have been achieved by the student on their own (as a solo learner).

Arising from this research is a series of three recommendations that higher education programs of study should consider in developing group work learning and assessments tasks. The recommendations are associated with the key issues that will develop in

students and graduates those referential and structural conceptions of group work learning associated with an increase in meta-cognitive awareness about socially engaged team based learning, and to develop the skills to engage successfully in group work.

Recommendations:

1. That the time provided for the group work learning tasks is long enough to engage students in the team environment so that the learning environment moves from one of cooperative learning where each student completes a small task within the group work task, to one of collaborative learning where students take responsibility for the management and organisation of the group work environment and content learning with students sharing resources and outcomes. In this research 10 weeks appeared to be a minimum time period to allow for the development of a collaborative approach to learning.
2. That students are given multiple opportunities during the task to discuss and debate their learning with their team members, so that they become aware of the knowledge and skills, and different interpretations of knowledge that different group members have and can bring to the team. Only through this can group members develop an awareness of the potential of socially constructivist learning.
3. That opportunities are provided for all group members, during both the learning and assessment phases of the group work task, to reflect on the work of their peers and their own work. This will provide a point of consideration and reflection of the values held by the individual learner within the team and the values held by the team more broadly within which the individual learner works.

7.6.2 Interest Orientated Research

The analysis of the poster research questions highlight the interest dimensions of the students in the University of Newcastle MRS programs. When given the chance MRS students asked questions of themselves that were clinically and academic challenging and meaningful. The dimensions of interest expressed by the students in the research questions they asked of themselves suggest that in health professional programs that learning is enhanced when students have the opportunity:

1. to contrast the complexity of the work role and the technology that they experience on placement,
2. to discuss and rationalise the complimentary clinical methods available for patients and clinicians, and
3. discuss the care and management of patients who come under their care.

The research supports the notion that the three MRS professions, while complementary, are different and may require practitioners who have a deep personal interest aligned with a specific professional role. As the role of the practitioner changes there is a need for the programs to change in line with these developments. Having students nominate what they find interesting about their academic and professional world is one way to gauge the changes in the workplace and assess whether the program of study is current to the workplace.

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9. APPENDIX

Appendix 1

Ethics Approval for Study 1 Analysis

RESEARCH DIVISION:
Research Services

Ruth Gibbins
Human Research Ethics Officer (Acting)

For enquiries please contact:
Kate Fraser
Administrative Officer
Human Research Ethics
Research Office
The University of Newcastle
University Drive, Callaghan NSW 2308

Telephone: (02) 492 17128
Fax: (02) 492 17154
Email: k.fraser@newcastle.edu.au

18 January 2017

Mr Shane Dempsey
Medicine Radiation Sciences
School of Health Sciences

Re: *Quality audit of students own assessment of their learning*

Dear Mr Dempsey

Thank you for your submission to the Chair, Human Research Ethics Committee seeking a determination as to whether ethics approval would be required in relation to the above project which will contribute towards your student project. The Chair was able to consider your submission on 23 November 2016.

Following consideration of your submission, the Chair agreed that the project as described in the proposal is within the category of Quality Assurance or Program Evaluation and that approval from the Human Research Ethics Committee at the University of Newcastle was not required.

For further information or clarification, please contact Kate Fraser on 492 17425 or via email at Kate.Fraser@newcastle.edu.au

Yours sincerely

Ruth Gibbins
Human Research Ethics Officer (Acting)

On: Dr Helen Watson-Furber, School of Health Sciences
GoEthics human.ethics20070218Shane Dempsey.doc

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of NEWCASTLE
1824-1989

Appendix 2

The Poster Project Task handout and Assessment Items as provided to Students

MEDICAL RADIATION SCIENCE
POSTER PROJECT & PRESENTATION
YEAR 2, 2002-

Contents

1. About the Poster Module
2. Aim of the Poster Project
3. The Poster Project
4. Progress through the Project
5. Research groups and collaborative learning
6. Timetable for the Project
7. Assessment

About the Poster Module

This module provides information related to the Poster Development and Presentation project that will be undertaken during Year 2, Semester 2, as part of the Bachelor of Medical Radiation Science.

There are multiple, and newly developing, methods and formats for presenting the results of inquiry and research to an audience. Formats include oral presentation, serial (journal) and monograph (text) writings, video recordings, static and interactive poster displays, and on-line web presentations. The development of presentation skills that enable students to present the results of research or inquiry to an audience, of either their or other professions, is one of the aims of the undergraduate course. In this task the presentation media to be explored is the poster presentation.

The poster development and presentation project is designed to allow students to inquire into or research a topic of essentially their choosing. The poster is driven by students developing a question that requires answering through the use of academic investigation. The project is conducted in groups that encourage peer support, team work, and the realism of being part of a research team. What you must do is convince your lecturer and supervisor that the question you are asking is of some importance to

your education and development. A timetable is produced within the module that you should attempt to keep to.

Aim the Poster Project

- To allow students the experience of designing a poster presentation as a means of professional and academic communication.
- To promote intellectual curiosity, inquiry skills, critical reasoning skills, self learning and collaborative learning, by requiring investigative groups to promulgate a question and provide a critically evaluated answer.

Objectives of the Poster Project

On completion of the task students should be able to:

1. develop a question that requires critical review
2. explain the stimulus and rationale for the study question
3. describe the methodology used to conduct the study
4. critically evaluate current knowledge on the question being asked
5. discuss succinctly the outcomes of the critical evaluation
6. describe the impact that the review has had on understanding
7. work as part of a team
8. develop and present information in poster format

Presenting the results of Inquiry or Research

The most common way of communicating investigative or research findings is to first report the results at a professional conference and then to write a more formal paper for a relevant journal (Thomas and Polgar, 1995).

Poster displays at conferences, whether static or interactive or web based presentations, are now recognised as a legitimate means of disseminating information, and as some authors agree maybe more effective than a conference paper. Journal articles, conference papers, **and poster presentations**, generally follow guidelines set down by the journal review board or conference committee.

Why ask a Question?

One reason we elect to undertake research is that in our clinical or academic life we are confronted by a single problem or a series of problems. A common way to commence finding the answers to these problems is to frame a question built around the problem. Often in answering one question other questions will be generated which in turn need to be asked and answered. There are many different research strategies that can be used to research topics. There are quantitative, qualitative and experimental approaches.

Questions can be as basic as:

Experimental approach: "I wonder what happens when I press the exposure button." – outcomes are explained

Quantitative approach: "I wonder how much radiation comes out when I press the exposure button." – outcomes are measured by numbers.

Qualitative approach: "I wonder how the radiation interacts with the patient when I press the exposure button." – outcomes are described by words.

Exactly what question you ask often depends on the issue being studied. Some issues are best studied in certain ways, but it also depends on your interests or curiosity about your world.

This project seeks to stimulate your curiosity by getting you to ask a question of yourselves (individually and as a research group). By asking yourself a question you have to inquire into the nature of things as we currently understand them, use critical reasoning skills to evaluate the current knowledge base, as well as draw conclusions that will answer the question. You will need to convince yourself, your group, and the reader, that you have answered the question rather than just informing them on an issue.

The evidence you will require to answer the question will come from the mainstream academic and professional literature on the issue at hand. Essentially you must support your discussion and conclusion through the critique of multiple sources of journal

writings. By critiquing multiple articles you can claim that agreement on your discussion has been made by several authors in several locations.

Poster Format

The traditional poster is a static one piece or multiple piece board that explains the themes and results of inquiry or research. With advancing technology posters may also include static or interactive computer displays such as web pages. Both fixed or computer posters have advantages, disadvantages and visual gimmicks. While a poster's effectiveness may be enhanced by different forms of presentation, and the immediate impression of the poster judged by its visual attractiveness, the quality of the poster will generally be judged ultimately by the content first and the form second.

Let's review the guidelines from a recent international conference:

The Network: Towards Unity for Health International Conference
"Towards Equity in Education, Service and Health Care Delivery"
Newcastle, Australia

POSTER AWARD

Following the example set by others, at the Newcastle, Australia Conference the organisers will make available an award for the best poster brought to this meeting. As we realise that access to the latest high-tech in poster production and artwork is not evenly spread around the world, the dominant criteria to assess the posters will be:

The 5 points above are really good descriptors of what makes a good poster.

For this task your poster should also address the following issues:

1. You should include a brief statement (rationale) for why the question is important, and
2. Your data should be supported by about six critiqued and referenced journal articles.
3. You will need to provide a critically evaluated answer to your question.

In terms of size your poster needs to be of a size that allows it to be pinned or stuck to conference boards, and also be transported fairly easily. Conferences usually issue size restrictions so that they can organise hanging space. Posters that arrive for conferences larger than that advertised will not normally be accepted for presentation.

For this task the following size guidelines will be expected:

The poster:

Height maximum = 1 metre

Width maximum = 90 cm

Progress through the Project

This project encourages and relies on your group's self-direction in achieving the poster projects aims. Groups need to organise regular group meetings to keep the project on target. However, the project will have fixed resource sessions for the entire year 2 group, supervised poster group sessions where a supervisor (a staff member) will meet with their poster group, and self-directed group sessions.

Fixed resource sessions (FRS) are designed firstly to introduce the poster project to the group, and then to allow all groups to present their thoughts and their progress

within the project to all other groups and individuals so that we all have a chance to hear how other groups are going and learn from their experiences to date.

Supervised poster group sessions are designed to allow the group to both provide information to their supervisors about their progress, and also for the supervisor to provide feedback and information to the group about the group's progress. The supervisor's supervision is a vital aspect of the project. The supervisor is supposed to help the group maintain focus, provide direction, and not allow the project to grow too large.

Self-directed group sessions need to be held regularly. Groups need to collect evidence, critically appraise articles, find out about poster presentation, format words, and lastly communicate all findings with all members.

A timetable for progress through the poster project is provided below. Groups should attempt to meet the deadlines given within the timetable.

Read the section on assessment to find out what is required to complete the project.

The Portfolio

A project portfolio must be developed that details group meetings both with and without the supervisor. In the portfolio you should record time and place of the meeting as well as progress made with the project. Examples may include stating objectives, meeting objectives, members doing or achieving certain things, dates for completion of items, the papers used as part of the project and a brief formal critical appraisal of each paper. When meeting with the supervisor groups should get the supervisor to read the diary and sign off their name as indicating that they know the direction and achievements of the group.

RESEARCH GROUPS AND COLLABORATORY LEARNING

As health science professionals you will be working in health care teams trying to meet the needs of individual clients and communities. Most research is conducted in groups. Group effort is far more productive than individual effort. For this poster project it is

important that you form a poster group with other students. It is important that the group is formed through a shared interest for the topic rather than formed through friendships.

A session will be held during week 2 of semester that will explore student generated ideas for the project. If you have ideas for the project please bring them to the session. At this session you may hear topics that you are interested in or introduce topics that others are interested in. You will then need to form groups based around topics.

Once your group has been formed you will, as a group, meet with the group's supervisor and present occasionally to the rest of the student body. This occasional presentation is a very important step in helping guide the direction of the research and keeping the process moving.

Each group should have about 5 members (min 4 – max 6). Any less than this then the entire process becomes reliant on too few people and the quality of work suffers, and more than 6 results in the tasks spread too widely.

TIMETABLE FOR THE PROJECT

Week 1 week commencing 22 July	Poster display in MRS area to allow students to experience previous works.
Week 1 Thurs 25 July 11am HC19	Fixed Resource Session to discuss the project and previous posters. Start looking for a Supervisor.
Week 2 Tuesday 29 July 10am	Introductory questions introduced to the group Poster groups declared
Week 3 - week commencing 5 August	Self learning, self-directed group work Meeting with supervisors
Week 4 - week commencing 12 August	Self learning, self-directed group work Meeting with supervisors
Week 5 - week commencing 19 August	Self learning, self-directed group work Meeting with supervisors
Week 6 - week commencing 26 August	Self learning, self-directed group work Meeting with supervisors
Week 7 - week commencing 2 Sept	Self learning, self-directed group work Meeting with supervisors
Week 8 – Thurs 5 Sept 11am HC19	Fixed Resource Session - open discussion, groups to present how they are going, assessment
Week 9 - week commencing 19 September	Posters due by Friday 17 September, 12 noon to Discipline Office. Late penalty starts from 12 noon.
Week 10 - week commencing 16 September	All groups and individuals to commence poster assessment. Poster assessment due by Thursday 23 September, 5pm

ASSESSMENT INFORMATION

The assessment is made up of three parts. All forms will be made available at the beginning of the last week – the assessment week - of the project

Part 1 - Group task – Poster Assessment

Each group will assess every poster including their own. The poster will be assessed by considering:

- the overall quality of the information contained on the poster in answering the question asked
- the overall structure and appearance of the poster in engaging and attracting the viewer
- whether the poster met the students objectives for the task

All groups will assess all other posters (1 assessment per group per poster). The assessment sheets will be available at the commencement of the assessment week. Assessments will need to include marks and grades. In assessing the posters each group should assess all other posters before assessing their own. Your group should consider and reflect on the qualities that make the other posters either great or expressive or in fact poor. It is only with this reflection that you can honestly assess your own work.

Part 2 - Individual task – Self and Peer Assessment

Part of the learning process for the poster project is the ability of the group and individuals within each group to work together to achieve an outcome. Both group and personal objectives will be made, and should be met and assessed. On completion of the project, and perhaps if needed during the project, all groups and individuals will complete a self and group evaluation of the learning process.

Part 3 – Individual Task – Reflection on Learning

Each student will also complete a formative assessment of the key points of learning for this project. Assessment will be qualitative descriptors of process and outcome.

Assessment Summary

All parts of the project are vital to the process of learning, therefore all parts must be completed by all students for a pass in the research project. There may or may not be some variation in assessment between different forms of posters. These issues may become evident and will be discussed during the project.

PART 1 Group Task - Poster Assessment

Please read the poster before completing this assessment.

Title and number of poster being assessed:

Please read each of the statements below and tick which best represents the judging criteria.

Judging Criteria

SA = strongly agree; A = agree; NA/D = neither agree or disagree D = disagree;

SD = strongly disagree

MARKING SCALE - TICK THE BOX

POSTER QUESTION AND INTRODUCTION	SA	A	NA/D	D	SD
Is the question asked appropriate or the theme/purpose of the poster immediately obvious? <i>Is the question asked or title prominent and does it reflect the aim & contents of the poster accurately.</i>					
Is the reason why the topic has been investigated explained? <i>Viewer understands the importance of the topic and why the researchers have asked their question</i>					

DESIGN OF THE POSTER					
Is the layout helpful for easy orientation? <i>Captions, pictures and background assist in guiding the viewer through the poster & distinguishes the beginning and end.</i>					
Are the illustrations effective? <i>Consideration of size, content, position & relevance</i>					
Is the written information easy to read? <i>Type set and font are of appropriate dimensions</i>					
Does the overall effect give evidence of imaginative & creative planning for effective communication? <i>Intelligibility of presentation.</i>					

CONTENT					
Is the information presented sufficiently informative and does it appear to be valid? <i>The information presented is validated by evidence, there is sufficient data to explain the topic, a good range of informative discussion</i>					
Is all the written information necessary? <i>The poster succinctly conveys and explains the major points without being lengthy & detailed</i>					
The poster answers the question asked or the problem posed? <i>Do you feel that you are more informed and the question has been answered</i>					

This poster was assessed by (all group members names):

The mark that we would give this Poster is = %

Note: In giving a mark consider the ratings you have used above.

Ranges of marks are generally Pass 50-64, Credit 65-74, Distinction 75 – 84, Higher Distinction 85 -100

PART 2 Individual Task – Self and Peer Assessment

This questionnaire asks you about your own involvement with the project & the others that you shared the project with. Please be honest. Circle the answer that best describes your & the members involvement.

SA = strongly agree A = agree N=neither agree or disagree D = disagree SD = strongly disagree

Your Name:

I believe I contributed effectively within the project team	SA	A	N	D	SD
I believe that I contributed equally as other members	SA	A	N	D	SD
I could have done more	SA	A	N	D	SD
I would rate my involvement in this project as (circle answer):	low 1 2 3 4 5 6 7 8 9 10 high				

Group Members Name:

The project member contributed effectively	SA	A	N	D	SD
The member contributed equally as other members	SA	A	N	D	SD
The project member could have done more	SA	A	N	D	SD
I would rate the members involvement in this project as:	low 1 2 3 4 5 6 7 8 9 10 high				

Group Members Name:

The project member contributed effectively	SA	A	N	D	SD
The member contributed equally as other members	SA	A	N	D	SD
The project member could have done more	SA	A	N	D	SD
I would rate the members involvement in this project as:	low 1 2 3 4 5 6 7 8 9 10 high				

Group Members Name:

The project member contributed effectively	SA	A	N	D	SD
The member contributed equally as other members	SA	A	N	D	SD
The project member could have done more	SA	A	N	D	SD
I would rate the members involvement in this project as:	low 1 2 3 4 5 6 7 8 9 10 high				

PART 2 Individual Task – Reflection on Learning

This self learning evaluation asks you to nominate the 3 most important things you learnt from undertaking this project. They may be connected with any aspect of the project.

Student number:

Group:

Title of Poster:

The 3 most important things I learnt undertaking this project were:

1.

2.

3.

Appendix 3

Version 1 Code Book for coding Responses of Students to the Questionnaire

Version 1 Code Book for Raters

This document outlines the coding scheme to be used when coding the text responses to the questionnaire. There are 5 major categories with a range of subcategory descriptions. For the purpose of data entry and analysis the 5 categories have been assigned a primary code number of 1 – 5, and the subcategory descriptions have been given consecutive numbering within the category. These numbers do not represent any form of ranking or order of the data.

Ideally each response written on a questionnaire should only be able to be coded into one of the 5 categories, and into 1 subcategory description. The coding of each response should ideally be clear and unambiguous.

The primary codes given to the major categories are:

1 = Collaboration

2 = Research Skills

3 = Self Assessment

4 = Information about the Topic

5 = Poster Development

How to Rate Responses for this Training Exercise

For the purpose of testing the version 1 code book, you are asked to read the written responses of students on the questionnaire, one at a time, and code each response into as many categories or subcategory descriptions that you think describes or captures the meaning of the response. You are asked to do this independently from other raters. Write your coding alongside the response of the student on the questionnaire.

On completion of this the researcher will meet with all raters and there will be open discussion about the coding scheme and coding of responses and overlapping descriptions and categories.

COLLABORATION = Primary Category Code = 1
Sub-category Codes are given below
The response describes the idea of
1.1 agreement
1.2 commitment
1.3 complexities arise from different ideas with team members
1.4 compromising differences
1.5 contributing to a team effectively, equally
1.6 co-operation
1.7 difficult
1.8 don't like group work
1.9 easier to achieve goals in a team
1.10 easy to drift off into conversation
1.11 flexibility
1.12 good to get other members views
1.13 group dynamics
1.14 importance of leadership in a group
1.15 listening skills
1.16 makes it fun
1.17 need breaks to be alone
1.19 organisation
1.20 patience
1.21 reliability (of team)
1.22 requires planning, setting objectives
1.23 resolving problems
1.24 respect others opinions
1.25 teamwork/groupwork
1.26 time consuming
1.27 time management, meeting deadlines
1.28 within group communication discussion
1.29 work with people you like, get on with
1.30 working with different personalities, need for different personalities

RESEARCH SKILLS = Primary Category Code = 2
Sub-category Codes are given below
The response describes the idea of
2.1 collating ideas
2.2 critical appraisal skills
2.3 deadlines
2.4 experimental skills
2.5 good communication with experts
2.6 Informatics skills/information gathering
2.7 objectivity in research
2.8 places to look for information
2.9 planning effectively
2.10 referencing skills
2.11 research skills

SELF ASSESSMENT = Primary Category Code = 3
Sub-category Codes are given below
The response describes the idea of
3.1 accepting criticism
3.2 assessing other's work
3.3 comparative analysis of own work against others
3.4 hard work pays off
3.5 important to answer questions
3.6 inputting more personally
3.7 need others to critically appraise your ideas
3.8 peer reviewing
3.9 putting a lot of knowledge together
3.10 swallowing your ego
3.11 the most effort doesn't always produce the best poster
3.12 valuable to have other peoples input
3.13 world priorities
3.14 self learning and responsibility

THE TOPIC = Primary Category Code = 4
Sub-category Codes are given below
The response describes the idea of
4.1 ask small questions
4.2 educating others through the poster
4.3 information about the topic

POSTER = Primary Category Code = 5
Sub-category Codes are given below
The response describes the idea of
5.1 colour schemes
5.2 creating a poster
5.3 creativity
5.4 design skills
5.5 difficulties with the medium
5.6 editing (cutting down)
5.7 expenses
5.8 formatting
5.9 how to make
5.10 importance of presentation
5.11 presentation requirements for effective communication
5.12 quality assurance of information
5.13 time consuming
5.14 use of computers in design
5.15 vision of poster
5.16 web design skills

Appendix 4

Clustering of Overlapping Items of the Version 1 Code Book

Developing the Version 2 Code Book

COLLABORATION = Primary Category Code 1		
VERSION 1 CODEBOOK		VERSION 2 CODEBOOK
Current sub-category codes and descriptions are given below	Items clustered to form	The new sub-category codes and descriptions are given below
1.9 easier to achieve goals in a team 1.11 flexibility 1.14 importance of leadership in a group 1.19 organisation 1.22 requires planning, setting objectives 1.27 time management, meeting deadlines	→	1.1 ORGANISATION organisation, easier to achieve goals in a team, importance of leadership in a group, requires planning, setting objectives, time management, meeting deadlines, flexibility
1.2 commitment 1.5 contributing to a team effectively, equally 1.6 co-operation 1.21 reliability (of team) 1.25 teamwork/groupwork	→	1.2 EFFECTIVENESS commitment, co-operation, reliability (of team), contributing to a team effectively, equally, teamwork / group work,
1.1 agreement 1.4 compromising differences 1.15 listening skills 1.23 resolving problems 1.24 respect others opinions 1.28 within group communication & discussion	→	1.3 AGREEMENT agreement, compromising differences, resolving problems, respect others opinions, listening skills, within group communication & discussion
1.3 complexities arise from different ideas with team members 1.7 difficult 1.8 don't like group work 1.10 easy to drift off into conversation 1.13 group dynamics 1.17 need breaks to be alone 1.20 patience 1.26 time consuming	→	1.4 DIFFICULTIES complexities arise from different ideas with team members, group dynamics, patience, difficult, don't like group work, need breaks to be alone, easy to drift off into conversation, time consuming
1.12 good to get other members views 1.16 makes it fun 1.29 work with people you like, get on with 1.30 working with different personalities, need for different personalities	→	1.5 POSITIVES good to get other members views, working with different personalities, need for different personalities, makes it fun, work with people you like, get on with
		1.6 other

RESEARCH SKILLS = Primary Category Code = 2		
VERSION 1 CODEBOOK		VERSION 2 CODEBOOK
Current sub-category codes and descriptions are given below	Items clustered to form	The new sub-category codes and descriptions are given below
2.3 deadlines 2.9 planning effectively	→	2.1 PLANNING deadlines, planning effectively
2.5 Good communication with experts 2.6 Informatics skills/information gathering 2.8 places to look for information	→	2.2 INFORMATION GATHERING informatics skills/information gathering, places to look for info, good communication with experts
2.1 collating ideas 2.2 critical appraisal skills 2.7 objectivity in research 2.10 referencing skills	→	2.3 APPLICATION critical appraisal skills, collating ideas, objectivity in research, referencing skills
2.4 experimental skills 2.11 research skills	→	2.4 GENERAL OR SPECIFIC SKILLS experimental skills, research skills
	→	2.5 other

SELF ASSESSMENT = Primary Category Code = 3		
VERSION 1 CODEBOOK		VERSION 2 CODEBOOK
Current sub-category codes and descriptions are given below	Items clustered to form	The new sub-category codes and descriptions are given below
3.1 accepting criticism 3.6 inputting more personally 3.10 swallowing your ego	→	3.1 ACCEPTING NEGATIVE FEEDBACK accepting criticism, inputting more personally, swallowing your ego
3.2 assessing other's work 3.3 comparative analysis of own work against others	→	3.2 ASSESSING WORK assessing others work, comparative analysis of own work against others
3.7 need others to critically appraise your ideas 3.8 peer reviewing 3.12 valuable to have other peoples input	→	3.3 POSITIVE FEEDBACK need others to critically appraise your ideas, peer reviewing, valuable to have other people's input
3.4 hard work pays off	→	3.4 WORKLOAD ISSUES

3.9 putting a lot of knowledge together 3.11 the most effort doesn't always produce the best poster		hard work pays off, putting a lot of knowledge together, the most effort doesn't always produce the best poster
3.5 important to answer questions 3.14 self learning and responsibility	→	3.5 AWARENESS self learning and self responsibility, important to answer questions
3.13 world priorities	→	3.6 other

THE TOPIC = Primary Category Code = 4		
VERSION 1 CODEBOOK		VERSION 2 CODEBOOK
Current sub-category codes and descriptions are given below	Items clustered to form	The new sub-category codes and descriptions are given below
4.1 ask small questions	→	4.1 QUESTION DESIGN Ask small questions
4.2 educating others through the poster	→	4.2 USE AS AN EDUCATIONAL TOOL educating others through the poster
4.3 information about the topic	→	4.3 SPECIFIC LEARNING information about topic
	→	4.4 other

POSTER DEVELOPMENT = Primary Category Code = 5		
VERSION 1 CODEBOOK		VERSION 2 CODEBOOK
Current sub-category codes and descriptions are given below	Items clustered to form	The new sub-category codes and descriptions are given below
5.2 creating a poster 5.9 how to make	→	5.1 POSTER MAKING SKILLS creating a poster, how to make
5.1 colour schemes 5.4 design skills 5.3 creativity 5.6 editing (cutting down) 5.8 formatting 5.14 use of computers in design 5.16 web design skills	→	5.2 POSTER DESIGN SKILLS design skills, colour schemes, creativity, use of computers in design, web design skills, formatting, editing (cutting down)
5.5 difficulties with the medium 5.7 expenses 5.13 time consuming	→	5.3 POSTER DIFFICULTIES difficulties with the medium, expenses, time consuming
5.10 importance of presentation 5.11 presentation requirements for effective communication 5.12 quality assurance of information 5.15 vision of poster	→	5.4 POSTER PRESENTATION FOR EFFECTIVE COMMUNICATION importance of presentation, presentation requirements for effective communication, vision of poster, quality assurance of info
	→	OTHER

Appendix 5

Version 2 Code Book for coding Responses of Students to the Questionnaire

Version 2 Code Book for Raters

This document outlines the coding scheme to be used when coding the text responses to the questionnaire. There are 5 primary categories of description, and 26 subcategory descriptions and codes. Each response should be read and coded into one of the 5 primary categories and one of the 26 subcategory codes.

For the purpose of data entry and analysis the 5 categories have been assigned a primary code number of 1 – 5. These do not represent ranked or ordered data.

The primary codes are:

1 = Collaboration

2 = Research Skills

3 = Self Assessment

4 = Information about the Topic

5 = Poster Development

How to Rate a response

The primary and sub-category descriptions and codes are given over the pages. Prior to coding responses please read through the tables so that you understand all categories and descriptions. When you are ready to start coding please follow the advice below.

1. Read one response at a time, and choose the primary category that best fits the response.
2. Re-read the response and select a sub-category description and code from the primary category group that best fits the response.
3. Write the code in the right hand column at the end of the response.

Your final code should read something like: 2.1

This means a text response was rated as a Primary code 2 (Research Skills), and a Sub-category code 1 (research requiring effective planning).

If you believe that a response fits more than one coded description please write all down, or it fits no current categories code it as 'other'. On completion of the coding the researcher will meet with all raters and discuss the coding scheme.

COLLABORATION = Primary Category Code 1	
Sub-category Codes are given below. The concept of:	
1.1	ORGANISATION organisation, easier to achieve goals in a team, importance of leadership in a group, requires planning, setting objectives, time management, meeting deadlines, flexibility
1.2	EFFECTIVENESS commitment, co-operation, reliability (of team), contributing to a team effectively, equally, teamwork / group work,
1.3	AGREEMENT agreement, compromising differences, resolving problems, respect others opinions, listening skills, within group communication & discussion
1.4	DIFFICULTIES complexities arise from different ideas with team members, group dynamics, patience, difficult, don't like group work, need breaks to be alone, easy to drift off into conversation, time consuming
1.5	POSITIVES good to get other members views, working with different personalities, need for different personalities, makes it fun, work with people you like, get on with
1.6	Other

RESEARCH SKILLS = Primary Category Code = 2	
Sub-category Codes are given below. The concept of:	
2.1	PLANNING deadlines, planning effectively
2.2	INFORMATION GATHERING informatics skills/information gathering, places to look for info, good communication with experts
2.3	APPLICATION critical appraisal skills, collating ideas, objectivity in research, referencing skills
2.4	GENERAL OR SPECIFIC SKILLS experimental skills, research skills
2.5	Other

SELF ASSESSMENT = Primary Category Code = 3	
Sub-category Codes are given below. The concept of:	
3.1	ACCEPTING NEGATIVE FEEDBACK accepting criticism, inputting more personally, swallowing your ego
3.2	ASSESSING WORK assessing others work, comparative analysis of own work against others
3.3	POSITIVE FEEDBACK need others to critically appraise your ideas, peer reviewing, valuable to have other people's input
3.4	WORKLOAD ISSUES hard work pays off, putting a lot of knowledge together, the most effort doesn't always produce the best poster
3.5	AWARENESS self learning and self responsibility, important to answer questions
3.6	Other

THE TOPIC = Primary Category Code = 4	
Sub-category Codes are given below. The concept of:	
4.1	TOPIC QUESTION DESIGN ask small questions
4.2	TOPIC USE AS AN EDUCATIONAL TOOL educating others through the poster
4.3	TOPIC SPECIFIC LEARNING information about topic
4.4	Other

POSTER = Primary Category Code = 5	
Sub-category Codes are given below. The concept of:	
5.1	MAKING SKILLS creating a poster, how to make
5.2	DESIGN SKILLS design skills, colour schemes, creativity, use of computers in design, web design skills, formatting, editing (cutting down)
5.3	DIFFICULTIES difficulties with the medium, expenses, time consuming
5.4	PRESENTATION FOR EFFECTIVE COMMUNICATION importance of presentation, presentation requirements for effective communication, vision of poster, quality assurance of info
5.5	Other

Appendix 6

Code Book for Assessing the Interest Dimension of the Poster Research Questions

Code Book for the Interest as Describe in the Poster Questions

This document outlines the coding scheme to be used when coding the poster research questions for the dimension of interest that they describe or reflect.

Three dimensions of interest have been identified though a validation study. These three dimensions of interest are described as an:

Interest in Clinical Procedures and Clinical Skills

Interest in Patient Management and Patient Care

Interest in Technology and Technology Assessment

For the purpose of data entry and analysis the 3 categories have been assigned a primary code number. These do not represent ranked or ordered data.

How to Rate a response

Over the page is a coding scheme that provides the interest dimension, a coded number to use to code, a range of qualitative descriptors of the characterisation of the interest dimension, and examples of the research poster questions that represent the interest dimension.

Prior to coding responses please read through the tables so that you understand all categories and descriptions. When you are ready to start coding please follow the advice below.

1. Read one poster research question at a time, and choose the primary category that best fits the response.
2. Write the code on the top of the questionnaire.

Coding scheme for coding Interest

Code 100 = Interest in Clinical Procedures and Clinical Skills
<p>The category of clinical procedures and skills was characterised by poster questions which attempted to:</p> <ul style="list-style-type: none"> ➤ compare clinical procedures or processes, ➤ explain the rationale for certain clinical procedures, ➤ examine the requirements for better imaging or treatment, ➤ review the clinical skills required in certain situations or ➤ examine professional role and function
<p>Examples of questions within this category included:</p> <ul style="list-style-type: none"> • Does the radiographer have a role in Accident and Emergency reporting? • Total Body Irradiation – what are its uses in Radiation Therapy?
Code 200 = Interest in Patient Management and Patient Care
<p>The category patient management and patient care was characterised by the questioning of:</p> <ul style="list-style-type: none"> ➤ outcomes for patients of imaging or treatment, ➤ the influence or effect of imaging or treatment on patient care or patient management, ➤ the basis of patient care and improved patient care, ➤ ethics or health law or communication
<p>Examples of questions within this category included:</p> <ul style="list-style-type: none"> • Head and neck radiation therapy – how can common side effects be minimised? • When should a parent be in the room (to assist the child)?
Code 300 = Interest in Technology and Technology Assessment
<p>The category technology and technology assessment was characterised by poster questions which:</p> <ul style="list-style-type: none"> ➤ analysed specific technology or technology more generally ➤ compared technology ➤ used technology as the impetus for the question
<p>Examples of questions within this category included:</p> <ul style="list-style-type: none"> • CT v Ultrasound in the detection of appendicitis? • Multi Leaf Collimators – what are the advantages?

Appendix 7

Study 2 Ethics Approval, Research Information Sheet and Questionnaire provided to Students



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

Helen Warren-Forward
Associate Professor
Medical Radiation Science
Box 16, Hunter Building
TELEPHONE: 02 4921 7142
FACSIMILE: 02 4921 7053
Email: Helen.warren-forward@newcastle.edu.au

Information Statement for the Research Project:

The Poster Task:

Important and Personal Learning Questionnaire

Document Version 2; Dated 11/09/08

Dear MRS Student,

You are invited to participate in the research project identified above which is being conducted by Shane Dempsey and Associate Professor Helen Warren-Forward from Medical Radiation Science, School of Health Science at the University of Newcastle. The research is part of Shane Dempsey's PhD studies at the University of Newcastle, supervised by Associate Professor Helen Warren-Forward.

Why is the research being done?

This research is being conducted to identify the important and personal learning outcomes of students who learn and are assessed in group work or social learning situations.

Research has shown that students hold a wide variety of views about what it is they learn when participating in learning and assessment task activities. Group work adds a dimension to learning that has not had the same amount of attention paid to it as individual or solo learning. You have just completed the group work Poster Task as part of year 2 MRS studies and therefore your views are important and meaningful for this study.

MRS students in previous years, who have completed the Poster Task, have provided open ended descriptions of their important and personal learning outcomes when undertaking the Poster Task. These descriptions have now been formulated into a questionnaire that could be more easily used to assess the quality of learning students take away from a group work or social learning task.

The purpose of this research is to assess whether the questionnaire can be used as an easy to use tool in measuring students' important and personal learning when participating in group or social learning situations.

Why are you receiving this invitation?

You have been selected to receive this invitation because you are an MRS student at the University of Newcastle who in Semester 2, 2008, completed the group work Poster Task.

Who can participate in the research?

Any University of Newcastle undergraduate MRS student who completed the year 2 Poster Task in semester 2, 2008 can participate in this study.

How will the research be conducted?

You will be required to complete an anonymous questionnaire. You can either complete and return the attached questionnaire to the MRS staff member in class or complete and return to the assignment box that is outside the office of AssProf Helen Warren-Forward (HA25).

What choice do you have?

Participation in this research is entirely your choice. Whether or not you decide to participate, your decision will not disadvantage you. Neither of the researchers who are undertaking this study coordinate the course that this task is a part of, and neither can influence your task or course assessment.

What are you required to do?

There are 3 things that you are required to do to complete the questionnaire.

1/ To assess the conceptions of learning you hold for the group work poster task, you are asked to choose from a list of 21 items the 3 most important things you learned from completing the group work task.

2/ To allow the responses to be analysed for a range of information related to the task, you are asked to choose from a list of 6 items the 2 items that best describe your poster project.

3/ To correlate the topic of your poster with your responses you will be required to write your poster title on the questionnaire.

You will NOT be required to write your name or any identifying details on the questionnaire.

How much time will it take?

It should take around 10 minutes to read and complete the questionnaire.

What are the risks and benefits of participating in the study?

There are no risks to you as a result of participating in this study. The research is not interested in which particular student held which particular view about group work learning. The research is only interested in the cumulative evidence that emerges from the questionnaire. You will not be individually identified in the research or publications arising from the research.

Whilst there is little direct benefit to you, you will be part of a study that will allow the experiences of undergraduate MRS students, to be communicated to the community, which may result in or contribute to education or assessment policy or syllabus change in the future.

How will your privacy be protected?

You do NOT need to identify yourself on the questionnaire. Do NOT write your name or student number or any other personally identifying information on the questionnaire. While you are asked to write your poster topic/title on the questionnaire the researchers will not access any lists that your course coordinator may have that may identify group members.

How will the information collected be used?

The information will be analysed and incorporated in a PhD thesis. The findings will be communicated via publication in professional journals and presentation at professional conferences and workshops. Individual participants will not be identified in any reports or publications. A summary of the results will be posted onto Blackboard for all student who completed the poster task. All study data will be kept in a secure cabinet within the School of Health Sciences at the University of Newcastle for a period of five years following the completion of this project. This information will be accessible only by the primary researcher and the supervisor of the project. At the completion of the project and award of degree all copies of the questionnaires will be shredded.

What do you need to do to participate?

Please read this Information Statement and be sure you understand its contents before you consent to participate by completing the questionnaire. If there is anything you do not understand, or you have questions, please ask the MRS staff member who is presenting this information in class or contact the researchers. You can either complete and return the attached questionnaire to the MRS staff member in class or complete and return to the assignment box that is outside the office of AssProf Helen Warren-Forward (HA25).

Further information

If you would like further information please contact Shane Dempsey (02 49216667 or Shane.Dempsey@newcastle.edu.au) Helen Warren-Forward (02 49217142 or Helen.warren-forward@newcastle.edu.au). Thank you for considering this invitation.

Yours sincerely

Helen Warren-Forward
Associate Professor
School of Health Sciences
University of Newcastle

Shane Dempsey
Senior Lecturer
School of Health Sciences
University of Newcastle

This project has been approved by the University's Human Research Ethics Committee, Approval No. H- 2008-0304. Should you have concerns about your rights as a participant in this research, or have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan, NSW 2308, telephone (02 49216333), email human-ethics@newcastle.edu.au.

The Poster Task: Important and Personal Learning Questionnaire

Thank you for agreeing to complete this questionnaire. This questionnaire asks you to consider the Poster task that you have just completed.

Students in previous years provided open ended written responses to the question:

The 3 most important things I learnt undertaking this task were ...

Their responses were analysed and coded by two independent assessors who were blind to the research topic. Five major categories and 21 sub-category descriptions of learning outcomes were identified. Students indicated that they learnt about:

1. Collaboration
2. Poster Development
3. Research Skills
4. Self Assessment
5. Topic Specific Information

To complete this questionnaire you are asked to consider and answer the same question:

The 3 most important things I learnt undertaking this task were ...

But rather than providing open ended responses you are asked to choose the 3 items that best represent your response from the list of 21 sub-category descriptions uncovered in the previous analysis (Part A of this questionnaire).

You are also asked to provide a small amount of information about you and your poster topic (Part B). This information will not identify you.

The questionnaire should only take around 10 minutes of your time. Thank you.

Part A: Please read through the 21 sub-category items and descriptions which appear under the 5 main category headings – these main headings have been listed in alphabetical order. After reading the items and descriptions (prompts) please select the 3 items that best describe the most important things you learnt. The 3 items may all come from one category or from several different categories.

Please write them down in rank order where:

1 = most important thing you learnt, 2 = 2nd most important, and 3 = 3rd most important.

The most important thing is that your answer represents your answer to the following question:

The 3 most important things I learnt undertaking this task were ...

Category: COLLABORATION		Write rankings in this column
1	ORGANISATION organisation, easier to achieve goals in a team, importance of leadership in a group, requires planning, setting objectives, time management, meeting deadlines, flexibility	
2	EFFECTIVENESS commitment, co-operation, reliability (of team), contributing to a team effectively, equally, teamwork / group work,	
3	AGREEMENT agreement, compromising differences, resolving problems, respect others opinions, listening skills, within group communication & discussion	
4	DIFFICULTIES complexities arise from different ideas with team members, group dynamics, need patience, difficult, don't like group work, need breaks to be alone, easy to drift off into conversation, time consuming	
5	POSITIVES good to get other members views, working with different personalities, need for different personalities, makes it fun, work with people you like, get on with	

Category: POSTER DEVELOPMENT		
6	MAKING SKILLS creating a poster, how to make	
7	DESIGN SKILLS design skills, colour schemes, creativity, use of computers in design, web design skills, formatting, editing (cutting down)	
8	DIFFICULTIES difficulties with the medium, expenses, time consuming	
9	PRESENTATION FOR EFFECTIVE COMMUNICATION importance of presentation, presentation requirements for effective communication, vision of poster, quality assurance of info	

Category: RESEARCH SKILLS		
10	PLANNING deadlines, planning effectively	
11	INFORMATION GATHERING informatics skills/information gathering, places to look for info, good communication with experts	
12	APPLICATION critical appraisal skills, collating ideas, objectivity in research, referencing skills	
13	GENERAL OR SPECIFIC SKILLS experimental skills, research skills	

Category: SELF ASSESSMENT		
14	Self Assessment ACCEPTING NEGATIVE FEEDBACK accepting criticism, inputting more personally, swallowing your ego	
15	Self Assessment ASSESSING WORK assessing others work, comparative analysis of own work against others	
16	Self Assessment POSITIVE FEEDBACK need others to critically appraise your ideas, peer reviewing, valuable to have other people's input	
17	Self Assessment WORKLOAD ISSUES hard work pays off, putting a lot of knowledge together, the most effort doesn't always produce the best poster	
18	Self Assessment AWARENESS self learning and self responsibility, important to answer questions	

Category: TOPIC SPECIFIC INFORMATION		
19	QUESTION DESIGN ask small questions when investigating a topic	
20	USE AS AN EDUCATIONAL TOOL educating others about the topic through the poster	
21	SPECIFIC LEARNING information about the topic	

Part B: Please answer the following 4 questions.

1. I consider that my poster is mainly concerned with (choose only 1 response)	Tick ONE Box
➤ Technology and/or Technology Assessment issues, or	
➤ Clinical practice procedures and skills, or	
➤ Patient care and/or patient outcomes and/or patient interaction	

2. I am a (choose only 1 response):	Tick ONE Box
➤ Diagnostic Radiography student	
➤ Nuclear Medicine student	
➤ Radiation Therapy student	

3. I am:	Tick ONE Box
➤ Female	
➤ Male	

4. The title/question of my poster is (as close as you can remember):

Thank you for completing this questionnaire – it is very much appreciated. Please seal the questionnaire in the envelope and return either to the MRS staff member who is presenting this research in your class, or to the assignment box located outside HA25 (AssProf Helen Warren-Forward's office) by 14th November 2008

Appendix 8

PAPERS ARISING FROM THIS THESIS

Dempsey SE, Warren-Forward HM (2010). An analysis of the professional and academic interest of medical radiation science students. Radiography. (Available online 9 Dec 2010) doi:10.1016/j.radi.2010.11.005