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The integration of critical reflection as a learning strategy in the training of health science practitioners

by

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ABSTRACT

In South Africa today a constant stream of demands characterise higher education. The global employment market expects graduating students to be flexible, adoptable and prepared to take responsibility for their own learning and their own continuous professional development. The pace of technological change in health sciences and the volume of available information highlight the need to develop students' critical reflective thinking.

A paradigm shift is required in health science education from one of providing instruction to one of promoting effective and lifelong learning. Educators in health sciences need to revisit, rethink and evaluate criteria for health practice.

The challenge of this research is to investigate the integration of critical reflection as a learning strategy in the outcomes of learning programmes within a transformative education approach; the integration of theory and practice through a reflective learning approach; the development and implementation of different

learning tools to facilitate effective learning; the importance of establishing an understanding of the link between the learning styles of students and critical reflection as a learning strategy; and the value of the integration of critical reflection to promote lifelong learning.

A mixed methods research approach was primarily utilised to monitor facilitation of learning initiatives and appropriate activities for strengthening the learning-centred approach, through reflective journals and reflective learning groups. A quantitative and qualitative study was used in which a pilot study questionnaire, observations, structured interviews and questionnaires were conducted and completed.

The findings of this investigation indicate that critical reflection adds value to the effectiveness of learning. The investigation also revealed the value of sharing learning experiences in a small learning group and proved that the learning environment for radiography education allows enough opportunities to integrate an alternative learning strategy such as critical reflection.

All role players in health science education need to build their own skills to function effectively as whole brain thinkers with a view to maximizing learning effectiveness.

Reflective practice enhances lifelong learning and can also be utilised as a tool for quality control of the learning programme.

Key words: critical reflection, reflection, reflective practice, learning strategies, transformative learning, flexible learning styles, lifelong learning, metalearning, work-based learning, reflective learning groups

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CHAPTER 1

BACKGROUND AND SUBSTANTIATION

1.1 INTRODUCTION

In South Africa today a constant stream of demands characterise higher education. Crouse (1988:1) states categorically "the educator can no longer sufficiently equip students for the demands put to him/her". He continues to suggest, "Students should be prepared by systematically developing their abilities in order to equip them for lifelong learning and creative application of knowledge on a high intellectual and scientific level". It is obvious that educators in health sciences need to revisit, rethink and evaluate criteria by which they practise. According to Du Toit (2007), to take part in the renaissance (in other words the revival, the strengthening) in education and training it is the individual, and not the education or training institution that should initiate, implement and nurture the new paradigm.

Another challenging factor is that we live in a rapidly changing world, a world of super complexity (Barnett, 2000). The more rapidly the world changes, the more unknown the future becomes. The unknown brings about uncertainties and therefore asks for creativity in all aspects of life, including education/training and learning. The paradox is that we have to prepare students for the unknown super

complex future by means of the known – our current knowledge (Barnett & Hallam, 1999). Two questions came to the mind of the researcher: How can we as facilitators encourage students to engage in the type of learning that will help them develop the capabilities associated with higher education and how do we prepare students for a rapidly changing future? Part of this process of rediscovering creativity means that in health science training the facilitator and the student need to become versatile and whole-brain partners.

The researcher, having been involved in health science education for twenty years, realised that facilitators are often frustrated in their attempts to help students become skilled inquirers and critical thinkers. When teaching, our aim is to promote, assist and advance learning. Leamnson (1999:3) refers to teaching as having "the conscious intention of, and potential for facilitating learning in another". For the purpose of this research learning facilitation includes all the actions of the facilitator that have the conscious intention of and potential for assisting, helping, advancing and enabling learning" (Gravett, 2005:ix). Especially, with reference to the clinical component of health science training, facilitators must create a meaningful teaching/training and learning environment within which students can learn to convert their theoretical knowledge into practical skills. The ever-closer integration of learning and work in health sciences means providing faster, more flexible, customised learning pathways and also much greater use of action learning to ensure professional excellence.

Furthermore, the researcher supports the view of Ramsden (1992) that the ways in which students understand or experience should be changed to enhance effective learning. It therefore implies a qualitative change in a view of reality. Learning brings about change and change means growth on a continuous basis (Du Toit, 2007).

According to Ramsden (1992:5) the vital competence in academic disciplines lies in understanding; this means "the way in which students apprehend and discern phenomena related to the subject". In order to construct meaning, productive learning should be promoted. Every student is created with unique, unlimited potential. Facilitators need to create opportunities by which students' potential could be rediscovered and developed. Learning, be it intentional or incidental, should, according to Du Toit (2007), lead to deep learning characterised by exploring, discovering and experimenting.

The global employment market expects graduating health science students to be flexible, adaptable and prepared to take responsibility for their own learning and their own continuous and professional development. Stefani and Nicola (1997) indicate that a paradigm shift is required in our concept of higher education from one of providing instruction, to one of promoting effective learning. Health science lecturers and clinical tutors must demonstrate leadership to shift their focus from teaching or providing instruction to facilitating collaborative inquiry as a means of empowering students.

A facilitator in health science training who wants to become a leader should model leadership in his or her own practice. The value of self-assessment and self-monitoring is, according to Du Toit (2007), an essential element for intrapersonal leadership development in the context of lifelong learning. Therefore the imperative for all health science facilitators of learning is to determine to what extent they are leaders. Catering for different learning styles in one's own practice and becoming a reflective facilitator are proof of one's leadership potential. Reflective thinking and learning form an integral part of the professional development of a leader.

An influential writer of educational thought and practice, John Dewey (1933:27), who is considered to have initiated reflective thinking as an aspect of learning and education, defines it as:

> *active, persistent and careful consideration of any belief or*
> *supposed form of knowledge in the light of the grounds that*
> *support it and the further conclusion to which it tends.*

Dewey introduced a distinction, which has endured, between critical reflection and less considered reflection. He argued that a person who is not sufficiently critical might reach hasty conclusions without examining all the possible outcomes. Dewey also argued that the development of reflective thinking should be an educational aim. The pace of technological change and the volume of

available information highlight the need to develop learners' ability of critical reflective thinking. In Dewey's original work, reflective thinking is placed in a broad context; however, there has been a tendency to reserve it for the context of professional practice. Boyd and Fales (1983:99) describe reflective learning as the process "of internally examining and exploring an issue of concern, triggered by an experience, which creates and clarifies meaning in terms of self, and which results in a changed conceptual perspective".

Lecturers and clinical tutors need to embrace meaningful planning/designing of a learning-centred approach if they are to provide students with rewarding experiences and produce a new generation of critically reflective health science practitioners. This demands of facilitators to plan innovatively. The restructuring of education and training in South Africa has as core principle an outcomes-based approach. It is pointed out by Olivier (1998:21) that this learning approach intends to focus equally on knowledge, skills, the process of learning and the outcome. According to Olivier (1998) certain processes or critical cross- fields are appropriate for students to achieve as outcomes. The processes include critical thinking, problem solving, analysing, synthesis, communication, teamwork, socialising, application, information verification and appreciation. These interpreted processes categorised according to the Herrmann model and combined with the expectations of students with thinking preferences in all four quadrants, indicate that an outcomes-based approach and a whole brain

approach to teaching and learning are complementary with regard to educational activities (Du Toit, 2007).

The challenge of this research is to determine how to design learning programmes to encourage reflective thinking. How to promote action learning (reflection-in-action) and action research (reflection on reflection-in-action) in curriculum design (Schön, 1987) also need to be investigated.

Action learning is grounded in the approach pioneered by Evans (Kember, 2001), which implies that there can be no learning without the action and no knowing without the effort in practice. Action learning thus promotes the creative integration of thinking and doing in practice. Action learning, according to Evans (Kember, 2001) involves working on real problems, focusing on learning and actually implementing solutions. It is a form of learning by doing – not only for learners in the health sciences, but also for the researcher/practitioner in education.

In the education setting, action research is a "researching while teaching approach" (Schartz, 1993:114). Practitioners research the teaching situation and improve teaching and learning based upon the information collected from the research process. Action research is therefore a method of inquiry, which can help to bridge the gap for practitioners, between theories, research and practice in education (Holter & Schwartz-Barcott, 1993).

In reviewing the literature, it was decided that a mixed method research design was the more appropriate approach to collect and analyse data, integrate the findings, and draw inferences using both qualitative and quantitative methods. Distinctiveness of action research is also evident to monitor facilitation of learning initiatives and planned learning strategies, to improve upon the educational process.

The researcher is of the opinion that the following comment of De Vos et al. (2002:365) is of value and applicable to this research: "A combination of qualitative and quantitative methods is imperative when doing intervention research and action research".

A rather useful guide to the researcher and applied as such is the definition provided by Kemmis and McTaggart (1988:35) that states:

> *Action research is a form of collective self-reflective inquiry under-*
>
> *taken by participants in social situations in order to improve the*
>
> *rationality and justice of their own educational practices, as well*
>
> *as their understanding of these practices and the situations in*
>
> *which these practices are carried out.*

It is further elaborated that action research specifically is composed of a series of cycles and each cycle consists of a series of steps, which include planning,

action, evaluation of and reflection on the outcome of the action. In this research only one cycle of action research (responded) has taken place in a 10-week period and therefore the researcher is of the opinion that the potential exists within this context to continue with a series of action research cycles in future.

According to Williamson (1997:96), reflection can be "a tool for directing and informing practice setting, or transforming and reconstructing the social environment"; the social environment implies the different clinical settings.

Students in health sciences need to take greater responsibility both for their learning and their understanding of the relationship between theoretical learning and its application in clinical practice.

Traditionally in health science education, the predominant model of professional education has been described by Schön (1983) as technical rationality, which emphasises the teaching of technical skills and systematic actions. This is the model, which has predominated in especially radiography education. Periods of theoretical learning, mainly the transmission of theory through lectures, would be followed by a clinical placement. Frequently, little or no effort was taken to link theory with clinical practice.

Therefore, this research needs to investigate the concept of critical reflection to assist in breaking down the traditional barriers between theoretical and clinical

components. A concern currently in professional programmes, such as radiography, nursing and pharmacy is to find effective and appropriate activities for strengthening the learning-centred approach.

Action learning and action research are both intended to improve practice in general. Action research intends to introduce some change regarding one's professional practice and action learning uses some intended change as a vehicle for learning through reflection, specifically in health science education.

With reference to the education of health science practitioners, work-integrated learning (experiential learning) forms an integral part of health science curricula. Experiential learning, as described by McKay (Ember & Ember, 2001) is a process that drives learning from experience. During work-integrated learning students can be persuaded to make links between their academic and clinical experience; students also use their clinical experience to contextualise their learning. Clearly, both action research and action learning are about learning from experience. This recurring process involves action and reflection on action taken.

Boud, Keogh and Walker (1985) indicate that reflection in the context of learning is a generic term for those intellectual and affective activities that individuals engage in to explore their experiences in order to guide them to new understandings and appreciation. When reflecting, one can make sense of the

environment only in ways, which build on one's prior understanding. In enhancing this understanding, we are better equipped to act on the environment.

Theories and assumptions inform critical review and development. These theories are derived intentionally from recent experiences and used to plan the subsequent experience. As an example, in radiography, the principle of gravitation can be applied when doing soft tissue radiography of the chest to demonstrate and evaluate the position of the diaphragm. From experience it is clear that the respiratory phase and age of the patient and not only the position of the patient, are of importance in evaluating the stance of the diaphragm. The appearance and position of the diaphragm is an indicator of possible pathology such as pleurisy, heart failure, hepatomegaly, etc. The following figure (Figure 1.1) demonstrates the importance of critical review and planning when performing radiographic chest radiography.
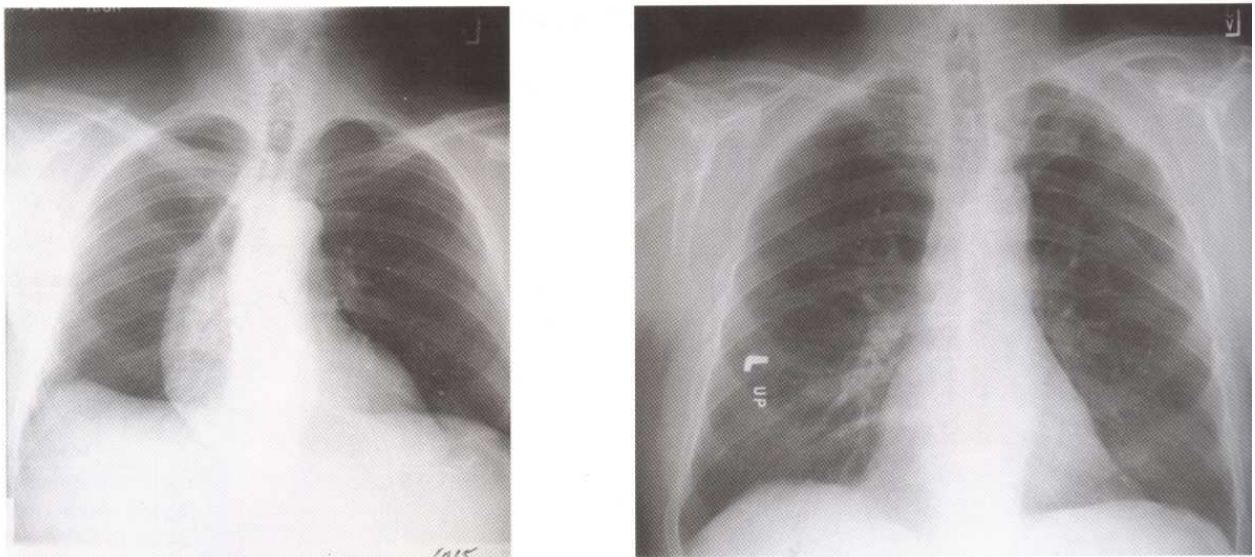
Figure 1.1.An example of chest images to demonstrate the stance of the diaphragm

The student and qualified health science practitioner need the ability to reflect critically on their experience, integrate knowledge and take action on insight gained. These abilities are considered critical aspects for students; furthermore, they prepare students to be lifelong learners when they focus on a holistic patient approach. The Continuous Professional Development (CPD) system, which is a prerequisite for annual professional registration with the Health Professions Council of South Africa (HPCSA), serves as proof of an accumulated number of points. This evidence reflects the fact that a certain level of knowledge, skills and competencies has been acquired in a prescribed time (HPCSA, 2006).

In the medical environment there is increasing demands from the Department of Health as well as employers for reflective clinical practice that will develop and enhance skills and attitudes appropriate to review, evaluation and professional revalidation. Maximising students' learning, especially in the applied sciences, is an ongoing challenge for lecturers and higher education researchers. Much has been published about the theory-practice gap when students are taught theory in an educational establishment and then discover that in the "real world" of practice, things can be very different (Salvage, 1998). For professional education this is a particular problem. Benner (1984) determined that while novice health science practitioners rely on theory-based principles to direct their decision-making, experts draw largely on intuition based on previous experiences. Learning from experience (experiential learning) is one of the values of critical reflection, therefore health science students should be well grounded in this

specific skill to maximise their learning both as a student and as a health science practitioner. Such added value should be seen as essential part and not as part of the "hidden curriculum".

'"Reflective practice is something more than just thoughtful practice. It is that form of practice, which seeks to problematise many situations of professional performance so that it can become a potential learning situation, so the health science practitioner can continue to learn, grow and develop in and through practice" (Jarvis, 1992). Increasingly health care professionals are required to utilise reflective practice within the initial learning programme, as well as within their continuing professional development.

A more reflective approach to learning and the facilitation of learning is called for in health sciences. Such an approach will "enable learners to achieve a deep approach to learning and equip learners to determine their own learning needs, set their own learning goals and monitor the occurrence of continuing progress" (Gravett & Geyser, 2004:24). Developing critical reflection is probably the ideal of the decade for many educators of adult learners, specifically in the context of higher education, who have long been searching for a form and process of learning that could be claimed to be distinctively adult. Evidence that adults are capable of this kind of learning can be found in developmental psychology, dialectical thinking, reflective judgment, post-formal reasoning and epistemic

cognition which all indicate how adults come to think contextually and critically (Brookfield, 1987).

Students are required to become reflective health science practitioners. To achieve this, critical reflection needs to be an integral part of the curriculum, as well as student support systems and professional development initiatives pertaining to academic staff development.

Advice from Johns (2000) states that in the reflective classroom, both teacher and student will appreciate the fact that some problems may forever remain a mystery. Those who are more 'outcomes-orientated' may find the reflective practice process challenging. However, its advocates see it as a very powerful tool to link theory to practice, using it to expand their own professional and personal zones of comfort continually. Reflective practice has become synonymous with professional practice and hence part of the discourse of professionalisation. According to Salvage (1998) the same applies to several other health science practitioners (e.g. nurses, paramedics and occupational health) who aspire to enhance holistic patient care.

Therefore action learning as such, can be a central part of many typically work based-learning programmes (e.g. radiography, nursing, pharmacy, etc.), and to be effective, requires the student to engage in reflective learning. Gray (2001) identifies how a reflective learning cycle can be incorporated with action learning

in the learning programme of nursing to create the dynamic of enhanced effectiveness and individual understanding. McKay (Ember & Ember, 2001) indicates the inter-relationship between the cycles in the radiography programme, where students are encouraged to keep for instance reflective journals and use clinical experience to inform tutorial discussions.

Many of the principles of interactive learning are derived from constructivism and arise from a notion of the Neapolitan philosopher, Giambattista Vico, that humans clearly understand only that which they have themselves built (Haigh, 2001). This statement contains the truth that making sense from the learning is, and should be, self-created by the learner.

In the South African context, the notion to encourage educators to create learning opportunities for learners to think creatively and critically is noteworthy. In section 7 of the National Education Policy Act, (1996), Norms and Standards for Educators are indicated in the policy with reference to the seven roles of an educator. Arising from these a practical competence for the "learning mediator" (facilitator of learning activities) is to create a learning environment in which critical and creative thinking is encouraged. The South African Qualifications Authority (SAQA) stipulates seven critical outcomes (SAQA, 2000) in addressing the relevance and quality of education. Killen and Spady (1999) indicate that the intention of these outcomes is to describe the characteristics that all citizens regardless of their profession should have. These outcomes should be built into

the curriculum. Of importance is the foundational competencies expected from a "leader, administrator and manager"and the understanding of various approaches to the organisation of integrated teaching programmes.

There is a need and urgency from my side as the researcher, given the substantiated background of health science education in general, that the study should focus on a conscious effort to move away from a technical-rational approach to one of a more learning-centred approach by developing a critical reflective learning approach.

According to Gravett and Henning (1998:61) dialogue teaching implies "a linking of educator, learner and knowledge in a dynamic reciprocal unity". For the purpose of this research dialogue teaching is seen neither content-, learner-, nor teacher-centred, but consequently learning-centred. A learning-centred approach to teaching is graphically depicted in Figure 1.2.
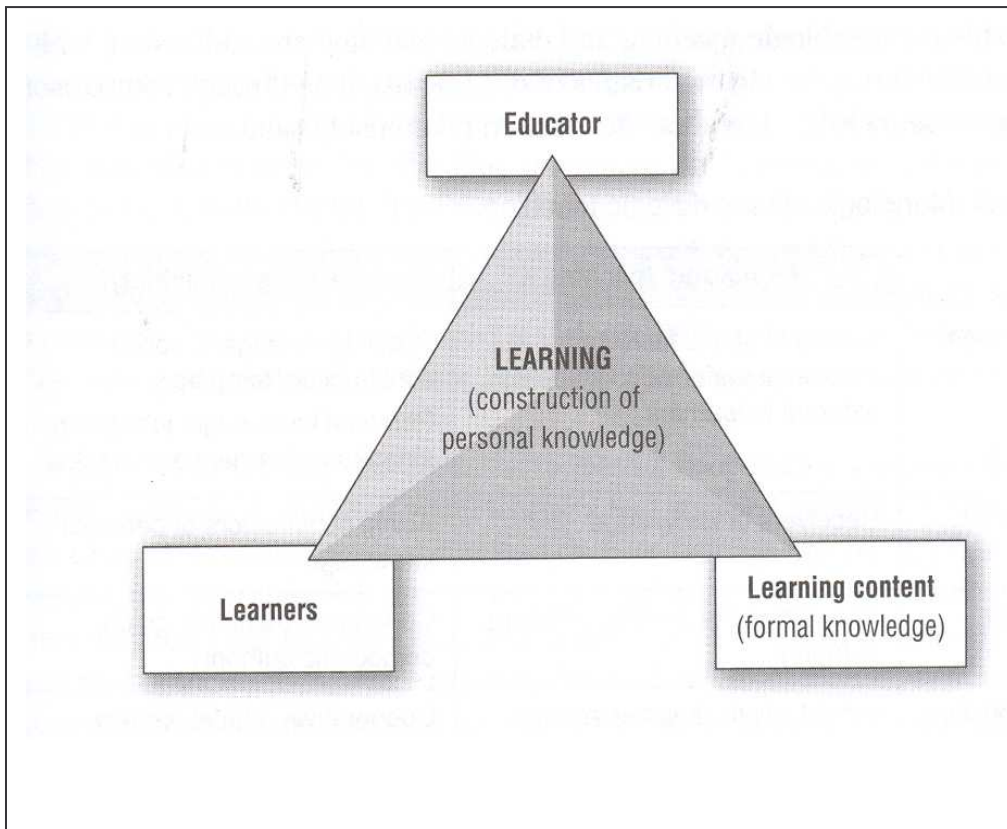
Figure 1.2. A learning-centred approach to teaching (Gravett & Henning, 1998)

1.2 PURPOSE AND AIM OF THE STUDY

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The first obligation of educators according to Robin (2000) is the improvement of the cognitive ability to reason and make meaning of the world. In other words, the acquisition of critical reflective and creative thinking skills results in the development of competencies. Therefore students should acquire skills that will develop the "habit, based on intellectual commitment, of using those skills to guide behavior" (Shriven, 2000:1). The development of a student's critical, creative thinking skills is of significance. Therefore strategies to facilitate the development of critical reflection need to be investigated and recognized.

The well known statement by Einstein (Copley, 2007) that the problems we face today cannot be solved at the same level of thinking we were at when we created them, is a stark reminder of the need to think and do differently. The importance of systemic or holistic thinking in which the emphasis is on contexts, relationships and wholes, is being increasingly acknowledged in the fields of science, medicine, psychology, business and education (Copley, 2007:30). This approach to teaching and learning will also prepare health science students for reasoning, for creativity and for having a professional vision, all of which are of paramount importance.

For metalearning, it entails that provision be made for various learning strategies in health science training as part of the establishment of a metacognitive learning approach. As part of a learning-centered approach, health science students should become competent in monitoring their own learning, as independent, self-regulating learners (Du Toit, 2007).

Copley (2007) highlights the fact that becoming fully able to respond or capable of responding to life experiences in both formal and informal learning experiences is a natural outcome of metalearning.

It is therefore important for every health science student to be critically attuned to the way(s) in which he or she enters into the relevant learning activities. In this regard Moelwyn-Hughes (1987:124) in this regard points out "…an individual

learner will have developed a unique combination of skills, attitudes and approaches to learning and knowledge of these will assist the learner in building his or her strengths".

Learning opportunities in health science education have to be created to advance the students' ability to synthesise new ideas, to explore assumptions and then to think of alternative solutions and to draw conclusions.

The researcher shares the view of Brower and Clay (2001) that how we as educators accentuate and exhibit the core values of our profession, is of central importance. What and how we teach illustrate the norms and values of the profession and introduce students to the opinions, arguments and debates about what constitutes knowledge, insight and appropriate behaviours.

We need to familiarise and organise ourselves as practitioners of honourable professions and focus on the challenges that Wegner (1998) writes about. These are to be inventive, creative and excited about what we love best, so that we engage our students to unlock their horizons, so that they can put themselves on learning trajectories that they can identify with, and to engage them in actions, discussions and reflections that make a difference to the communities that they value.

Pee et al. (2000) confirm that health science education has traditionally focused on the assimilation of vast amounts of knowledge and on clinical apprenticeship as the "hallmark" of good training, and has undervalued reflection in learning. Today, however, health science education needs also to prepare students for lifelong learning (Frick & Kapp, 2006). To achieve this, a more reflective approach to learning is called for and for this reason the following research question and sub-questions have been formulated.

1.3   RESEARCH QUESTIONS

Taking the above-mentioned into consideration to achieve a more reflective approach in health science education, the following central research question has been identified and formulated:

How can health science training institutions integrate critical reflection through action learning to add value to in-depth, independent, self-regulating and lifelong learning?

This overarching research question is refined in the following sub-questions:

- What is the significance of integrating critical reflection in the outcomes of learning programmes in health science education?
- What is the correlation between learning styles and critical reflection?

- Which learning tools/methods can facilitate opportunities for reflective learning?

- Can critical reflection be applied to inform, develop and improve professional practice?

- Does critical reflection promote the principles of lifelong learning in health sciences?

The extent of this investigation is to determine whether a learning strategy such as critical reflection can be integrated in health science education to meet the needs, requirements and expectations essential to a competitive and changing educational and professional environment.

1.4   SCOPE OF THE STUDY

The study therefore focuses on evaluating strategies:
- of facilitating effective learning;

- for promoting the concepts of ownership and reflection on learning;

- for promoting a learning-centred approach;

- for integrating theory and practice through a reflective learning approach.

Brookfield (1998) mentions that the capability to reflect critically on one's experience, integrate knowledge gained from experience with prior knowledge and take action on insights, is considered by some educators to be a unique

attribute of the adult learner specifically. Critical reflection therefore blends learning through experience with theoretical and technical learning to result in innovative knowledge construction and insight.

Reflective practice may be a developmental learning process according to Williamson (1997), but for the aims of the study it is necessary to:

- determine the value of integrating critical reflection in the outcomes of the learning programmes,

- determine the relationship between the learner's learning style and critical reflection as a learning strategy,

- develop and implement different learning tools to create learning opportunities for reflective learning,

- evaluate whether critical reflection as an academic skill can be applied to stimulate and inform practice,

- promote the principles of lifelong learning for health science students through critical reflection, and

- create and promote critical thinking through reflective practice.

1.5   RESEARCH DESIGN AND METHOD

Against the background given in the previous paragraphs, the research design of this study is a mixed methods research in which qualitative and quantitative methods are utilised to gather data. "The combination of qualitative and

quantitative approaches to research within a single study has become an accepted technique for exploratory and evaluative research" as stated by Bazeley (2003:117). The nature of this research is to a certain extent, related to action research. According to Mouton (2001:150) action or participatory research "involves the research participants as an integral part of design". Qualitative methods are mainly used to gain understanding and insight into life-worlds of the research participants.

The proposed application field for this research is institutions of higher learning involved in radiography education in South Africa. The commitment of educators, clinical tutors and students participating in the research process will be of the utmost importance. With reference to the title of this research, training in general refers to the training and education of radiographers.

A literature review involving current as well as other relevant literature is required to outline, explore, compare, verify and exploit understanding and insight into the application of reflective learning in health sciences in general.

Mainly a qualitative research approach supported by quantitative data is used. Qualitative research provides useful description when little is known about a group of people, an organisation, or some social phenomenon (Polit & Hunger, 1987). Qualitative forms of data gathering and analysis are used. The empirical

study includes sources of data gathering such as observation of participants, structured interviews and questionnaires.

Institutions of higher learning involved in radiography education were targeted to provide primary data through a pilot study questionnaire (base-line information) and a 10-week period of reflective practice with implementation of keeping a reflective journal and attending weekly reflective learning discussion groups. Thereafter focus group interviews (conversational analysis) were conducted and questionnaires completed. The interviews involving academic staff, clinical tutors and students were used to determine the groups' awareness and experience of and attitudes towards reflective learning. Furthermore, the qualitative research process was used to investigate the students' responses during reflective learning and to explore the consequences for individual and professional development. The students' feelings and thoughts were identified from the information gained from the observations during the 10-week reflective practice time-period and the data obtained from the structured focus group interviews. The characteristics and uniqueness of the students' affective status were recognised by means of the transcribed observation and interview data.

The learning experiences of the students were analysed through the implementation of learning tools, such as writing reflective journals and attending reflective learning group discussions. Reflective journal writing was used to support students to internalise their learning in all four quadrants of the brain according to the Herrmann Whole Brain Model (Herrmann, 1998).

Qualitative data gathering was further utilised in the implementation of different learning tools (e.g. reflective discussion sessions) to evaluate the effectiveness of reflective learning.

1.6   POPULATION

In South Africa a limited number of radiographers are educated at all levels (basic and post-basic) at universities and universities of technology.

Furthermore, the radiography learning programmes all form part of health science faculties. These learning programmes in principle deal with the wellness of the patient. The basic content of the different curricula with reference to Anatomy, Physiology, Pathology and Physics is fairly common and generic.

With regards to problem-based learning, it is worth looking into Argyris's (1985) comment that double-loop learning goes beyond simple problem solving. Clinical education forms a key part of all radiography learning programmes. In order to be able to support the students' integration of theory and practice through critical thinking and reflection, clinical tutors and academic staff members need to be committed to reflective practice. They need to be sensitive to the students' learning needs in these professional learning programmes. Richardson and Maltby (1995) indicate the vital role of the clinical mentor and lecturer in the

establishment of an open and supporting environment for reflective learning in the clinical situation.

Currently there are eight institutions involved in radiography education in the country and all of these institutions were approached to participate in this research project. The four institutions of higher learning, which were able and willing to participate, granted the necessary permission. The population in terms of the academic and clinical staff members is N=68 and the sample was n=27. With regards to the students the population is N=788 and the sample was n=202. The participating institutions were then targeted for the purpose of collecting data with regards to radiography education.

The following institutions participated: The University of Limpopo (Medunsa Campus), Tshwane University of Technology, Central University of Technology Free State and the University of Pretoria.

1.7   DATA GATHERING AND ANALYSIS

Data was primarily gained by means of a pilot study questionnaire, observations, structured focus group interviews and questionnaires.

Participants of the four institutions included academic and clinical staff members involved in radiography education, as well as radiography students. Research participants (students) were exposed to the reflective practice over a period of 10

weeks. During this time-period students had to keep a reflective journal (Addendum F) and had to attend and participated in the weekly reflective learning group discussions. Academic and clinical staff members and I observed these reflective learning group discussions. The academic calendar of each institution determined whether students were on campus for formal contact sessions or in the different clinical facilities for work-integrated learning. At the end of this phase focus group interviews were conducted and questionnaires completed. These were used to evaluate the acceptance, value and effectiveness of reflective writing and keeping a journal to accommodate reflective thinking and learning.

The observations were done to evaluate the students' attitude, commitment and overall discipline regarding keeping a reflective journal. The value of learning groups reflecting together and sharing learning experiences was also focused on. Students were observed especially with reference to their responses, expressions, attitudes, feelings and experiences during the application of keeping a journal and participating in reflective learning groups.

A wider and deeper perspective was gained through the different types of insights resulting from the quadangulation of four different data collection methods employed. The use of the term triangulation subsumes both multiple techniques and multiple voices. The researcher created the word quadangulation to point out that four different data collection methods were implemented.

A number of publications provide insight into learners' feelings (Duke & Copp, 1994; Holm & Stephenson, 1994) and numerous authors provide guidance on undertaking reflection (Wilkinson, 1999). However, with the data gained from the different data collection methods the emphasis was mainly on developing practice, but also on identifying the critical points that students encountered.

The questionnaires targeted the specific aspects listed by Williamson (1997) as guideline, and were used to gain data on critical aspects regarding the utilisation of reflective practice in learning programmes. This eventually contributed to the development of an applicable reflective learning process.

The study furthermore utilised structured focus group interviews to evaluate whether reflection as a learning strategy could be applied to direct and inform practice. The focus was also on promoting continuous professional development as well as ensuring lifelong health science students. Dempsey, Halton and Murphy (2001) state that the development of social workers-in-training and self-construction of the skills for reflective learning propagate successful learning. This is a constructivist, phenomenological approach to learning, which is also very pertinent to radiography.

Gathering data from a representative number of students to identify their preferences with regard to thinking and learning styles would have been tremendously valuable. For the purpose of this study only four academic staff

members' degree of preference for the four quadrants of the Herrmann Whole Brain Model could be determined. Learning opportunities ought to be constructed to accommodate and utilise the cognitive functions in all four quadrants of the Herrmann Whole Brain Model. Cognitive functions are accommodated when learning activities are constructed to comply with a student's preferred mode of thinking and learning. According to Knowles (1990) effective learning takes place if the whole brain is involved in learning. Lumsdaine and Lumsdaine (1995) documented four learning modes highlighting whether a learner is a whole brain person or not. The data regarding students' preferred learning styles was to be obtained from the different participating institutions of higher learning. Unfortunately very limited information at only one institution was available when permission was granted to access the brain profiles of students where the Neethling test was utilised. The cost involved in obtaining information regarding preferred thinking and learning styles of all participants using the Herrmann Brain Dominance Instrument would have been very high.

Because people learn differently it should be the aim of every educator to develop the full potential of all learners by providing learning opportunities that take them out of their preferred ways of doing. This could then be used to determine whether critical reflection as learning strategy complies with the students' preferred mode of thinking and learning. Students become flexible by strengthening the learning skills in which they are weak. Flexible learning implies

that a learner must be able to cope with problems of different kinds, and must be able to adapt, depending on the nature of the task at hand.

The general goal of the data analysis was to evaluate the information gained through different data collection methods introduced to integrate the data in a structured way to answer the research questions.

Utilising applicable and available computer aided software for analysis of the qualitative data supported this process. The computer program Atlas.ti was used to handle the large amount of qualitative data that was gathered. This software program categorises and compares data. Microsoft Word and Excel programs were also utilised to group information and to illustrate results graphically.

1.8   ETHICAL CONSIDERATIONS

In a written document to all deans of the identified institutions of higher learning, information regarding the participation in the research process was divulged. The following aspects were highlighted in the letter of consent (Addendum C):

• Nature and purpose of the research

• Description of who would be participating in the study

• What the participants would be expected to do

Participants were ensured of confidentiality and anonymity for their involvement in this research. It was also indicated to participants that involvement was voluntary. These issues were dealt with in face-to-face conversations during the

orientation sessions, prior to the start of the research (Addendum D). All the research participants were verbally informed with regard to the aim and objectives of research, as well as the anticipated outcome of the study.

The research data is kept at the Department of Curriculum Studies, University of Pretoria (Groenkloof Campus).

An application for ethical approval of this research involving human respondents had been submitted to and approved by the Ethics Review Board of the Faculty of Education, of the University of Pretoria (Addendum A).

1.9   CONCLUSION

This chapter provides the background to the study. The aim and objectives as well as the procedures followed through the research are outlined to provide the orientation to the project.

The next chapter looks into education in the South African context. This in turn highlights some aspects of learning and the nature of reflection is also investigated.

CHAPTER 2

THEORETICAL FRAMEWORK

2.1   INTRODUCTION

In this chapter the researcher addresses the philosophical educational context and important aspects regarding the learner in higher education. The researcher reviewed the literature that deals with the topic as well as with reflection, reflective practice, learning-centred education and the integration of critical reflection into the learning programmes of health science practitioners. The theoretical and conceptual framework discussed in this chapter assisted the researcher to provide the theoretical underpinning of the topic of study. This guided the analysis of the research results and helped to determine whether the outcomes of the study had been achieved.

2.2   THE SOUTH AFRICAN EDUCATION CONTEXT

2.2.1 Philosophical context

The South African education system underwent substantial changes after 1994. A variety of trends influenced the context of higher education in South Africa and also internationally. It is therefore essential to do a brief survey of these philosophical developments to enhance understanding of these changes and their consequences.

Higher education has been identified to play a vital role in economic and social development (UNESCO, 1995). Maintaining the relevance of education and the need to be a lifelong learner necessitates an adjustment in focus from teaching to learning. The learners have to be actively involved in constructing their own knowledge and a different educational approach has to be introduced which is more learning-centred. Quality education plays a critical role in the development of economical and social structures of a country and therefore it should be evident that health science education should be designed to encourage lifelong learning through reflective practice.

Technology development, knowledge and educational innovations necessitate a graduate who will be able to cope, adapt and continue learning in the world of work (Fielden, 1998). Furthermore UNESCO (1995) indicates that the regeneration of teaching and learning is crucial for enhancing its relevance and quality. It is also stated that learning programmes should expand the intellectual capacity of learners, should be designed with inter- and multidisciplinary approaches in mind and learning opportunities with applicable learning strategies must be created to increase learning effectiveness.

Education cannot be understood outside various contexts, one of which is the philosophical context. The world has been influenced by various philosophies which act as broad frameworks in terms of which mankind understands and interprets his/her reality and existence. Broadly seen, education according to

Gericke (2004:7) has been influenced by inter alia the following four major philosophical trends/driving forces:

- Form-matter driving force from the Greeks

- Creation, sin and redemption force from Christianity

- Nature-grace force from Scholasticism

- Nature-freedom force from Humanism

Education philosophy and theory should ultimately result in education practice. Part of education practice is the practice of learning facilitation that in turn relates to education and philosophical theory.

2.3   EDUCATIONAL CONTEXT

2.3.1 Learning paradigms

A paradigm according to Gericke (2004) is a person's individual way of interpreting reality, the criteria for value judgments and belief systems. There are basically three paradigms of learning, namely the objectivist, the interpretist and the emancipatory. Sometimes these paradigms are referred to as traditional, transitional and transformational paradigms of learning (Gericke, 2004).

The emancipatory (or transformational) education paradigm is presently the paradigm that forms the basis for the South African education system in terms of

its structure, focus, organization, curriculum development, learning facilitation, and assessment practices (Crouse, 1988).

Emancipatory education entails facilitation of transformative learning to learners who should, as a result thereof, confront presuppositions, analyse and explore alternative perspectives, transform old ways of understanding and act on new perspectives (Gericke, 2004). Emancipatory education therefore occurs when learner paradigms change and when the learners take deliberate actions as a result of such changes to embark on new directions.

Mezirow's transformative learning theory (Mezirow, 1990) of 1978 was conceptualised in several ways. According to Morrell and O'Connor (2002), transformative learning refers to learning that involves revision of significant aspects of our world-view, our view of ourselves or our way of "being in the world". In other words, the approach is holistic because it emphasises overall meanings and attempts to contextualise new learning within what is already known. Learning, therefore, can only be meaningful when it becomes clear, sensible and leads to new or revised interpretations.

When the educational paradigm is emancipatory (transformative), the learning paradigm that relates to it is known as a constructivist-learning paradigm. Constructivism represents a paradigm shift from education based on behaviourism to education based on cognitive theory. Fosnot (1996) has provided a synopsis of these theories. Behaviourist epistemology focuses on

intelligence, domains of objectives, levels of knowledge and reinforcement. Constructivist epistemology assumes that learners construct their own knowledge on the basis of interaction with their environment. Fundamentally, constructivist learning occurs where learners reflect critically, change their views and paradigms as a consequence of such reflection, and imaginatively inquire into issues with the aim of demonstrating their solutions to problems.

Baumgarter (2001) indicates that this paradigm implies that learning:

- is the constructed making of meaning;

- is action-orientated and communicative;

- is shaped by a particular paradigm;

- should be critically reflected;

- occurs through refinement and transformation;

- is instrumental, communicative and reflective to be authentic;

- becomes valid through rational discourse;

- should be active and based on a reflective decision to act; and

- should result in the acquisition of instrumental and communicative competence.

Crouse (1988) suggests that students be prepared by systematically developing their abilities in order to equip them for lifelong learning and creative application of knowledge on a high intellectual and scientific level. He also calls for the emphasis to shift from teaching to learning. The shift from teaching to learning

will result in the design, development and application of totally different policies, systems, procedures and approaches. Facilitators of learning in health sciences are responsible for the design of learning opportunities and experiences that will enable students to understand current knowledge and for assistance towards the acquisition of relevant related skills to apply within a diverse contextualised environment. The probability of successful and meaningful learning increases and will be marked by students' capability

> *to discern aspects of their knowledge and skill that are relevant*
> *to the situation, to determine what kind of response is required*
> *and to make that response effectively. The heart of the matter*
> *therefore is the development of the capability to see, and to*
> *experience certain sets of situations in a certain way*
> (Bowden & Marton, 1998:135).

The theory of transformative learning is complex and encompassing. Transformative (transformational) learning theory is a constructivist theory, focusing specifically on learning in adulthood. Mezirow (1997) admits that not all learning that adults engaged in is transformative, but regards transformative learning as the most significant kind of learning in adulthood. Gravett (2005) continues to indicate the two domains of learning that Mezirow distinguishes, based on Habermas's communicative theory, namely communicative learning

(learning how to understand something) and instrumental learning (learning how to do something).

Mezirow's theory (Mezirow, 1990) can be divided into three themes (Gravett, 2005): the central role of learners' frame of reference in new learning; critical reflection as it relates to meaning transformation; and the verification of beliefs through rational (reflective) discourse. Mezirow (2000:100) describes discourse as "that specialized use of dialogue devoted to searching for a common understanding and assessment of the justification of an interpretation or belief". This involves assessing reasons advanced by weighing the supporting evidence and arguments and by examining alternative perspectives. In other words, discourse is the medium by which critical reflection can be put into action to promote and develop transformative learning (Taylor, 1998).

The relationship between the core elements of Mezirow's theory (Mezirow, 1990) is graphically depicted in Figure 2.1. Within the domains four kinds of learning can be differentiated (Mezirow, 1991): learning can involve refinement of existing frames of reference; learning can also involve the learning of a set of beliefs, feelings, attitudes, judgements and knowledge; learning can involve a change in certain beliefs or attitudes; and learning can involve the transformation of a habit of mind. Taylor (1998) considers critical reflection as the distinguishing characteristic of adult learning and as a central process in transformative learning.
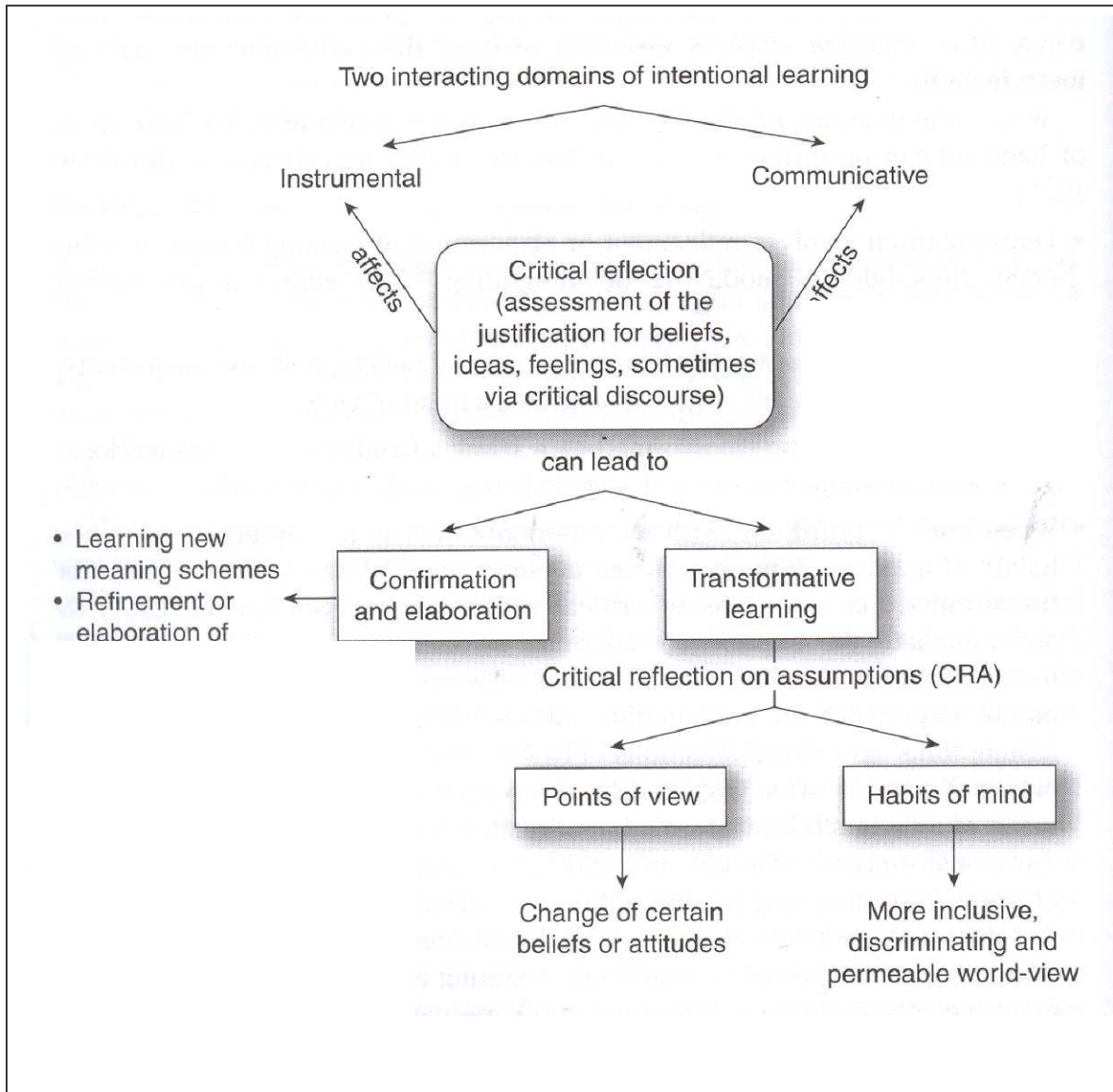
Figure 2.1. Learning in adulthood, according to Mezirow (Gravett, 2005:28)

2.3.2 Education approach

An "approach" according to the Chambers-Macmillan South African Student's Dictionary (1996:45), is "the attitude you take or the way you deal with it". In the 1970s, research showed that learners approach intentional learning in different ways and that the diverse approaches lead to different learning outcomes (Gravett, 2005).

The South African education approach is known as outcomes-based education (OBE) aiming at the provision of meaningful learning opportunities. OBE requires educators to focus on what learners should be able to do as opposed to what they should know. According to Boughey (2004) OBE is therefore necessary in terms of its capacity to transform the sort of learning required by the country, as well as its capacity to make a national qualification framework function.

Curriculum reform (design and development) in health sciences also requires capacity building (development of knowledge and skills) that will ensure competent practitioners in the health care environment. Role change according to Holtzhausen (1998:33) involves "moving away from being a lecturer to being a facilitator, from not being the source of knowledge but the manager of knowledge". The role of the health science educator is therefore to create a context conducive to effective learning. According to Van der Westhuizen in Hassan (2003:65) the shift from the traditional approach includes:

- adopting a more facilitative role;

- becoming innovative and creative in facilitating learning;

- inculcating problem solving skills, creativity and critical thinking in learners;

- focusing more on assessment.

The movement towards emancipatory education and learning is a worldwide trend that has vast influences on educational theory and practice, particularly learning mediation and facilitation (Gericke, 1994).

"Transformation in the context of higher education is a change from one state to another – in educational terms the empowerment of students or the development of new knowledge" (Harvey, 1995:9). Transformed students are empowered, a state which is described by Morrison (1996:324) as "one in which they gain greater control of their own thinking, avoiding uncritical acceptance and passivity". The transformed individual has the ability and skills of analysis, critique, synthesis and innovation.

Ramsden (1992) states that learning should be about changing the ways in which learners understand or experience the world around them. The world around them includes the concepts and methods that are characteristic of the discipline/profession that they are studying. The vital competence in academic disciplines lies in understanding. By understanding Ramsden (1992:4) means the "way in which students apprehend and discern phenomena related to the subject, rather than what they know about them or how they can manipulate them".

Educational institutions are sites of multiple discourses be they liberal, technological, pragmatic, humanistic or professional and according to Barnett

(1997) no matter what the type of relationship that exists within the institution between authorities, professional and vocational training – critical reflection as such should retain the primary role.

Reflecting on my own practice, as well as past experiences of teaching and learning, I realised that to contribute to the full personal development of each student, any health science learning programme must make the individual aware of the importance of: "Reflecting critically on and exploring a variety of strategies to learn more effectively" (Smith, 2006) — as indicated by one of the developmental outcomes (listed under critical cross-field outcomes).

A self-regulated, flexible, reflective student/health science practitioner will be able to monitor his or her own progress. Such a student/practitioner is also able to monitor intrapersonal aspects like, amongst others, learning style preference, reflective learning, action learning, creative thinking and critical thinking. According to Du Toit, 2007 being metacognitively aware of how one learns is empowering. Identifying one's learning style preference in terms of one's strengths and weaknesses and developing flexibility is likewise emancipatory.

Reflection is an integrated part of metalearning or self-regulated learning. Metalearning demands the specific skill of reflection. The blueprint for learning about one's own practice is action learning — it simply refers to learning through action. Revans (2004) is widely credited as the person who used and developed

action learning in Europe. Revans once said, "Action learning is simply this — asking questions and finding implementable solutions".

Kember (2000:27-28) reasons that the action research cycle incorporates systematic observation and evaluation that will bring theory and practice to closer accountability through public scrutiny. Action research in education is considered good reflective practice. Burell and Morgan (1979) indicate that action research consists of two components, namely "the process of generating change" and "generating knowledge".
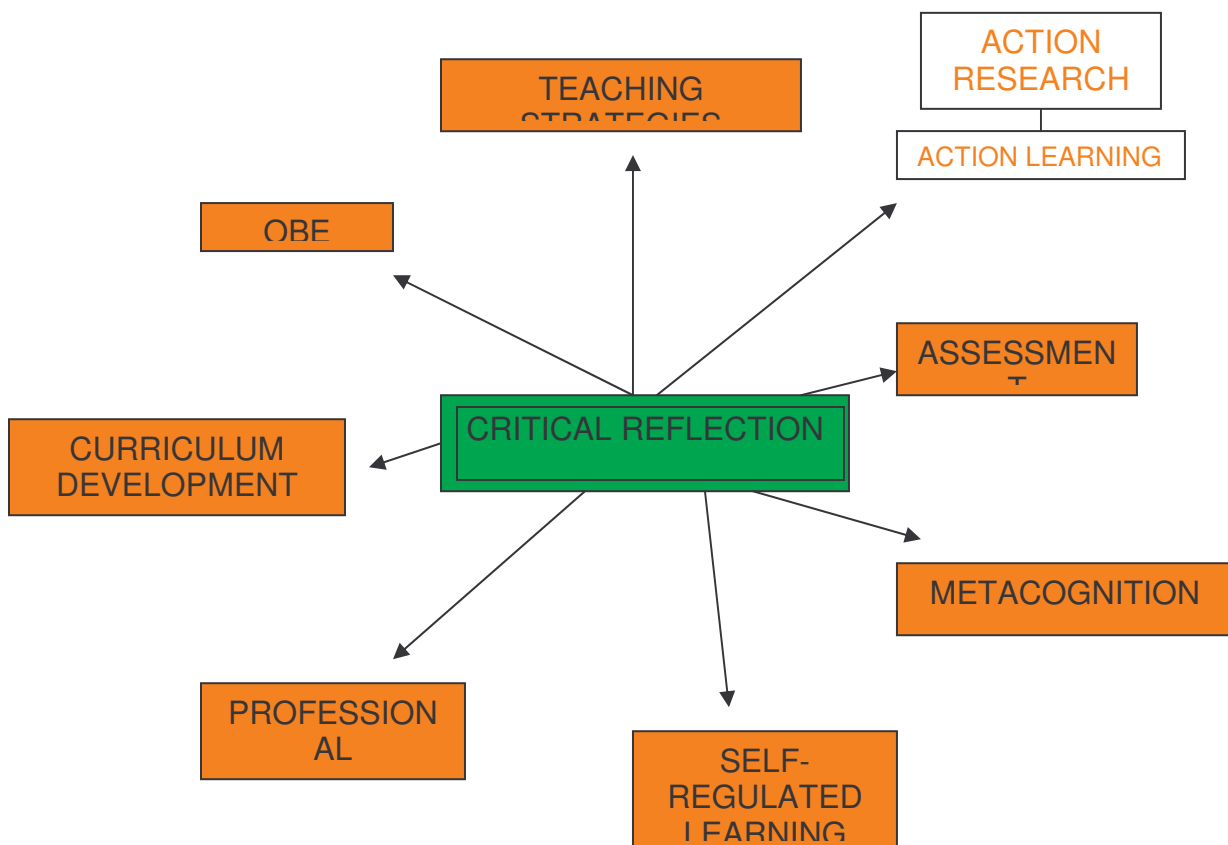
Figure 2.2. Integration of Critical Reflection in Teaching and Learning

In the view of the researcher, the conclusive framework in Figure 2.2 is a culmination of indicating how critical reflection as a learning skill is integrated and embedded in the comprehensive educational paradigm of action learning.

2.3.3 Learning outcomes

Research initiated by Marton (1975) indicates that different approaches to learning are aligned to different learning outcomes. It is indicated by Bowden and Marton (1998) that the concept of learning approaches emphasises the relationship between the object of learning (learning content), learning intention, the learning process and learning outcomes in a specific content. Gravett (2005:38) states that the research on learning approaches "has established a link between the depth of learning outcome and the learning approach or strategy used". Different approaches lead to differences in the quality of the learning outcomes. A distinction is metaphorically drawn between a deep and a surface approach (Gravett, 2005).

Deep learning approaches focus on what any discourse is really about and is associated with an active approach to learning. In adopting a deep approach to learning, students seek to understand. Students are personally involved in tasks and seek to attain underlying meanings and relationships between task and context (Gericke, 2004). The requirement for the kind of learning associated with

health science programmes is a deep approach, and for the researcher it means the realisation of significant learning that will last.

The terms "single- and double-loop learning" were first used by Argyris (1985) and Schön (1983) to distinguish between:

- instrumental learning where assumptions, values and theory do not change; and

- learning where paradigm shifts occur and as a result related assumptions and values are challenged and changed.

Kolb (1984) argues that goals are set on the basis of theory after which action is taken. Single-loop learning can lead to mere repetition of knowledge and fixed forms of learning. The learner works within a standard programme of study and sets goals and routes for learning within the discipline. Single-loop learning occurs within the loop in Figure 2.2.
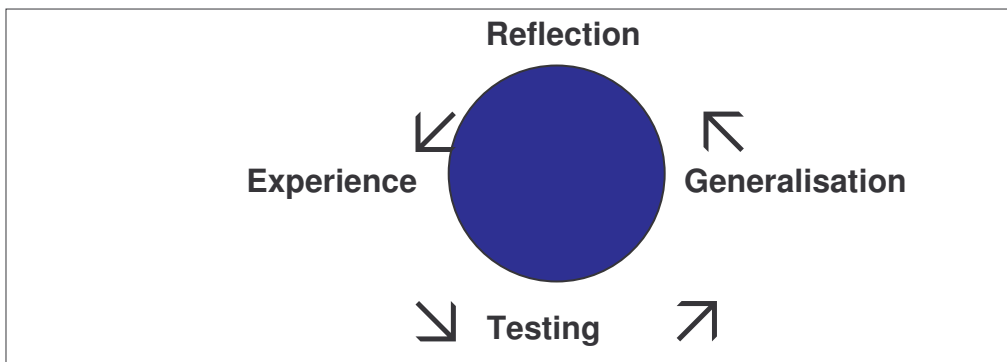
Figure 2.3. Single-loop learning (Kolb, 1984)

The moment that the learner becomes uneasy about his/her points of departure/ norms/values/paradigms he/she starts to leave the single loop and enter the double loop. Reflective dialogue and action commences but only after the shift has occurred; the learner returns to the single loop again with a new understanding of the discipline, a conception of development and an intention to act.

It is accepted that deeper-level learning arises from critically reflecting on one's own experiences. If learning gives rise to a change in basic assumptions, it is commonly referred to as double-loop learning in contrast to learning that does not challenge underlying assumptions, known as single-loop learning. In essence then, to 'learn something', the health science student must consciously experience a cycle of events, which begins when actions become experiences and deeper-level learning continues as the student reflects on the experiences, then develops, plans and implements new actions taking into account the outcomes of learning from 'doing' and 'reflecting'. According to Revans (2004:103) "there can be no learning without action and no sober and deliberate action without learning".

Double-loop learning according to Gericke (1994) will lead to a more effective way of making informed decisions about the way in which we design and implement action. The researcher is once again of the opinion that double-loop learning should be enhanced within the health science higher education sector.

Double-loop learning can be illustrated as follows in Figure 2.3.
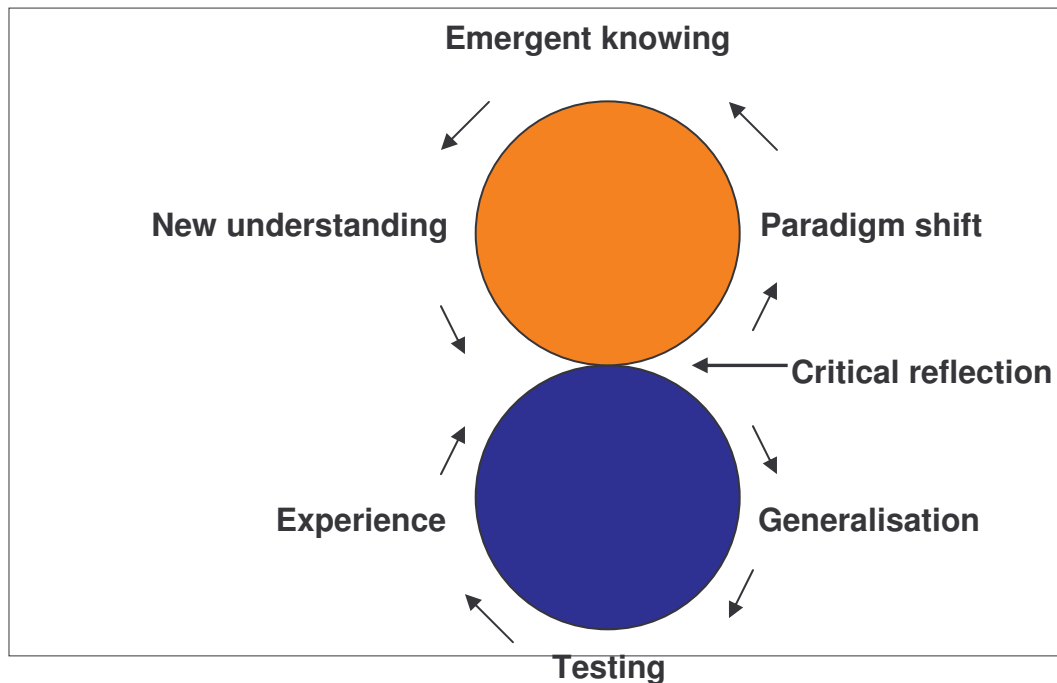
Figure 2.4. Double-loop learning (Kolb, 1984)

Looking broadly at the policies and documentation of Government Departments dealing with education and training, it is apparent that embarking on an emancipatory education approach which is transformative in nature, is inevitable. If the consequences of actions/behaviour are as the person intended them to be, there is a match between intention and outcome. If not, there is a mismatch and a possible response to this mismatch may be to change the action/behaviour. Where the action is changing we refer to it as single-loop learning and where the underlying norm and value system changes we refer to it as double-loop learning. It is clear to the researcher that double-loop learning will lead to a more effective way of making informed decisions about the way in which we design

and implement action. It is therefore eminent that double-loop learning should be propagated within the higher education sector.

2.3.4 Curriculum and critical cross-field outcomes

Curriculum is narrowly seen as an array of learning areas, or broadly as the real-life learning experiences an individual needs to participate meaningfully within society. Another view of curriculum is that it is the learning area or outcomes with an emphasis on facts, concepts and generalisations of a group of learning areas. Malan, Du Toit and Van Oostrum (1996) propose a curriculum development model that may be applied to professional courses like Radiography. The model has been adapted to suit the higher education context in South Africa and the focus for this discussion is only on one of the three levels, namely the micro-level. At this level learning areas serve as guides to direct learners towards achieving outcomes (Olivier, 1999).

In OBE the role of the facilitator is that of facilitating and monitoring the learning process. The guidance that the facilitator in health sciences provides is in the form of specific learning procedures, which have a bearing on real-life applications through stimulation of creativity, self-learning and critical thinking (Olivier, 1999). On this micro-level it is necessary to formulate a number of specific outcomes that are essential for the mastery of knowledge, skills and processes in order to achieve the outcomes.
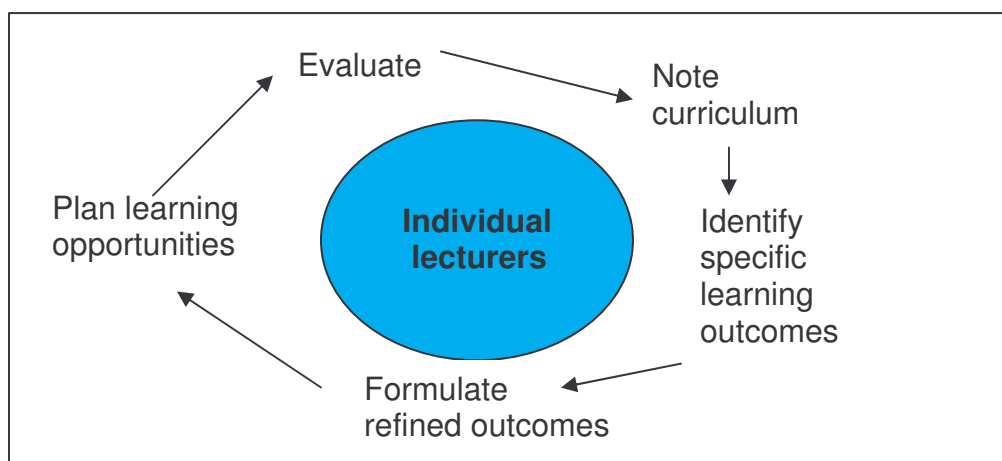
Figure 2.5. Curriculum Development Model on Micro-level (adapted from Malan, Du Toit & Van Oostrum, 1996)

According to Smith (2006:61), "designers of qualifications should ensure that all critical cross-field outcomes (CCFOs) have been addressed appropriately at the level concerned". OBE encourages facilitators to be creative and innovative when developing learning programmes — a shift from the confines of traditional education, which requires facilitators to be lecturers who teach fixed subject content, from a textbook, being lecturer-centred. Olivier lists the following differences between traditional education and outcomes-based education, which are adapted to the health science higher education context:

Traditional education	Outcomes-based education
a. Rote learning	a. Critical thinking and learning
b. Syllabus is content-driven, divided into subjects	b. Learning is a process and outcomes-driven
c. Textbook/worksheet bound	c. Lecturer is a facilitator
d. Lecturer-centred	d. Learner- and outcomes-centred
e. Syllabus is rigid and non-negotiable	e. Learning programmes are seen as guides
f. Emphasis is on what the lecturer	f. Emphasis is on outcomes – what

hopes to achieve	learners achieve
g.Curriculum development process not open to the public	g. Wider community involvement is encouraged

Table 2.1.Differences between traditional education and outcomes-based education (Olivier, 1999)

Furthermore, critical thinking competencies according to French and Rhoder (1992:187) involve interpreting, analysing or evaluating information, arguments or experiences, but need a purpose and an outcome. Critical thinking can be described as cognitive accountability. It entails providing reasons for actions or thought. This statement is congruent to the CCFOs in that students must seek answers and better their learning strategies.

The CCFOs are the outcomes the South African Qualifications Authority (SAQA) wishes all students to demonstrate at the end of any learning programme or intervention. In health sciences specifically, outcomes presume competencies, and competencies presume certain demonstrations by the student. The following section discusses the typical learner in higher education.

2.4   THE LEARNER IN HIGHER EDUCATION

2.4.1 Introduction

Maintaining the relevance of education to professional and societal needs and the need to be lifelong learners necessitates a change in focus from teaching to learning. The students themselves have to be actively involved in constructing

their own knowledge and a different educational approach and strategies have to be introduced in health science education, which will be learning-centred.

2.4.2 Learner biographical profile

A biographical profile of a learner in higher education gives a brief description of the characteristics or experience of such a person according to Chambers-Macmillan South African Student's Dictionary (1996).

Successful provision of higher education is dependent on proper knowledge and understanding of students' characteristics and needs. Factors that need to be incorporated in all strategies, methods are inter alia demographics, psychological and sociological characteristics, cultural background, religious affiliation, level and quality of school preparations and family background. Students in higher education are generally regarded and dealt with as adult learners. However, it appears that aspects such as autonomy, responsibility and self-determination are generally perceived as significant attributes of adulthood. Adults have a self-concept of being responsible for their own lives and decisions (Knowles, Holton & Swanson, 1998).

Although it is not likely for all lecturers to know all these elements related to learners, knowledge about learners' biographical profiles would be useful for meaningful design and development of learning opportunities and activities.

In general however, students entering the higher education health science system do have certain characteristics that are of relevance with regard to learning facilitation. These are subsequently briefly discussed.

2.4.3 Learner typification

A typical learner in higher education is regarded as an adult learner by Gravett (2005:8) because he/she:

- is an adult by definition, which implies that learning facilitation should confirm and promote independence, responsibility, self-determination, negotiation, dialogue and operation;

- brings accumulated experience to the learning process, which includes prior educational and life experiences that are linked to his/her identity;

- is life-world and life-task orientated because he/she wants to apply what is learnt in life-worlds;

- participates in higher education because he/she wants or needs to study and is activity orientated.

The term "adult" is not easy to define and is repeatedly socially constructed. Adulthood is seen as the stage of fulfilment of roles assigned to adults and according to which they accept their responsibilities. According to Gravett (2005) teaching must also rather be seen as learning facilitation, which includes all the

activities of the facilitator of learning that has a conscious intention of and potential for assisting, advancing and enabling effective learning.

In health science education, learning programmes are constructed in such a way that work-integrated learning forms an integral part as from the first year of study. The implication thereof is that students are exposed to and experience real-life situations from a very premature stage of formal teaching and learning.

The experience of adult learners can be utilised and affirmed in several ways. Gravett (2005:15-16) indicates the following aspects:

- Exploring existing knowledge – existing knowledge and experience serve as an interpretative framework for learning. Meaningful learning should relate existing knowledge with the learning outcomes to such a level of consciousness where it can be explored and clarified.

- Linking new learning to existing knowledge – facilitation of learning activities must be created where experiences are also made available to fellow learners as a resource for learning.

- Reflecting on existing knowledge – opportunities should be afforded to learners to reflect and to scrutinise their convictions. Stimulating learners by confronting them with anomalies and discrepancies in their existing views will enhance the process of reflection.

- Providing opportunities for interaction with co-learners in small groups. Resources can be pooled and shared learning can take place.

- Creating experiences that can be utilised to stimulate reflection as a base for the construction of meaning – by utilising learning methods such as case studies etc., a common base of experience can be established.

- Assisting learners to learn from experience with a view to personal or professional transformation – authors such as Schön (1987) and Boud (1992), to name a few, explored learning from experience by reflecting and acting on it extensively in adult education literature. A common feature to views regarding learning from experience is that learners talk about experiences, analyse them, identify the implications and act on these implications.

Radiography practice, for instance, also demands total responsibility for patient care and radiation protection by students as early as the first year of study. The radiography student is expected to behave in an adult manner and to demonstrate it in his/her professional socialising. It is therefore assumed that radiography students have the characteristics of an adult learner, but also characteristics of a professional practitioner due to the demands of practice.

2.4.4 Learning styles

In the last 30 to 40 years it has been proposed that teaching would be more effective if institutions of higher learning took account of differences in students'

learning styles. Probably the most widely accepted and best-validated conception of learning styles is Marton's (1976) "deep processors" versus "surface processors" based upon the levels of processing theory developed by Craik and Lockhart (1972). Thinking about learning styles can lead a facilitator to consider about different ways of teaching, with a view to accommodating different ways of learning. To be an effective health science facilitator, a variety of techniques and teaching tools must be available to maximise learning for as many students as possible.

According to Weinstein and Mayer (1986) learning styles are preferences and habits of learning that have been learned; everyone is assumed to be capable of going beyond a particular "style" preferred at the time. Therefore students can learn strategies that enable them to be effective when learning through methods that are not compatible with their preferred "style". These authors add that the student's prior knowledge; intelligence and motivation are learnable characteristics. Institutions of higher learning should design and develop learning programmes to accommodate differences in individual characteristics and preferences. This refers inter alia to students' preferred thinking, perceptual and learning styles. The thinking style of a learner relates to and influences perceptual, learning and learning facilitation styles.

Teaching and learning practices in higher education urgently need improvement. This is supported by the literature on educational change in general (Hargreaves,

1997). *Learning style* is a concept that can contribute to realising this paradigm shift, not only in informing practices but also in bringing to the surface issues that highlight the role and responsibilities of institutions of higher learning. In being more sensitive to the differences students bring to the classroom, it can also serve as a guide to designing learning opportunities that match or mismatch students' styles. This mismatch can indeed be viewed in a positive manner through the fact that facilitators in health sciences are challenged beyond their comfort zones. The implication is that facilitators must become whole brain practitioners themselves and create opportunities that will ensure effective learning.

Curriculum designers often fall into the trap of referring to the "learner" as if there is only one type of learner or as if all learners are clones of the same type of learner. Such thinking can lead to an oversimplification of approach by assuming that all learners are alike. One should keep in mind that learning styles, preferences and abilities may vary.

As individuals differ, so do their learning styles. Each learner is unique and has a distinct style of preference. According to Klopper (2000:80) a learning style refers "to the way a learner constructs knowledge and processes information". Entwistle (1988:28) defines a learning style as "the general tendency to adopt a particular strategy in learning". According to Kolb (1984) numerous studies have been undertaken within diverse professional groups, but there is little evidence

available on how radiography students prefer to learn. The knowledge about the preferred learning styles of students can be utilised by educators, managers etc to optimise learning and to promote lifelong learning. Fowler (2002) conducted a study to identify the preferred learning styles of radiographers. The study concluded with a summary indicating that radiographers are generally strong in perceiving information or experience in a concrete manner and processing this information actively. However, they are weaker in the use of the attributes "concrete experience" and "reflective observation". From this single research study it is indicated that there is a need to assist radiographers to facilitate reflective practice and maximise learning from practice. Helping students to understand their learning styles and preferences can maximise learning and promote lifelong learning.

Taking that "Every classroom represents a complete spectrum of learning style preference", Herrmann (1996) emphasises that a variation in design and delivery approaches by health science lecturers would facilitate the development of the full potential of the student. This will not only accommodate learners' thinking preferences, but also develop areas of lesser preference.

Kloppers (2000:80-85) mentions a number of learning style theories that exist: "Whole-brain thinking, Dunn and Dunn learning style inventory, Myers-Briggs type indicator, Herrmann Brain Dominance Instrument (HBDI), Felder-Silverman Learning Style Model and the Kolb Learning Style Inventory". Furthermore, in

health sciences it is indicated by Kloppers (2000:91) "a deep holistic approach is a requirement for knowledge construction and conceptual change". When the deep approach to learning is following intentionally, metalearning takes place.

Herrmann (1996:42) points out that each hemisphere of the brain is "specialized in a different way and physical connections secure integrated brain activity". The two hemispheres left and right represent the cerebral processes. The cerebral mode is the more intellectual, cognitive part, while the feeling-based processes (visceral) are represented by the limbic system's two halves. The limbic mode is the more emotional, visceral and structured part of the thinking processes (Figure 2.4). The dominance between the paired structures of the brain provides the basis for measuring the level of dominance.

The HBDI is an assessment tool developed in 1977 and finalised in 1981, which quantifies the degree of a person's preference for specific thinking modes. At the core of Whole Brain Technology is a metaphor of how the brain works; there is observable evidence that thinking styles can be best described as a coalition of four different thinking selves. These selves are characterised as follows:

- The A-quadrant Analyser (logical thinking, analysis of facts, processing numbers).

- The B-quadrant Organiser (planning approaches, organising facts, detailed review).

- The C-quadrant Personaliser (interpersonal, intuitive, expressive).

- The D-quadrant Visualiser (imaginative, big picture thinker, conceptualising).

Thinking preference profiles based on the results of the Herrmann Brain Dominance Instrument (HBDI) can be displayed on a four-quadrant grid. It has been documented by Knowles (1990) that effective learning occurs only if the whole brain is involved in learning. Students arrive at institutions of higher learning with thinking style preferences that have been established through schooling and life experiences. According to the New York Times (17 March 2008), Prof. Robert J. Sternberg cautions that there is often little resemblance between the way thinking is taught in school and thinking in the real world. Most real-life problems can be tackled only within the real-life context. Everyday problem solving often takes place as a group endeavour in which people behave differently and less rationally than they do as individuals.

The goal of education is to promote higher level thinking. Education needs to capitalise on individual strengths while working toward improvement of the weaknesses through facilitating analytical, creative and practical learning. The knowledge and skills that Sternberg (1990) believes are worthwhile come from the Triarchic Theory of Intelligence. This theory in itself was groundbreaking in that it was among the first to rebel against a psychometric approach to intelligence in favour of a more cognitive approach. Sternberg's theory (1990) comprises three parts: componental (analytic); experiential (creative) and

practical (contextual). Meaningful learning is important for intellectual ability. According to Sternberg (1990) knowledge is a form of intelligence and intelligence is redefined to incorporate practical knowledge. Knowledge is the ability to think and learn within new conceptual systems. Sternberg's model for developing expertise has five key elements: metacognitive skills, thinking skills, learning skills, knowledge and motivation. The collaborative influence of these elements leads to the acquisition of skills and knowledge (Sternberg, 1988). Facilitating learning in health sciences should therefore be geared not just towards advancing a knowledge base, but also towards developing reflective, analytic, creative and practical learning with a knowledge base.

A thinking style preference leads to a learning style preference and in turn determines a student's dominant cognitive mode in which he or she communicates. Differing mental preferences contribute to the level of success or failure of communication processes (Herrmann, 1996:115). Effective communication is fundamental to successful human interaction and very susceptible to family, social and clinical situations.

Learning style models are well documented in research, namely the Myers-Briggs Type Indicator (MBI), Carl Jung's theory of psychological types and Kolb's learning style inventory. The Herrmann Four Quadrant Whole Brain Model, however, is not the only instrument that quantifies a person's preference for thinking in four different modes based on the task-specialised functioning of the physical brain (Herrmann, 1995)

The reason for selecting the Herrmann model is that it is a valid method of evaluating a person's strengths and weaknesses using the innovative Whole Brain Thinking approach. Whole Brain Thinking is the science of cultivating the ability for individuals to act outside their preferred thinking styles. In the health science educational context the Herrmann model can increase educational outcomes, create a learning community that understands and respects the learning preferences of lecturers and students and offers opportunities for learning based on personal uniqueness and specialised learning styles. In 1980 Bunderson (2004) conducted a HBDI validation study and found good evidence that four stable, discrete clusters of preference exist; the scores derived from the instrument are valid indicators of the four clusters and the use of the instrument meets high professional standards as applied in learning, teaching and self-assessment settings (Herrmann, 1996).

The metaphoric whole brain model of Herrmann (1995) can be used as exemplarto develop flexibility and cater for diversity. Health science facilitators are encouraged to become sensitive to the expectations of the students when planning learning opportunities. The alignment between the expectations of the students and the planning of the facilitator is illustrated in Figure 2.6 – it indicates that the learning environment can promote learning style flexibility (LSF).

The left structured mode is categorised by processing dealing with logical, rational, critical and quantitative issues and activities. The procedural, planned,

sequential and organised elements of learning are found in the structured left mode. Left mode learning is depicted by achievements, fact-based knowledge and traditional ways. The experiential right mode is categorised by processing dealing with visual, conceptual, emotional and interpersonal aspects. Right mode learning can be described as participative and future-orientated.

RESULTS-DRIVEN   OPPORTUNITY-DRIVEN

UL   INTELLECTUAL   UR

Fact-based   Open minded

STUDENT PREFERS: STUDENT PREFERS:

Facts, textbook readings, precise,   Pictures, intuitive learning, fun,

to the point information, numbers,   metaphors, overviews, discovery,

data, theory, logical rationales,   opportunity to explore, experiment,

proof of validity.   playful approaches.

STRUCTURED   EXPERIMENTAL

STUDENT PREFERS: STUDENT PREFERS:

Organised approach, evaluation,   Sharing ideas, emotional involve-

examples, clear instructions, clear   ment, personal connection, group

expectations, practical application,   discussion, intrapersonal learning,

complete subject chunks.   hands-on learning.

Controlled   Feeling

INTUITIVE

LL   LR
TASK-DRIVEN   FEELINGS-DRIVEN

Figure 2.6. Thinking preferences: Alignment of expectations of students and planning of facilitator (adapted from Du Toit, 2004)

A learning opportunity or a series of learning opportunities that incorporates all these modes will ensure that students' preferred learning styles are accommodated and less preferred thinking modes are utilised.

Functioning effectively in any professional capacity, however, requires working well in all thinking modes. Felder (1996:18) states that the objective of education should thus be "to help students build their skills in both their preferred and less preferred modes of learning".

Furthermore, outcomes-based education emphasises the necessity of learning provision according to learner needs. It is therefore important always to bear in mind that although students might share characteristics, they remain individuals with unique preferences and needs (Candy, 1998).

Lumsdaine and Lumsdaine (1995) indicate four modes of students' learning that complement Herrmann's model:

- *External learning* is teaching from authority through lectures and text books. It is predominantly *A-quadrant learning.*

- *Internal learning* can be described as an insight, a visualisation, and the synthesis of data. This is predominantly *D-quadrant learning.*

- *Interactive learning* is brought about by discussion, hands-on activities where a student can try, fail, retry with an opportunity for verbal feedback and encouragement. This is a predominantly *C-quadrant learning.*

- *Procedural learning* is characterised by repetition to improve skills and competence. It is predominantly *B-quadrant learning*.

It has been documented by Knowles (1990) that effective learning takes place if the whole brain is involved in learning. Interpreted in terms of the Herrmann model this means that all four-brain quadrants are included in teaching and learning activities.

Cognitive functions are optimally utilised when learning activities are constructed in such a way that the cognitive functions associated with all four quadrants of the Herrmann model are used.

The HBDI does not test competencies, but gives an indication of preferences and potential competencies (Herrmann, 1995). Although the HBDI was originally developed for adult users in a corporate environment, it has been successfully used with higher education students (Lumsdaine & Lumsdaine 1995, De Boer & Steyn 1999, De Boer, Coetzee & Coetzee, 2001).
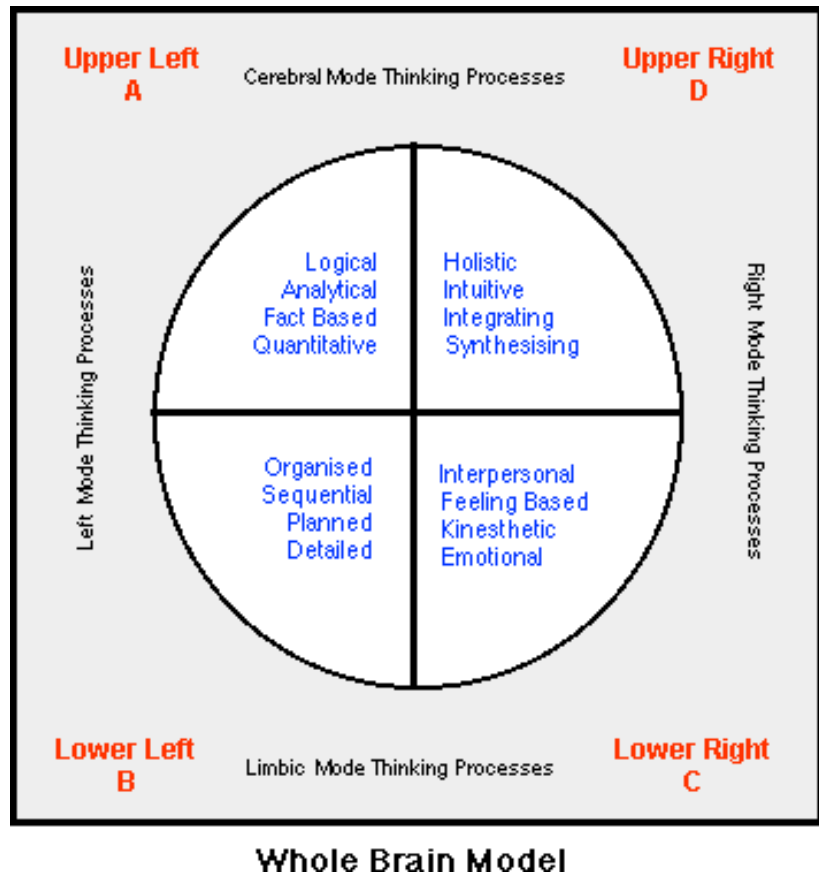
Figure 2.7. The Herrmann Whole Brain Model (Herrmann, 1998)

2.5   THE NATURE OF REFLECTION

Reflection is no new concept; in fact, Aristotle discussed reflection many years ago. "Reflection can be seen as a mirror imaging or producing a likeness upon which to contemplate. Mirrors also deflect light; thus the mirror image may also be illuminating and assist in viewing the images more clearly" (Garrett, 1992:218). The seeds of reflective practice can be traced back to the educational philosopher John Dewey (1933) who argued that the ability of an individual to reflect is initiated only after he identifies a problem as well as recognising and accepting the uncertainty this generates. He furthermore claimed that reflective

thinking requires continual evaluation of beliefs, assumptions and hypotheses against existing data and other plausible interpretations of the data. Dewey (1933) was an influential writer of educational thought and practice who advocated student-centered learning. He is considered to have initiated the concept of reflective thinking as an aspect of learning and education, defining it as:

> *active, persistent and careful consideration of any belief or*
>
> *supposed form of knowledge in the light of the grounds that*
>
> *support it and the further conclusion to which it tends*
>
> (Dewey, 1933:9).

Dewey argued that the development of reflective thinking should be an educational aim.

A definition of reflection is further given by Boud, Keogh and Walker (1985:43):

> *Reflection in the context of learning is a generic term for those*
>
> *intellectual and affective activities in which individuals engage*
>
> *to explore their experiences in order to lead to new understandings*
>
> *and appreciation.*

The mentioned authors' definitions move towards the context of professional practice in that both view experience as the touchstone for reflection.

King and Kitchener's (1994) work on reflective judgment follows the work of Dewey (1993) on reflective thinking. Their model takes into account cognitive development and contends that the ability to recognise and deal with ill-defined problems depends on beliefs about knowledge. Reflection is thus a process by which experience is brought into consideration when you are dealing with any matter. Reflection is the "evaluation of how and why we understand, think, feel or act in a specific context" (Escrow, 1990:6).

According to Kloppers (2001:35) the reflective process (Figure 2.5) consists of:

• an awareness of uncomfortable feelings and thoughts;

• a critical analysis of the situation;

• the development of a new perspective.

PHASE 3
NEW PERSPECTIVE

Synthesis

Evaluation

REFLECTION

PHASE 2

ANALYSIS OF FEELINGS

AND KNOWLEDGE

Critical Analysis

PHASE 1
AWARENESS

Self-awareness

Description
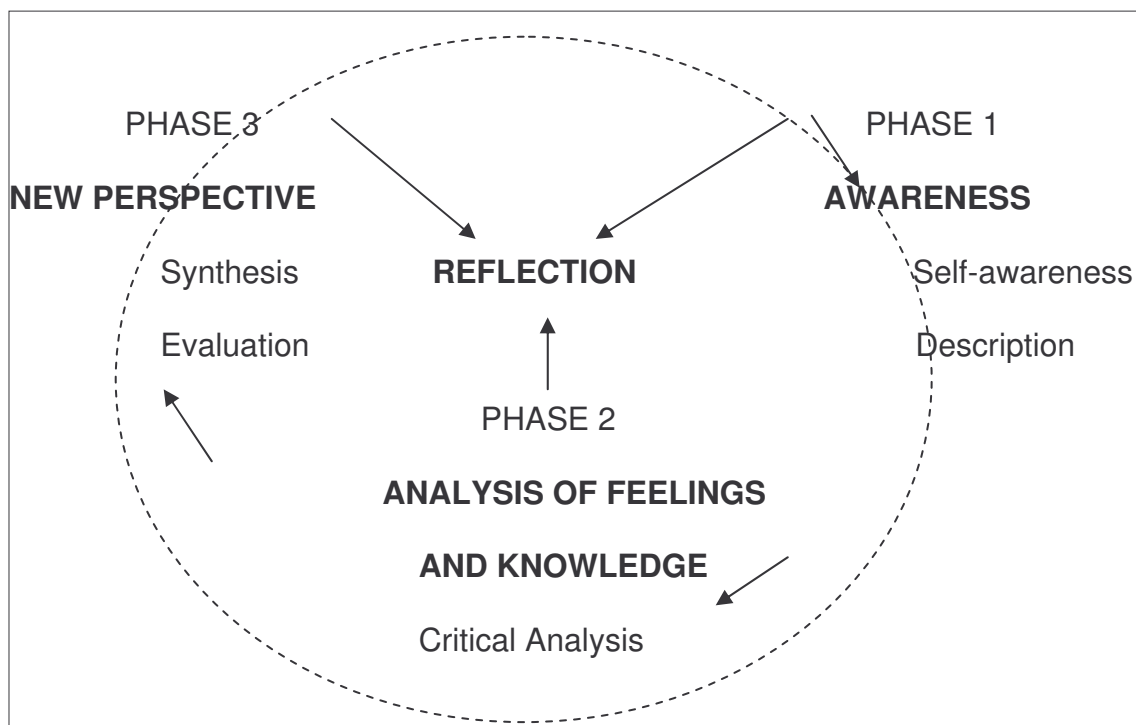
Figure 2.8. Reflective process and integrated skills (Kloppers, 2001: 37)

From the nature of the reflective process, a paradigm shift from the logical-positivistic view to the direction of reflection is essential. Self-awareness is an essential component of reflection during phase one, which means an honest investigation of a specific situation. Boud et al. (1985:12) state that description implies the ability to recognise the key characteristics of the experience. During phase two a critical analysis of knowledge is done which includes an evaluation of how relevant knowledge applies to a specific situation. The new perspective phase consists of the integration of new knowledge with prior knowledge. Atkins and Murphy (1993:1190) define evaluation as "…the making of judgments about the value of something, it includes the use of criteria and standards".

Reflection starts to get critical in nature once learners show the potential to look at things differently (Gericke, 1994).

| **Experien** **ce** | **Returning to the** **experience**

Description of the incident
Analyzing the experience from the
perspective of the wise, compassionate | Identifying new ways of behaving, thinking and feeling. A commitment to changing your practice |
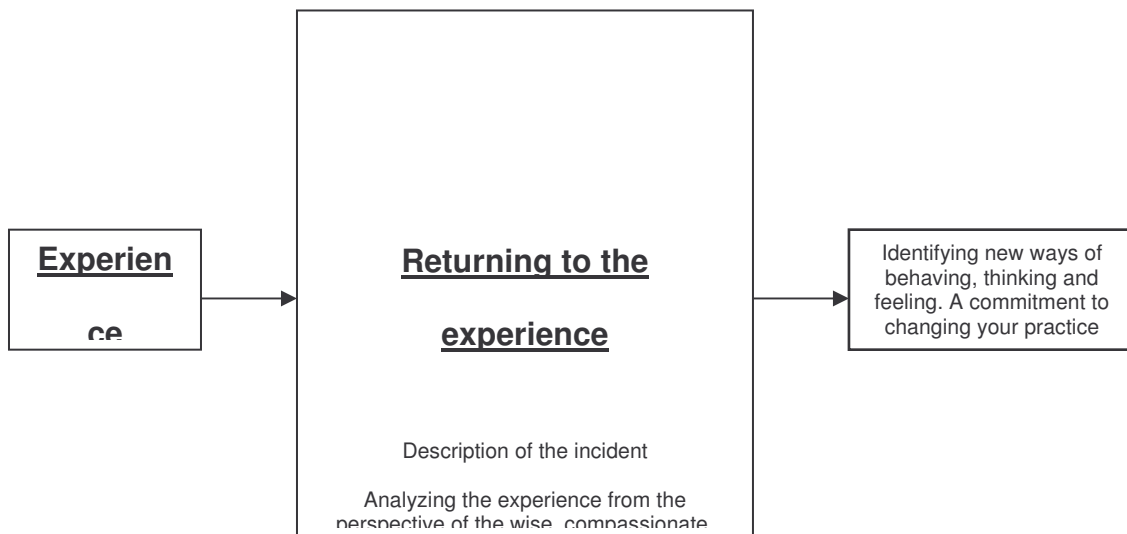
Figure 2.9. The Reflective Learning Cycle (Adapted from Boud, Keogh & Walker, 1985)

Schön (1983) describes the process of reflective practice when he categorises knowledge into two types, namely technical rationality ("the knowing that") and professional artistry ("the knowing how"). Both types of knowledge are needed in becoming a reflective practitioner.

Greenwood (1998) has criticised the limitations of Schön's model (1983) because it involves only two components of reflective practice, namely reflection-in-action and reflection-on-action. Greenwood's view of reflection-before-action, involves thinking through what one intends to do before doing it. Furthermore, another limitation of Schon's contribution is that it refers only to the practice situation in a studio; he does not make reference to the theoretical element of the large majority of professional programmes. The recognition that reflection can take place in an academic context and not only in a situation of professional practice must be noted.

Johns (2000:34) describes critical reflection as:

a window through which the practitioner can view and focus self within the context of his own lived experience in ways that enable him/her to confront, understand and work towards resolving the contradictions within his practice between what is desirable and actual practice".

Boyd and Fales (1983) claim that critical reflection is the difference between whether a person repeats the same experience several times, becoming highly

proficient at one type of behaviour, or learns from experience in such a way that he is cognitively or affectively changed.

This critical reflection is therefore viewed as transformational learning, which Baumgartner (2001) says, "…can occur gradually or from a sudden, powerful experience and change the way people see themselves and their world".

Freire (1972) and Mezirow (1981) share some of the same philosophical underpinnings. Both believe that knowledge is not "out there" to be discovered but is constructed through the interpreting of new experiences (cognitive rational approach). Daloz (1999), however, uses the concept of development where he believes in the role of a mentor in guiding a learner on a journey that is affected by his social environment (development approach). The cognitive rational approach may therefore be most relevant during initial education with the development approach being more relevant within Continuing Professional Development (CPD).

The amount of understanding and learning that takes place as a result of the iterative process of critical reflection depends on the individual's amount of self-awareness, honesty and openness to feedback.

Johns (2000) suggests the engagement of the "ten C's of reflection" in order to engage effectively in the critically reflective process:

- Commitment – dedication to the process of reflection.

- Contradiction – challenge inconsistency during reflection.

- Conflict – differences in how to reflect effectively.

- Challenge and support – confronting own methods of learning.

- Catharsis – reflecting through art and images.

- Creation – construction of own learning through reflection.

- Connection – linking experiences with learning expectations.

- Caring – reflective thoughtfulness.

- Congruence – exploring similarities with previous learning experiences.

- Constructing personal knowledge in practice – creating and applying learning.

All role players in health science training can adopt the "ten C's of reflection"; it will contribute to sharing and development of understanding between critical thinkers.

From the nature of the reflective process it is clear that radiography must move away from the reductionistic, logical-positivistic view and that a paradigm shift in the direction of reflection is essential. In this process of learning the educator's reflection with the adult as learner is important. Bruni (1991:172-173) points out that the formulas of dialogue, discourse and narrative centre around images of language, power and subjectivity". In health science education it is essential that the educators reflect together with the adult learner about the learning situation

and his/her experiences of the cooperative learning relationship. "To grasp shared meaning from experience is essential learning for the true art of nursing" (Garrett, 1992:221).

Boud, Keogh and Walker (1985) indicate in their description of reflection that the central point of reflection in learning is experience. The complex model of learning from Jarvis (1987) highlights the fact that reflection is recognised as being related to other forms of thinking and learning.

Furthermore, the Atkins and Murphy (1993) model of reflective thinking identifies the process of reflection as the internal examination of self, which results in a changed conceptual perspective. The key elements of this process can be divided into three stages:

- Awareness of uncomfortable feelings and thoughts
- Critical analysis
- New perspective

Another higher order thinking process, which might be compared to reflection, is metacognition. This term has been used to refer to two somewhat separate phenomena, namely knowledge about cognition and regulation of cognition (Baker & Brown, 1984). The act of monitoring one's own cognition requires self-reflection. Metacognition is clearly a reflective process. Baker and Brown (1984) clearly state that effective learning requires an active monitoring of one's own cognitive activities.

In this study reflection is considered to be a process that operates at a number of levels and leads to new perspectives. The concept of reflective thinking can thus be considered to be a holistic process and a multi-faceted activity; it is, in other words, the "ability to stand back from the self" and examine critically one's own thinking patterns. Critical reflection is therefore considered as an underlying skill required to achieve all learning outcomes.

According to Hargreaves (1997) reflective practice is a tool that is believed to result in both improvement in professional development and patient care. Reflective practice can be defined as "the process of turning thoughtful practice into a potential learning situation (Jarvis, 1992:26).

There are three types of reflection:

• Reflection-before-action – planning before the incident (Reed & Proctor, 1993).

• Reflection-in-action – thinking on your feet (Schön, 1987).

• Reflection-on-action – retrospectively reviewing an incident (Schön, 1983).

Gibbs (1988) describes a reflective practice model namely the cyclical or structured model. He continues to encourage radiography students to utilise the cyclical model of reflection, which provides a general framework, which guides the student into "reflection-on-action".

Barnett (1997) in particular brings together three domains of critical practice, namely critical analysis, critical reflexivity and critical action, while Fook (2002:41) refers to the potential of critical reflection for "emancipatory practices".

2.5.1 Reflection and Assessment

Reflective skills are considered important for effective practice as reflected in the benchmark standards for healthcare professionals (Quality Assurance Agency for Higher Education UK, 2001), and they need to be assessed. Hyland (1992) asserts that assessment often focuses on simple, technical skills because they are easy to observe and measure, while ignoring more complex aspects of practice such as critical reflection.

Schön (1991) and Johns (1995) state that all reflection should be coached or guided by another person. For assessment to be reliable students need some guidelines about what is expected of them. Stewart and Richardson (2000) explored the experiences of physiotherapists and occupational therapists that underwent assessment of their reflective work. Data from student focus groups and interviews showed concerns about fairness, consistency and the impact of the student/tutor relationship.

Kember and Leung (2000) have developed and tested a questionnaire to identify levels of reflective thinking. This work was carried out with student

physiotherapists, occupational therapists, radiographers and nurses. The questionnaire covers four scales representing Mezirow's (1991) levels of reflective thinking; to be reliable it focuses on the following:

- Habitual action – activity carried out with little conscious thought as a result of frequent repetition.

- Understanding – thoughtful action.

- Reflection – the critique of assumption about the content or process of problem solving.

- Critical reflection – becoming aware of why we perceive, think, feel or act as we do, leading to the redefinition of a problem and redirected action.

However, Du Toit (2007) adds another level of reflective thinking:

- Scholarly reflection – grounded in the literature and evidence from action research.

Reflective writing is often suggested as a suitable instrument for assessment, but students may have excellent reflective thinking skills but poor language integration. Deep reflection is likely to include consideration of complex cognitive and affective issues that may be difficult to express in the written form. Rich (1995) indicates that students may be reticent to document details of their mistakes in writing, particularly if they relate to clinical work where patients may have been discomforted by their actions. One advantage of written reflection is

that it is retrospective and allows the student time to collect and organise his thoughts.

Assessing reflection and using reflective strategies for facilitating assessment present healthcare educators with a significant challenge with a range of dilemmas. Research and inter-professional collaboration are needed to support those who have then responsibility for assessment to ensure that the process is fair and transparent.

2.6   CONCLUSION

This chapter reviewed literature of the more prominent writers on the topic of reflection in order to provide a framework to interpret the literature. An element of confusion surrounds the literature because the concept of reflection has become so widely and diversely used that it is now found within disparate contexts and based upon divergent frames of reference. Notwithstanding the wide interest in reflection, the concept is still ill defined and the reliability and validity of the way in which it is assessed are still questionable.

The study furthermore reveals the changing South African educational context. Successful provision of higher education is dependent on proper knowledge and understanding of learner characteristics and needs. Knowledge of students' thinking preference profiles would be useful for meaningful planning and creating

significant learning facilitation. Learners in higher education are generally regarded and dealt with as adult learners.

In the next chapter the research approach, design and methods are discussed to find answers to the question on how to integrate critical reflection as a learning strategy in the design of health science learning programmes.

CHAPTER 3

RESEARCH DESIGN

3.1   INTRODUCTION

As indicated in Chapter 1, the purpose of this study is to determine how critical reflection as a learning strategy can be integrated in the curriculum of radiography learning programmes. The data obtained in this study is used to clarify the value of integrating critical reflection as a learning strategy to ensure effective and transformative learning.

The purpose of this chapter is not only to discuss the methods and procedures as such, but also to provide the rationale for selecting these methodologies.

3.2   RESEARCH DESIGN

In Chapter 1 the purpose and aim of the research are discussed on page 14-16.

The implementation of a pilot study is aimed at gaining information regarding the current radiography education environment. The current application and integration of a learning-centred approach is also verified and determined.

The outcome of the pilot study, which the researcher also utilises as an indicator for the research process, informed and directed the research approach. It is therefore clear that the nature and intensity of the orientation session with the research participants was directed by the results obtained from the pilot study.

This section clarifies the research approach adopted to find answers to the research questions as reviewed in section 1.3 (p16-17). The research approach used is mainly a mixed methods approach with, to lesser extent characteristics of action research because of the involvement of the research participants as an integral part of the design.

3.3   MIXED METHODS RESEARCH

It seems as if one of the fastest and currently growing interest areas in educational research methodology today is the mixed methods research design, because its advantage is obvious: take the best of two or more methods and combine them. The quantitative paradigm was prevailed for most of the 20th century. The qualitative paradigm came of age as an alternative to the quantitative paradigm during the 1980's and it was often conceptualised as the polar opposite of quantitative research. Although the contemporary roots of mixed research go back to the late 1950's as indicated by Tashakkori and Teddlie (2003), but it is clear to the researcher that mixed methods research

became the justifiable third paradigm of research methodology, after quantitative and qualitative research.

Bazeley (2003:117) states that the term mixed methods is "most commonly applied to research involving a combination within a single project, of quantitative and qualitative approaches to data gathering and/or analysis".

Tashakkori and Teddlie (1998) argue that the term "mixed model" is more suitable than "mixed method" for research in which diverse approaches are applied at any or all of a number of stages through the research, their point being that mixing often extends beyond just the methods used in the research. "A typology in which attempts to distinguish between mixed models, mixed methods and multimethod research" is utilised by Tashakkori and Teddlie (1998:2003).

It was decided that the mixed methods research design is the most appropriate design with a scientific method that is deductive and inductive. The utilization of multiple forms of data collection also enriches the understanding of an experience through confirmation of conclusions, the extension of knowledge or by initiating innovative ways of thinking.

This research, to a certain extent, also fits into an action research design because of the direct participant involvement in a cyclic process (although only one cycle was possible), to improve radiography education practice. This study

therefore sets the stage for continuous and extended action research (more than one cycle) in the area of critical reflection and learning styles, as well as the promotion of educators' awareness of it.

3.4   ACTION RESEARCH

"Action research has become widely accepted in the health and educational sciences" (Kember, 2001:29). Action research is portrayed as a cyclical or spiral process involving steps of planning, acting, observing and reflecting. Inherent within the action research cycle is a need for the researcher to reflect upon her own action and practice. Action research has emerged as an approach to enhance the quality of teaching and learning in institutions of higher learning (Zuber-Skerrit, 1992). Action research is also a strategy for quality improvement or educational development underpinned by both a theoretical framework and by practical experience (Kember, 2001).

It was decided that this research project fits in well with the above views from the literature with regards to action research, because it is characterised by a process by which change and understanding can be pursued. It is also cyclic with an action phase of 10 weeks and critical reflection in turn realised through reflective journals and reflective learning group discussions. This research project intends to introduce some change within health science education and to eventually improve practice.

According to Kemmis and McTaggart (1994:10)

> *… to do action research is to plan, act, observe and reflect*
>
> *more carefully, more systematically, and more rigorously than*
>
> *one usually does in everyday life; and to use the relationships*
>
> *between these moments in the process as a source of both*
>
> *improvement and knowledge.*

From a higher education perspective, Zuber-Skerrit (1992:1-2) defines action research as "collaborative, critical enquiry by the academics themselves into their own teaching practice, into problems of students learning and into curriculum problems".

In this study the researcher involved in radiography education came to the conclusion that with a learning-centred approach, there is a need to identify learning strategies that will assist the student in health care education to reflect and to think critically, to ensure effective and lifelong learning. Barnes (1992:115) asserts that action research is "closer to ethnographic research than scientific experiment in that the researcher cannot stay on the fringe as an observer, but must become closely involved with participants".

It is clear to the researcher that this project, over and above the mixed methods research design, also fits in well, to a definite extent, with the

principles/characteristics of an action research approach as discussed in the abovementioned paragraphs.

The primary research design used is a mixed methods approach, which is discussed in section 3.3, with limited features of an action research approach that might be explored and developed in future.

3.4.1 The action research model

According to Van Rooyen (1998:79) health professionals use research "to try to answer the many questions facing them in their daily practice as they try to respond to the current rapidly changing social scene in South Africa". Health science educators have come to realise that they must use research to "examine the need for, as well as support, the outcomes of practice" (DePoy et al., 1999:560).

Research is an integrated process that is needed for current practice that accommodates active thinking, which converts knowledge into professional service. The elements of specifically action research, which are of importance as the focus of this research, are graphically illustrated in Figure 3.1.

This research project has its roots within health science education and took place in a transformative paradigm within an emancipatory approach. The seven

elements illustrated in Figure 3.1 constitute the Health Science Research model and can be regarded as integral building blocks for this research.
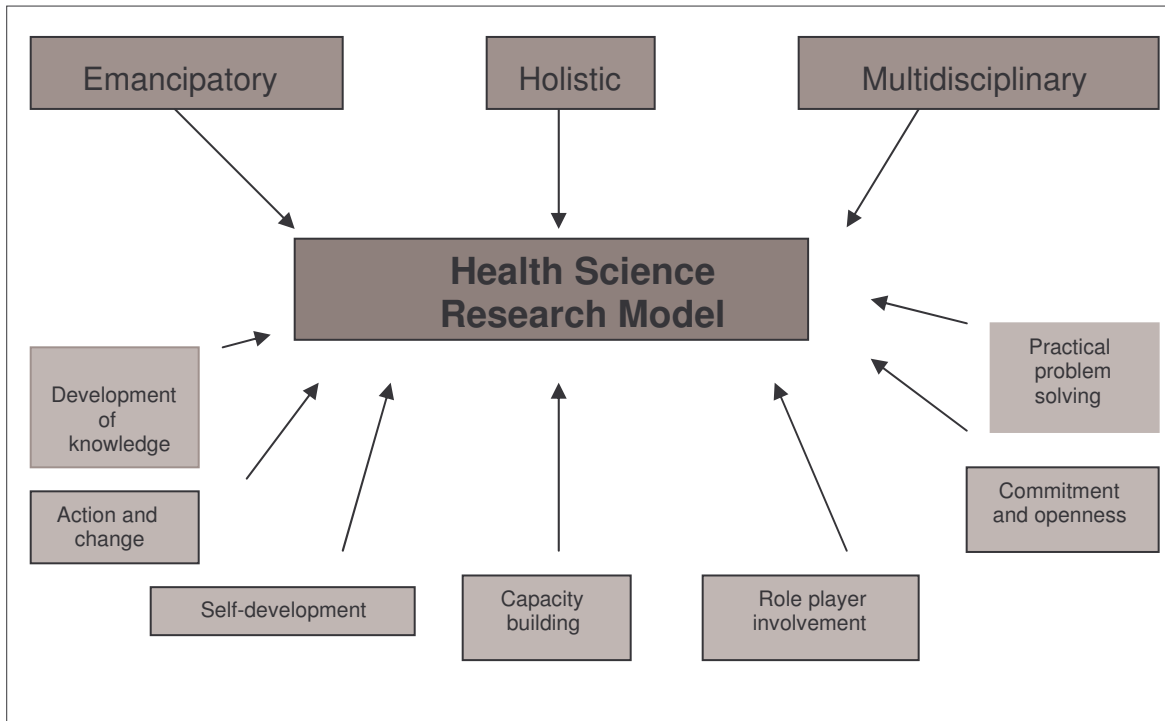
Figure 3.1. Health Science Research Model (adapted from Collins, 1999; Denzin & Lincoln, 2000; Green, 1998)

Figure 3.1 illustrates seven elements that are prominent features in this project. The first element is the endeavour to develop knowledge through research. By taking action and creating better ways to achieve change a more holistic approach is achieved. Prominent elements are also directed at problem solving through applied research and research processes based on capacity building of individuals that must organise themselves and take responsibility for their own actions and development. Development of knowledge and specifically self-

development is created through research and serves as an encouragement towards competency, dignity and an urge to grow and participate. Commitment to responsiveness, openness to dialogue and ongoing surveillance of the competing demands for participation and action are essential elements to the research process in health sciences. Role players must be kept interested and encouraged to participate actively in the research process through shared control and support. A transformative research environment contributes towards and stimulates interdisciplinary research activities.

3.5 QUANTITATIVE AND QUALITATIVE RESEARCH

Henning, 2004:3 states that "the distinction between the qualitative paradigm and the quantitative paradigm lies in the quest for understanding and for in-depth inquiry". According to Elliot (1981) action research can be seen to be too subjective or as highlighted by Cohen and Manion (1994) as lacking rigour. It is therefore of the utmost importance that a multi-method or triangulation approach as described by Dentin (1978) be used to "increase the reliability of observations" (Mouton, 1996:156).

According to Denzin (1978:308) triangulation "can take many forms, but its basic feature will be the combination of two or more different research strategies in the study of the same empirical units". The technique of triangulation for comparing and contrasting three points of view of a lecture room episode – the student's

view, the academic and clinical staff's view and an external researcher's (observer's) view – is premised on the idea of a performance gap (Ebbutt, 1983). This gap, according to Ebbutt, is the "gap between espoused theory and theory-in-action" (1983:3). Wiersma (1991) further distinguishes between triangulation of multiple data sources and multiple data collection methods.

In this study the triangulation of multiple data sources includes three distinct groups, namely the radiography students, academic and clinical staff. The multiple data collection methods utilised adheres to the principle of triangulation and includes four methods (quadangulation) as illustrated in Figure 3.2. An important rationale for selecting a mixed methods research design is to seek corroboration, convergence and correspondence of results from different methods.

Pilot study questionnaire   **Observations**

<div style="text-align:center">Data collection</div>

Questionnaires   **Structured focus**

                                                  group interviews

Content/Text analysis
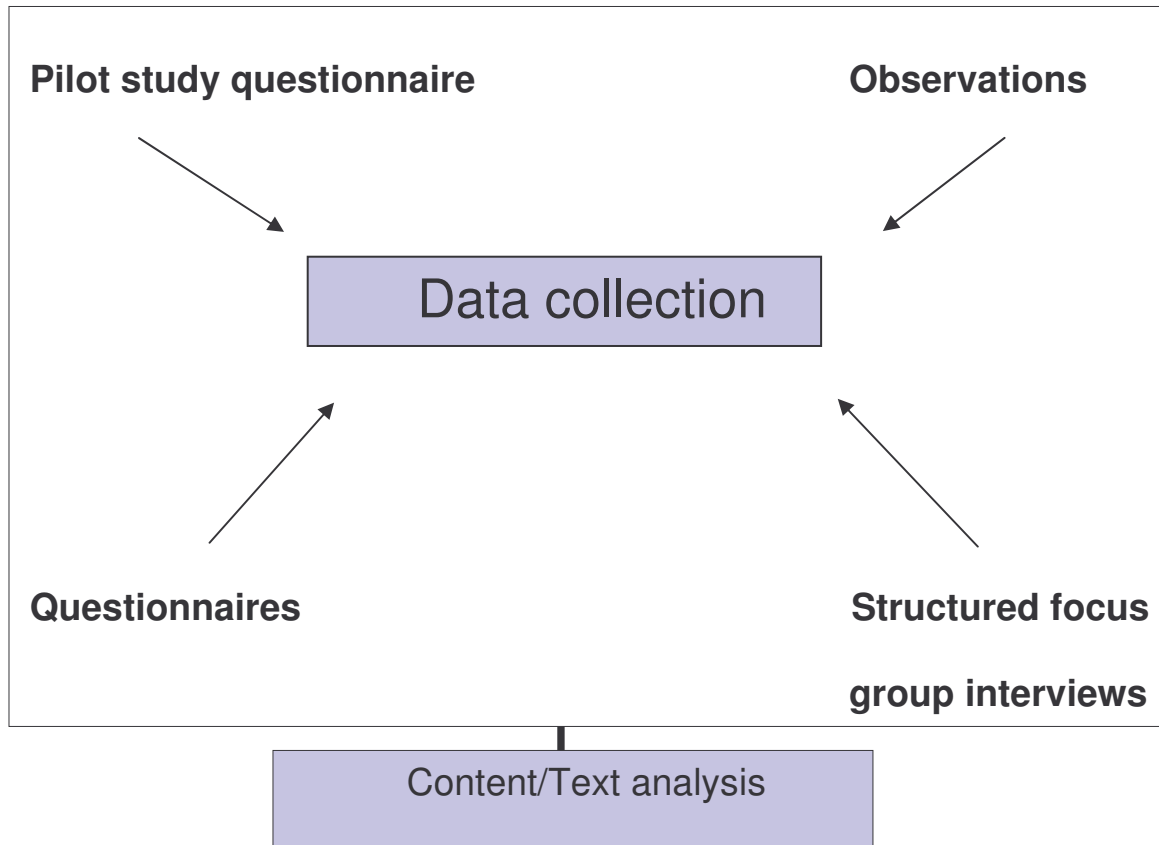
Figure 3.2. Quadangulation: data collection methods

Mouton, 1996:157 argues that each method has its limitations, but by "employing different methods of data collection in a single project researchers are to some extent, able to compensate for the limitations of each".

The data collection methods utilised in this investigation are tabulated in Table 3.1:

METHOD	REASON (S) FOR THE CHOSEN METHOD	INVOLVEMENT
Pilot study questionnaire (before AR phase)	●To obtain an overview ●To serve as broad orientation ●Knowledge enrichment in terms of participants' insight and experience with regard to reflective practice	●Students ●Academic and clinical staff members

Observations (during AR phase)	●**Obtain information regarding students':**
	  1) feelings, attitudes and commitment regarding to keeping a journal;
	  2) involvement and participation in sharing experiences during reflective discussions.
		●Students
		●Staff members ("observers")
		●Researcher

Structured focus group interviews (after AR phase)	●**Obtain:**
	  1) responses on the keeping of reflective journals and the value thereof;
	  2) viewpoints on the integration of critical reflection.
		●Students
		●Academic and clinical staff
		●Researcher

Questionnaires	●**Obtain information regarding participants':**
	  1) general approach to learning;
	  2) perspectives on the reflective process;
	  3) perspectives on reflection as a learning strategy.
		●Students
		●Academic and clinical staff

Table 3.1. Data collection methods

3.5.1 Pilot study questionnaire

A pilot study is defined in the New Dictionary of Social Work (1995:45) as the "process whereby the research design for a prospective survey is tested". Celliers (1973) however, advances the following view of a pilot study: it commences with a literature study, which puts the experience of various experts on the table. Thereafter, an overview of the concrete field of investigation should

be obtained through a pilot study, which should finally be complemented by a thorough study.

The information from the pilot study questionnaire served as a broad orientation and as knowledge enrichment in terms of the participants' insight and experience regarding the reflective practice in general.

The pilot study questionnaire is included as Addendum E. An analysis of the pilot study is provided in section 3.7.1. The information sessions and consent process were conducted according to the dates included in Table 3.2.

Institutions of higher learning	Research orientation presentation session
CUT	09-06-2006 (staff) 17-07-2006 (students)
UP	24-07-2006 (students) 01-08-2006 (staff)
Medunsa	22-05-2006 (staff) 24-05-2006 (students)
TUT	13-06-2006 (staff and students)

Table 3.2. Time schedule for the information sessions and consent process

3.5.2 Observation

Participant observation was prominent in the late 19th and at the beginning of the 20th century in European and American anthropological research (Dentin & Lincoln, 1994). However, participant observation has to a large extent been

neglected by health professionals in general and has been utilised mainly by sociologists and anthropologists.

Henning (2004:82) indicates, "Observation in general implies seeing as well as observing with the other senses". Participant observation can be regarded as a research procedure that is typical of the qualitative paradigm.

Academic and clinical staff as well as the researcher herself acted as observers during the weekly reflective learning group discussions that took place during the 10-week action research phase. The "observers" received briefings beforehand and the aspects to be observed were outlined. The students' feelings, attitudes and commitment with regards to keeping a reflective journal were observed and documented. Positive and negative aspects as well as challenges experienced while keeping a reflective journal were noted. Furthermore, the students' involvement and participation in sharing their learning experiences and reflections within the group were observed and documented.

The format of the reflective journal that was provided to the students is included as Addendum F and the observation sheet as Addendum G. An analysis of the observations made during the 10-week reflective practice phase is provided in section 3.7.2.

The time period of reflective practice and the observations is indicated in Table 3.3.

Institutions of higher learning	Reflective practice phase and observations (10 weeks)
CUT	17-07-2006 until 22-09-2006
UP	31-07-2006 until 06-10-2006
Medunsa	17-07-2006 until 22-09-2006
TUT	31-07-2006 until 06-10-2006

Table 3.3. Time period of the 10-week reflective cycle

3.5.3 Structured focus group interviews

Focus groups originated in the field of American marketing (Fern, 2001) and it was not until the late 1980's and early 1990's that the social sciences recognised focus group interviews as important data sources in themselves (Vaughn, Schumm & Sinagub, 1996). The goal in organising focus groups is to get feedback and investigate concerns, experiences or attitudes/beliefs related to a clearly defined topic.

According to Krueger (1994), a focus group is a carefully planned discussion designed to obtain perceptions of a defined area of interest in a permissive, non-threatening environment. Focus group research is relatively easy to organise and is an economical way of generating information/evidence.

Information yielded in a group dynamic is rich and useful (group interaction can bring out additional information). Other research sources are also utilised to gain

information. It can thus be seen as a research tool, conducted for the purpose of exploring people's thoughts and feelings and obtaining detailed information.

The recorder is invaluable for focus group interviews. For the purpose of this study the microphones and recorder were set up prior to the interviews and were visible to all participants. The room was set up and seats arranged in either a circular or U-shape, so that everyone could face one another throughout the discussion. As indicated by Krueger (1988), participants were encouraged to speak one at a time to avoid garbling the recording.

I also took notes where/when necessary during the interviews to note nonverbal behaviours, which can aid in interpretation. The discussion focused on probes and follow-ups, as well as ensured all the participants were given the opportunity to voice their comments.

At the end of an interview the most talkative and the least talkative participants were asked probing questions to clarify discussion issues, as suggested by Steinhauser (2000). This was done to ensure reliability and trustworthiness, but no new information/themes emerged in this specific part of the discussions.

Enough time was allowed before dismissal of each group to clarify specific questions, if necessary. This is the time to verify the accuracy of the recorded information. After each focus group interview had ended it was imperative for the

researcher to summarise the discussion, because it guarded against a fading memory and therefore enhanced the quality of the information gathered.

Fowler (in Hassan, 2003:244) indicates that "personal interviews are probably the most effective way of gaining the cooperation of most populations". Interviewing has become a way of life in our society (Atkinson & Silverman, 1997). According to McMillan et al. (1997: 263), the interview also has "a higher response rate than questionnaires". This method also ensures that all questions have responses as the interviewer can ask probing questions in trying to seek clarification.

Ethical considerations for focus groups are the same as for most other methods of research (Homan, 1991). A particular ethical issue that the researcher considered in this case of focus groups was the handling of confidentiality. At the outset the researcher clarified that each participant's contributions would be shared with the others in the group. The researcher also had the responsibility to anonymise data obtained from each group.

In this investigation face-to-face focus group interviews (structured) were conducted. Several aspects such as time available, logistical and practical issues as well as the financial implications culminated in the decision to conduct focus group interviews with the students. Depending on the work situation the interviews with the academic and clinical staff were either individual or in the format of a focus group. These focus groups also allowed sharing and comparing

among participants, as well as accommodating multiple viewpoints and responses. Focus group interviews were decided on as an economical data collection option, taking the number of participants/groups and the locations selected, into consideration. Furthermore, they allow for capturing a wider range of responses and reveal insights and nuances that other research methods usually cannot do.

Staff members' and students' responses regarding to the value of keeping a reflective journal and sharing experiences within a reflective discussion group were obtained. Viewpoints with regard to the integration of critical reflection through reflective journals and reflective discussion groups during the 10-week action research cycle were focused on during the interviews.

The two sets of interview questions asked to students and staff members respectively are included as Addendum H. An analysis of the content of the interviews is provided in section 3.7.3.

The timetable for the scheduled interviews is included in Table 3.4.

Institutions of higher learning	Number of interviews (focus groups)	
	Staff	Students
CUT	4 16-10-2006 & 17-10-2006	7 16-10-2006 & 17-10-2006
UP	1 31-10-2006	6 03-10-2006 & 10-10-2006
Medunsa	3	3

	31-10-2006 & 03-11-2006	19-10-2006 & 20-10-2006
TUT	1	4
	23-10-2006	12-10-2006

Table 3.4. Structured focus group interview schedule

3.5.4 Questionnaires

The New Dictionary of Social Work (1995: 51) defines a questionnaire as "a set of questions on a form which is completed by the respondent in respect of a research project". The questions can be open or closed. The basic objective of a questionnaire is to obtain facts and opinions. Questionnaires are probably the most generally used instrument of all data gathering tools available.

The researcher ensured a high and acceptable response rate through the strategy to give questionnaires to groups of participants, allowing time for completion and immediate collection.

The two sets of questionnaires are included as Addendum I. An analysis of the content of the questionnaires is provided in section 3.7.4. The schedule for the completion of the questionnaires is indicated in Table 3.5.

Institutions of higher learning	Completion of questionnaires
CUT	16-10-2006 & 17-10-2006
UP	17-10-2006 & 31-10-2006
Medunsa	31-10-2006 & 03-11-2006

TUT	30-10-2006

Table 3.5. Schedule for the completion of the questionnaires

3.5.5 Selection of research participants

From the eight institutions of higher learning involved in radiography training in this country, four institutions accepted the invitation to participate in the research. The invitation letter to institutions is included as Addendum B.

The participating institutions were:

- Central University of Technology Free State

- Tshwane University of Technology

- University of Limpopo (Medunsa Campus)

- University of Pretoria

The participants in this research project included the following groups indicated in Figure 3.3:

- Radiography students

- Academic staff involved in radiography education

- Clinical tutors involved and responsible for the clinical component of the learning programme.

The detail of the research participants is indicated in Table 3.6.

Institutions of higher learning	Number of staff members	Number of radiography	Approved clinical facilities involved

	(academic and clinical)	students	
Central University of Technology Free State (CUT)	**10** 5 academic & 5 clinical	**58** 27 first years & 31 second years	Universitas Hospital National Hospital Rosepark Medical Centre Kimberley Hospital Dr von Benzin & partners
University of Pretoria (UP)	**4** 4 academic & 0 clinical	**45** 27 first years & 18 second years	Not involved
University of Limpopo (Medunsa)	**10** 2 academic & 8 clinical	**54** 27 first years & 27 second years	George Mukhari Hospital Pietersburg Hospital Mangkweng Hospital
Tshwane University of Technology (TUT)	**3** 3 academic & 0 clinical	**45** 27 first years & 18 second years	Not involved

Table 3.6. Names and numbers of respondents participating

Selection was based on institutions and individual role players relevant to the research problem in terms of "being knowledgeable, available and willing to participate in the research study" (Wiersma, 1991:265).

The population with regard to academic and clinical staff was N=68 with the sample n=27. All academic staff members from the four participating institutions involved in the education of radiography students were considered. Clinical staff was selected based on their involvement in the education of radiography students as clinical tutors as well as mentors. Their role is primarily supervision

during clinical practice – their input could not be underestimated in determining the relevance and quality of the learning programmes.

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The radiography students themselves provided first-hand information concerning their learning experiences with regard to the integration of critical reflection as part of the teaching and learning process. Consequently the research participants were seen to be in a position to shed light on the research questions, as they were directly involved as important role players in the learning programme

Triangulation in terms of research participation by the three main role players in radiography education ensured that a wide variety of perceptions, opinions, experiences, views, feelings, and attitudes could be obtained and converged to validate the research data.
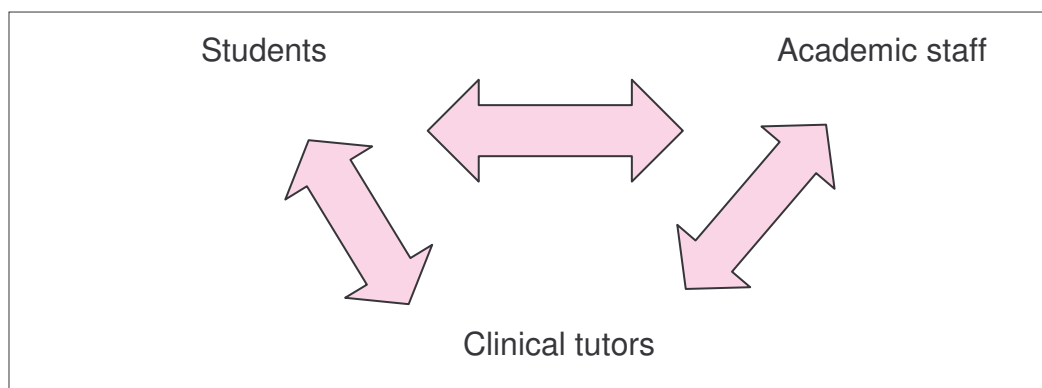
Figure 3.3. Triangulation: research participants

3.6 RELIABILITY, VALIDITY AND TRUSTWORTHINESS OF THE DATA-COLLECTION METHODS

According to Leedy (1993:40), reliability is the term used to "deal with accuracy". A scale measurement is considered reliable if it measures that which it is supposed to measure. Reliability is enhanced by the consistent quality and character of, for instance, interview questions. Furthermore, the methodology, with regards to the focus group interviews specifically as source of data, must be employed in such a manner to promote validity.

Furthermore, validity is concerned with the soundness and the effectiveness of the measuring instrument. McMillan (1997:404) indicates validity as "the degree to which the interpretations and concepts have mutual meanings for the researcher and respondent".

Letters requesting the participation of all the institutions involved in radiography education were sent out. After approval and acceptance to participate had been received academic and clinical staff were contacted and briefed about the action research study.

An information session took place at the different institutions to inform participants about the aim and objectives of the study, participants' role and function. All participants were assured of the confidentiality of the information and

thanked for their commitment, time and co-operation. Detail of the information sessions is indicated in Table 3.2.

3.7 DATA ANALYSIS

Data was gathered through the four collection methods. Descriptive statistical methods were used to give meaning to the data. Microsoft Excel was used to plot some of the readings on graphs to support the explanations provided from the qualitative data gathering methods, namely the weekly observation of reflective practice as well as the structured interviews. The software data analysis program Atlas.ti was (to a limited extent), also utilised.

Tables with frequencies were used to represent the data quantitavely indicating the number of respondents for the different categories included in the pilot study as well as the two questionnaires presented to academic and clinical staff and students.

McMillan and Schumacher (1997:501) describe data analysis as "a process of organizing the data into categories and identifying patterns among the categories". The steps like "organizing, summarizing and interpreting the collected data were applied throughout the process" (Hassan, 2003:270).

The recorded interview proceedings were typed and analysed after they had been put into a readable format. The process of "meaning condensation" described by Kvale (1996:192) was applied where necessary to eliminate unmanageable information.

The interview transcripts were scrutinised and investigated to provide a basis for the process of analysis and interpretation of the study. In order to reduce the amount of information to facilitate the handling of data it was put into categories (themes), with a few summarising tables and figures. According to McMillan and Schumacher (1997:508) and Mason (2002:151) the system used "to categorize or index the data is determined by the researcher and is based on the pre-planning of the study, field of experience and ultimately the focus of the research". The aim of analysis is to look for trends and patterns that reappear within a single focus group or among various focus groups. As suggested by Krueger (1988), the content analysis begins with a comparison of words used in answers. In the analysis of the interview data the best way was to identify key themes that emerged from the discussion and that fall under each of the discussion guide questions. It is important to understand that the analysis is an interpretation by the researcher based on experience, skills and ability to keep the discussion on track while gaining meaningful and rich detail from each group.

The coding system was designed with a view to drawing the findings into specific categories. This enabled comparison and integration of data with the information

gathered from the pilot study, observations and questionnaires. For the purpose of this study similar responses were grouped together and codes were allocated with reference to the structured questions. Alphabets and digits were designed, for example SI 1.1. These alphabets and digits refer to student interviews (SI) and the number of the question (1.1).

3.7.1 Analysis of the pilot study

The utilisation of a questionnaire was essential to gain base-line information regarding students', academic staff's and clinical tutors' perspective, background, expertise and understanding of the concepts *reflection* and *reflective practice*. The purpose of the pilot study was to give direction to the main investigation. "The pilot study was also the first step in the research process" (De Vos et al., 2002:220). After the research intervention of 10 weeks of reflective practice and critical thinking, the aspects could be meaningfully compared with the other data available. A questionnaire with eight (8) questions/statements was compiled and distributed for completion.

Research participants were categorised according to the sector that they belong to within the context of radiography education. The various sectors, namely academic and clinical staff and student radiographers together with the pilot study participant numbers are indicated in Table 3.7.

SECTOR	NUMBER
Student radiographers	197
Clinical tutors	11
Academic staff	11
Total number of respondents	**219**

Table 3.7. The different sectors the respondents are working in

The academic staff (50%) and clinical tutors (50%) of the four institutions of higher learning accounted for 10,1% of the respondents. The student component in the pilot study was 89,9%, which includes students from different years of study from the four participating institutions.

Table 3.8 indicates the percentage of responses of participants with regard to their basic understanding of terminology and insight relating to concepts applicable to reflective practice. 53% were of the opinion that they do have a basic understanding of and insight into reflective practice.

OPTIONS	RESPONSE (%)
No	15 %
Not really	32 %
Yes	53 %

Table 3.8. Understanding of terminology and insight with regard to concepts applicable to reflective practice

15% of the respondents indicated that terminology related to reflective teaching and learning is not familiar to them. Furthermore, 32% of respondents were not so sure of the meaning of aspects such as reflection, reflective learning and reflective practice.

The responses of the participants indicating whether reflection has the ability to improve the effectiveness of learning, are indicated if Table 3.9.

OPTIONS	RESPONSE (%)
Yes	74 %
Do not know	24 %
No	2 %

Table 3.9. Reflection has the ability to improve the effectiveness of learning

According to 74% of the respondents integrating critical reflection as a learning strategy may add value to the effectiveness of the learning process. Only 2% of the role players did not think it would have any value and a further 24% did not know whether this strategy can potentially enhance the effectiveness of learning.

The existence of available opportunities to reflect on experiences to enhance effective and lifelong learning within the radiographic education context was indicated by 62% of the participants (Figure 3.10).

OPTIONS	RESPONSE (%)
Yes	62 %
Not really	33 %
No	4 %
Not answered	1 %

Table 3.10. Opportunities to reflect on experiences to enhance effective and lifelong learning

As few as 4% of the respondents indicated that there are not opportunities available and a further 33% were not convinced that opportunities do exist. Therefore to enhance effective and lifelong learning through reflective learning opportunities in the formal as well as in the integrated clinical setting seems to be unrealistic to 37% of the respondents.

The following list of tools/strategies/methods that can be useful to facilitate reflection has been identified by 62% of the research participants and indicated as such in Table 3.11:

●	Reflection reports on experiential learning in the work place.

●	Documenting reflections on a regular basis according to a specific format provided.

●	Group discussions

●	Case study presentations

●	Problem solving tasks

- Simulations

- Portfolios

- Image critique sessions (evaluation of radiographic images produced)

Tools / Strategies / Methods
Group discussions
Evaluation of x-images
Case studies
Observation studies
Problem solving tasks
Reflection report on experiential learning
Portfolio

Table 3.11. Tools/strategies/methods that might be useful to facilitate reflection

Table 3.12 shows the respondents' opinion on the necessity of role players' involvement in the radiography educational context.

81% of the respondents indicated that they think that all role players involved in the education of radiographers should be involved in the process of reflection. The role players were students, academic and clinical staff members. Only 4% of the respondents indicated that involvement of all role players is not necessary.

OPTIONS	RESPONSE (%)
No	4 %
Do not know	15 %

Table 3.12. The necessity for the role players in radiography education to be involved in the process of reflection

The factors responsible for the apparent lack of opportunities that are currently utilised are indicated in Table 3.13.

According to the respondents (students, academic and clinical staff) the apparent lack of enough opportunities for reflective practice can be ascribed to the following:

- 81% would prefer to be told if something has been done wrong, (especially with reference to the clinical learning environment).

- 75% claimed that pressure due to workload contributes towards limited opportunities to facilitate reflective practice.

- 47% are of the opinion that creating more opportunities fore reflective practice is too hard work.

- 75% of the respondents do not feel informed enough regarding the concept of reflection.

- 81% consider reflective practice as an additional aspect and not an integrated aspect of teaching and learning.

- 12% dislike the idea of metalearning and fewer than 1% did not answer whether they prefer to take responsibility for their own learning.

- 61% of the respondents do not feel threatened by the fact that reflection might contribute to bad feelings about yourself.

- 34% regard critical reflection not as a priority for effective learning and fewer than 1% did not answer the question.

- 59% would rather spend available notional time to obtain technical skills and increase practical skills.

Statements	Yes	No	Not answered
I'd rather be told if I am doing something wrong	81 %	14 %	5 %
Workload pressure	75 %	19 %	6 %
It is too much work	47 %	50 %	3 %
I am not really informed about reflection	75 %	22 %	3 %
It might be considered as something additional to the normal teaching and learning activities	81 %	17 %	2 %
I dislike the idea of taking the responsibility to learn from my own experiences	12 %	83 %	5 %
Are you scared to feel bad about yourself (when practising reflection)	35 %	61 %	4 %
Critical reflection is not regarded as a priority for effective learning	34 %	61 %	5 %
Prefer spending available time on learning technical skills rather than on	59 %	36 %	5 %

critical reflection			

Table 3.13. Factors contributing to the current lack of utilising opportunities for reflective practice in radiography education

The lack of utilising opportunities currently for reflective practice in the radiography educational context is mainly due to workload pressure (75%); the perception that reflection is something additional (81%) to the normal academic activities; dominate participants do not really feel well informed about reflection (75%). Participants do not want to take responsibility for their own learning, but would rather be told by someone else what has been done wrong (81%).

In Table 3.14 a total of 55% of the respondents regard opportunities for radiography students to reflect on their own personal development as sufficient. 23% of the respondents were uncertain whether there are enough opportunities for reflection to determine progress with regard to personal development.

OPTIONS	RESPONSE (%)
No	21 %
Uncertain	23 %
Yes	55 %
Not answered	1 %

Table 3.14. Opportunities for students to think about their own personal development

3.7.2 Analysis of the observations done during the weekly reflective group discussions

During the 10-week reflective practice session participating students had to keep a reflective journal with weekly inscriptions, the nature of which was provided to all of them in advance. Furthermore, a reflective group session took place in which group members could share their learning experiences, as well as their feelings/attitudes towards the process of reflective practice and keeping a journal within the group.

During these reflective group sessions the participants' comments, body language and involvement were observed and documented by the observers. Academic and clinical staff members as well as the researcher herself acted as observers. The observations were documented as positive and negative aspects as well as remarks in general. A total number of thirty-five observation sheets were received and analysed.

For the purpose of this study similar observations were grouped together. The coding system used is described in Table 3.15. Different shades of colour dots were used to make the process of grouping easier and more visible. After the data had been grouped according to the colour dots and the coding system, they

were verified and checked by an assistant, ms Antoinette LaCante; minor corrections resulting from the verification process were effected. The abbreviation (code) RPOS refers to "Reflective Practice Observation Students"; this was used together with numbers 1 to 22 to group the data obtained through the researcher's notes during the observation of the different learning groups.

Observation	Code
Effective time management needed	RPOS 01
Attitude towards change in learning strategy	RPOS 02
Influence of learning style preference	RPOS 03
The value of group work	RPOS 04
The value of proper planning of learning activities	RPOS 05
The value of sharing learning experiences	RPOS 06
Students feel uncomfortable when reflecting in a group	RPOS 07
The discipline of documenting in journal	RPOS 08
The influence of workload on reflection	RPOS 09
Difficulty to express reflections in words	RPOS 10
Reflective practice becomes an automatic process	RPOS 11

The challenge associated with the format of the journal	RPOS 12
Identifying a specific learning experience to reflect on	RPOS 13
Reflective practice has more value in the clinical component than in the academic component of the learning programme	RPOS 14
Progression to deeper levels of reflection	RPOS 15
Effectiveness of smaller numbers of students in reflective groups (5-6)	RPOS 16
Surfacing of metalearning principles through reflective discussions	RPOS 17
Comparing individual progress leads to increased motivation	RPOS 18
Differences in attitude between students regarding an alternative learning strategy	RPOS 19
Negative feelings regarding keeping a reflective journal	RPOS 20
Reflective practice can be a very personal process	RPOS 21
Willingness of students to investigate alternative learning strategies	RPOS 22

Table 3.15. Coding system for observations during the weekly reflective group sessions

According to Mason (2002:151) the system used to categorise the data is "determined by the researcher and is based on the focus of the research, field

experience or preplanning of the study". In Table 3.16 the coding system is indicated with the verbal responses from the students during the interviews.

Code	Explanation
RPOS 01	Effective time management needed
Observed responses/comments	**(R=8)**

"…time management is a problem for me…"

"…I need to be more organised, to be able to have time for reflection and keeping my journal up to date…"

"…before a test I have to plan my 'time available better…'"

"…integrated academic and clinical components, limiting time for reflections…"

"…students are reluctant to attend the group sessions, time limited for this in the departments…"

Code	Explanation
RPOS 02	Attitude towards change in learning strategy
Observed responses/comments	**(R=5)**

"…I don't want to change to another way of learning…" — third year student

"…maybe other students are more willing to try new things…"

"…I want proof that reflective practice can increase my results…"

"…another approach to learning, why not trying something new…"

Code	Explanation
RPOS 03	Influence of learning style preference

	Observed responses/comments (R=3)

"…reflection only now starts to be more natural…"

"…I am comfortable with the idea to write my reflections down…"

Code	Explanation
RPOS 04	The value of group work
	Observed responses/comments (R=14)

"…I realised that group work can help a lot…'

"…getting together as a group reflecting helps to stay focused…"

"… support of my group is wonderful…"

"…reflection only now starts to be more natural…"

"…I am comfortable with the idea to write my reflections down…"

Code	Explanation
RPOS 05	The value of proper planning of learning activities
	Observed responses/comments (R=9)

"…to be successful, planning is necessary…"

" …the pressure to prepare for assignments and reflections is difficult…"

Code	Explanation
RPOS 06	The value of sharing learning experiences
	Observed responses/comments (R=18)

"… it helps to share learning experiences within the group…"

"…sharing my learning experiences increases my confidence…"

"…sharing knowledge is stimulating and encouraging…"

Code	Explanation
RPOS 07	Individual students feeling uncomfortable reflecting in a group
Observed responses/comments (R=7)	

"…reflection for me is still a very personal thing…"

"…I tend to feel uncomfortable in a group reflecting and sharing… "

"… there is a clash of personalities in my group, sometimes unexpected conflict while reflecting together as a group…"

Code	Explanation
RPOS 08	The discipline of documenting in a reflective journal
Observed responses/comments (R=11)	

"… getting into a rhythm to reflect and document is very difficult…"

"…at least after a few weeks I get more and more used to the idea of documenting my thoughts and feelings…"

"…it is still a challenge for me to reflect critically and to keep a journal thereof…"

Code	Explanation
RPOS 09	The influence of workload on reflections
Observed responses/comments (R=15)	

"…the reality of work and study, not a lot of time to do something else like reflection…"

"…the reality of work forces you to reflect immediately and continuously…"

Code	Explanation
RPOS 10	Difficulty to express reflections in words
Observed responses/comments	**(R=13)**

" … difficult to express my feelings in words on paper…"

Code	Explanation
RPOS 11	Reflective practice becomes an automatic process
Observed responses/comments	**(R=4)**

"…reflection is part of human life, for me it comes automatic…"

"…I think I am a natural reflector type of person, it is just happening…"

Code	Explanation
RPOS 12	The challenge associated with the format of the journal
Observed responses/comments	**(R=19)**

"…the four questions in the journal are more or less the same… "

"…the questions in the yellow journal force me to reflect deeper and more

specifically…"

Code	Explanation
RPOS 13	Identifying a specific learning experience to reflect on
Observed responses / comments	**(R=16)**

"…I have learnt so many things in a week, it is difficult to decide which activities

to reflect on in my journal…"

"…reflective practice actually forced me to look back specifically on my learning activities…"

Code	Explanation
RPOS 14	Reflective practice has more value in the clinical component than in the academic component of the learning program
Observed responses/comments (R=20)	

"…I can evaluate myself by doing reflection in the department while applying my theoretical knowledge…"

"…the reflection process in the clinical setting becomes more like a completed puzzle…"

"… the integration of knowledge and skills in the work place gives me a positive feeling and it is easier to reflect on it…"

"…I need to learn quickly in practice; through reflection I can identify my mistakes more easily…"

Code	Explanation
RPOS 15	Progression to deeper levels of reflection
Observed responses/comments (R=2)	

"…after 5 weeks of doing this, I think I am progressing in terms of deep thinking…"

Code	Explanation
RPOS 16	Effectiveness of smaller numbers of students per reflective group
Observed responses/comments	**(R=10)**
"…the interaction and sharing between members in a smaller group (5-6), seems to work better…"	

Code	Explanation
RPOS 17	Surfacing of metalearning principles through reflective practice
Observed responses/comments	**(R=13)**
"…I realise through this (reflection) that I need to be more responsible with regard to my learning…'	

Code	Explanation
RPOS 18	Comparing individual progress leads to increase in motivation
Observed responses/comments	**(R=10)**
"…by attending this weekly session I could compare my experiences with other students' progress…it enables me to identify areas for development…" "…due to comparing myself with others, I realised that I have to be more involved and interacting with students and lecturers…"	

Code	Explanation
RPOS 19	Differences in attitude between students regarding an alternative learning strategy

Observed responses/comments (R=4)
"…maybe to get use to something new (reflection) is not for me at this late stage of my studies…"

Code	Explanation
RPOS 20	Negative feelings regarding keeping a reflective journals
Observed responses/comments (R=16)	
"… I am still doubtful about the value of keeping a reflective journal…" "…I am starting to see the point (reflection) … " "…some students' body language is much more positive during these sessions (week 7-10)…"	

Code	Explanation
RPOS 21	Reflective practice can be a very personal process
Observed responses/comments (R=3)	
"…I really do not like to share my mistakes or anything else with other students…"	

Code	Explanation
RPOS 22	Willingness of students to investigate alternative learning strategies
Observed responses/comments (R=5)	
"…reflecting critically by keeping a weekly record was a good method to evaluate	

my integration of theory and practice…"

"…I feel more comfortable with the principles of reflective practice (week 7)…"

Table 3.16. Quotations of students' responses and observations during the weekly reflective discussion sessions

The following could be drawn from the analysis of the observed comments/feelings and attitudes from the students during the weekly reflective learning group discussions (the R indicates the number of responses with regards to the questions illustrated in Table 3.16):

The observations revealed the following:

●   Due to workload constraints it is difficult for students to keep a reflective journal (RPOS 09).

●   It is difficult to express feelings and experiences in words (RPOS 10).

●   The format of the journal seems to be challenging to the students answering four questions with a slightly different angle (RPOS 12).

●   The identification and analysis of a specific learning experience to reflect on seems to be difficult (RPOS 13).

●   Negative feelings exist regarding keeping a journal due to the already mentioned aspects (RPSO20).

●   Progression to deeper levels of reflection was limited (RPOS 15).

●   Keeping a journal and attending reflective group discussions sensitised more students to take responsibility for their own learning (RPOS 17).

Furthermore, the observations revealed the following positive aspects at the end of the 10-week reflective practice phase:

● There is definite value in group work and discussions (RPOS 04).

● The sharing of learning experiences is beneficial for students and enables them to compare their own knowledge/progression with other students (RPOS).

● Reflective practice most definitely has more value in the clinical environment where the integration of theory and practice is realised (RPOS 14).

The coding system and analysis of the structured interviews with all the participants are discussed in the following section 3.7.3.

3.7.3 Analysis of the structured focus group interviews

The respondents participating in the research included the students, clinical tutors and academic staff members. Participants at each institution were grouped together for focus group interviews. The motivation for focus group interviews was mainly a practical issue. It was a logistical exercise to plan these interviews because of the four institutions' holiday calendar, the work obligations of students in the different hospitals and the different timetables for different year groups.

The structured interview with academic and clinical staff consisted of twelve questions. To ensure consistency the same twelve questions in the same numerical order were asked.

In the structured interview with the student focus groups nine questions were asked in the same numerical order. A total number of twenty four focus group interviews were conducted. The interview questions to students (Table 3:17) and staff (Table 3.18) are indicated below, together with an explanation of the rationale for the specific question.

	Questions	Reason for asking the question/What the researcher wanted to determine
Question 1	Do you feel that you have developed as a person through reflective practice? Explain.	To determine whether the 10-week time period of reflective practice (action research), has had any developmental influence on the student.
Question 2	Was it difficult to get into the discipline of documenting your reflection? Why?	To determine whether the students experienced documenting their reflections as a challenge in terms of their discipline.
Question 3	What were the difficulties you experienced the last 10 weeks	To determine the difficulties students experienced in

	keeping a reflective journal?	keeping reflective journals.
Question 4	What was the value of reflecting together as a learning group? Explain.	To establish the value of reflective learning group.
Question 5	Do you think you have enough basic skills to do reflection? Justify.	To determine whether there is a need to equip students in advance with basic reflective skills.
Question 6	What have you learned about your own learning in the past 10 weeks?	To determine whether the students understand the importance of the concept of metalearning.
Question 7	Do you think the reflective learning discussion groups provide an effective forum where learning experiences can be shared? Explain.	To determine whether the reflective learning group concept can be a platform to share learning experiences.
Question 8	Were there enough opportunities to share your own personal reflection, during the weekly group discussion? Explain.	To establish whether there are enough opportunities to share personal reflections during a reflective group session.
Question 9	Do you foresee making systematic reflection an integral part of your daily learning activities? Justify.	To establish whether systematic reflection can be an integral part of academic learning activities.

Table 3.17. Interview questions to student focus groups and their purpose

The interview questions to the academic and clinical staff and their purpose are listed below.

	Questions	Reason for asking the question/What the researcher wanted to determine
Question 1	Do you regard the reflective practice of the past 10 weeks as a developmental process for all persons involved? (students, academic and clinical staff) Why?	To find out whether reflective practice is regarded as a developmental process for all role players in radiography education.
Question 2	Did you gain any value with regard to your own reflective practice from observing the weekly reflective discussions of the students? The following four (4) questions refer to the observation done, during the weekly reflective discussions.	To determine whether by observing the reflective learning groups on a weekly basis, any value was added to staff members' own reflective practice.
Question 3	Did some students dominate the discussions? How did you deal with that?	To determine whether it was observed that some students dominate the reflective group sessions.
Question 4	Do you think the students were	To determine whether the

	focused enough as a group on the importance of reflecting together on their own reflective processes? Explain.	students understand the importance of sharing their reflections and learning experiences in a group.
Question 5	What according to your experience the past weeks is the ideal size of a reflective discussion group? Explain.	To establish the ideal size (number of students) of a reflective group.
Question 6	Do you think the time available for reflective discussion was sufficient? Explain.	To determine the time-period that is sufficient for reflective practice.
Question 7	What were the main aspects (positive or negative), that you have observed with regard to the following: • The attitude of students towards reflective practice in general. • The students' ability to master the skill of reflection. • Students' discipline of keeping a reflective journal. • Students taking responsibility for their own learning.	A&C: Q7.1 – To establish through the weekly observation sessions, whether students have a positive or negative attitude towards reflective practice in general. A&C: Q7.2 – To establish through the weekly observation sessions, whether the students have demonstrated mastering the skill of reflection. A&C: Q7.3 – To establish through the weekly observation sessions, whether the students have demonstrated discipline in

		keeping a reflective journal.
		A&C: Q7.4 – To determine whether the students have taken ownership of their own learning (metalearning).
Question 8	Did you observe (in the 10 week cycle) any growth in the students' motivation and ability to reflect deeply?	To determine whether it was observed that there is a growth in the students' motivation levels and ability to reflect more deeply.
Question 9	As a facilitator of learning in the context of radiography education, what do you regard as the outstanding aspect of reflective practice as a process in which staff (academic or clinical) and students are all involved?	To establish from the facilitators of learning in the radiography context what they regard as the outstanding aspect of reflective practice as a process, in which all role players are involved.
Question 10	Do you regard reflective practice as a strategy to indicate/show the "value-added elements of a learning programme"…. in other words evidence of a student's development over time? Explain.	To determine whether the learning strategy of critical reflection can be used to indicate evidence of a student's development over time.
Question 11	Do you feel that there are still aspects that contribute to the apparent negligence of reflective	To establish the reasons for the apparent negligence of reflective practice still

	practice, in the radiography-learning environment? Explain.	present in the radiography learning environment.
Question 12	Do you think regular updating on reflective techniques would equip staff better to facilitate successful reflective learning groups? Motivate.	To determine whether regular updating on reflective techniques would equip the staff members in such a way that the facilitation of reflective learning groups can be more successful.

Table 3.18. Interview questions and their purpose to staff members

3.7.3.1 Conducting the interviews

After permission had been granted by the Deans/Heads of Departments of the four participating institutions of higher learning, the 10-week cycle of the research started with the implementation of the reflective journal and the weekly reflective learning group discussions.

Initially an orientation session took place to indicate the aim and objectives with the research. Thereafter the expectations of the participants as well as of the researcher were clarified.

A 10-week reflective practice period was implemented at different stages at the participating institutions. After completion of this phase of the research, the structured interviews were conducted and the completion of the questionnaires

took place. The time schedule for the focus group interviews and completion of the questionnaires are indicated in Tables 3.4 and 3.5 respectively.

Participants were once again assured of the confidentiality of the information and thanked for their time and co-operation. The atmosphere was made as relaxed as possible so that the respondents could be comfortable and feel free to respond to the questions.

The interviews were tape-recorded with a digital voice recorder (Speed-Link) and notes were taken as backup. The recorded interviews are available for scrutiny. Afterwards the recorded proceedings were put into a readable format for analysis. Comparing them to the notes and making minor amendments and additions to the transcripts to eliminate unmanageable information reduced the recorded data. This reduction process is called "meaning condensation" according to Kvale (1996:192). The interview data as well as the other sources of data obtained were investigated to provide a platform for the analysis and interpretation phases.

According to Kvale (1996:192) coding the data involves "reducing long statements into simple categories". McMillan and Schumacher (1997:510) state that "words, phrases and sentences that appeared often were identified to determine units of meaning". The purpose of categories is to reduce the amount of information into tables and figures to facilitate handling.

As a validity check the data gained from the pilot study, observations, interviews and the questionnaires were given to an assistant to check the correctness of the categorising, and coding. The statistical data was also verified in accordance with the information included in the questionnaires.

The coding system used for the interview question analysis is described in section 3.7.3.2 and 3.7.3.3. The essence of the responses was interpreted and coded.

3.7.3.2   Coding system for the responses (students)

For the analysis of the responses received with regard to the focus group interviews with the students an applicable coding system was created. The coding system for the interview questions, responses and their explanation is indicated in Tables 3.19.1-3.19.9.

Explanation	Responses	Code
Positive developmental value added	12	SI 1.1
Not sure whether it has developmental potential	4	SI 1.2
No real developmental value added	1	SI 1.3

Table 3.19.1. Coding system for students' personal development through reflective practice

Explanation	Responses	Code
An extremely difficult challenge	3	SI 2.1
Yes, it has been a difficult process	13	SI 2.2
No, it has not been a problem	1	SI 2.3

Table 3.19.2. Coding system for disciplined documentation of reflections

Explanation	Responses	Code
Time	5	SI 3.1
Planning learning activities	1	SI 3.2
Lacking skills with reference to expressing feelings in words	4	SI 3.3
Lacking effective writing skills	7	SI 3.4

Table 3.19.3. Coding system for difficulties experienced while keeping a reflective journal

Explanation	Responses	Code
Sharing of learning experiences – more knowledge/different perspectives available	9	SI 4.1
Building confidence	3	SI 4.2
Created a support basis	3	SI 4.3
Improving interpersonal relations	1	SI 4.4
No value at all	1	SI 4.5

Table 3.19.4. Coding system for the value attached to a reflective learning group

Explanation	Responses	Code
Adequate reflective skills	6	SI 5.1
Need more skills to do effective reflective practice	8	SI 5.2
Development of own personal reflective skill (10 weeks)	3	SI 5.3

Table 3.19.5. Coding system for basic reflective skills

Explanation	Responses	Code
Taking responsibility for own learning is important	3	SI 6.1
Evaluating and correcting own learning activities	5	SI 6.2
Realising that learning is a holistic, but personal process	2	SI 6.3
Improving planning, expressing yourself and building confidence	5	SI 6.4
Flexibility in terms of adapting to alternative learning strategies	2	SI 6.5

Figure 3.19.6. Coding system for understanding the importance of the concept of metalearning

Explanation	Responses	Code
Yes, it provides an effective forum to share learning experiences	11	SI 7.1
It provides a forum, but difficulties with facilitation in the group, language differences and learning style preferences	6	SI 7.2
No, it doesn't provide an effective forum to share learning experiences	0	SI 7.3

Table 3.19.7. Coding system for reflective learning groups providing an effective forum, where learning experiences can be shared

Explanation	Responses	Code
Yes, there were enough opportunities	15	SI 8.1
No, there were not enough opportunities	2	SI 8.2

Table 3.19.8. Coding system for sufficient opportunities for sharing personal reflections during the weekly reflective group sessions

Explanation	Responses	Code
Yes, reflective practice will be integrated	12	SI 9.1
Not sure whether reflective practice will be integrated	4	SI 9.2
No, reflective practice will not be integrated	1	SI 9.3

Table 3.19.9. Coding system for systematic reflection becoming an integral part of daily learning activities

The student response at the end of the 10-week reflective practice phase, which includes keeping a reflective journal and attending reflective learning group discussions, were obtained through asking nine questions to seventeen student focus groups.

According to the researcher the responses to the nine questions indicate that the majority of the students are of the opinion that the 10-week reflective phase:

● was difficult, especially the discipline to document their reflections (SI 2.1).

● revealed that they are lacking effective writing skills (SI 3.4);

● indicated that they need more reflective skills to do effective reflective practice (SI 5.2);

- forced students to plan their learning better, to express themselves more clearly and it contributed towards an increase in their confidence (SI 6.4);

- could be utilised to evaluate and correct their learning (SI 6.2);

- showed that reflective practice added positive value towards individual development (SI 1.1);

- indicated that sharing learning experiences in a group contributed towards more knowledge and different perspectives (SI 4.1);

- revealed that reflective learning groups provided an effective forum for sharing learning experiences (SI 7.1) and an opportunity for sharing personal reflections (SI 15);

- showed that students are prepared to make systematic reflection an integral part of their daily learning activities (SI 9.1).

3.7.3.3 Coding system for the responses (academic and clinical staff members)

For the analysis of the responses regarding the interviews with the academic and clinical staff members, an applicable coding system was created. The coding system for the interview questions, responses and their explanation is indicated in the tables below (Tables 3.20.1-3.20.9)

Explanation	Responses	Code

Explanation		Code
Positive developmental value added	7	ACSI 1.1
Not sure whether it has developmental potential	0	ACSI 1.2
No real developmental value added	0	ACSI 1.3

Table 3.20.1. Coding system for a developmental process for all role players involved in radiography education

Explanation	Responses	Code
Gaining own value through students' reflective practice	6	ACSI 2.1
Not really gaining any value	1	ACSI 2.2
No value gained at all	0	ACSI 2.3

Table 3.20.2. Coding system for own value gained with regard to the students' reflective practice through the weekly observations

Explanation	Responses	Code
Yes, there were students dominating discussions	3	ACSI 3.1
Not really	2	ACSI 3.2
No, students did not dominate discussions	2	ACSI 3.3

Table 3.20.3. Coding system for observing students dominating the reflective discussions sessions

Explanation	Responses	Code
Yes, students were focused on the importance of group reflections	1	ACSI 4.1

Students were not really focused on the importance of group reflections	5	ACSI 4.2
No, students were not focused at all on the importance of group reflections	1	ACSI 4.3

Table 3.20.4. Coding system for students' understanding of the importance of reflecting together as a learning group

Explanation	Responses	Code
Fewer than three (3)	1	ACSI 5.1
Four to five (4-5)	6	ACSI 5.2
More than six (6)	0	ACSI 5.3

Table 3.20.5. Coding system for the ideal size (number of students) of a reflective learning group

Explanation	Responses	Code
Yes, there is enough time in the clinical and academic components	0	ACSI 6.1
Not really enough time in especially the clinical setting	7	ACSI 6.2
No, there is not enough time in the clinical and academic components	0	ACSI 6.3

Table 3.20.6. Coding system for sufficient time available for reflective discussion group sessions

Explanation	Responses	Code
Positive	0	ACSI 7a.1

Average to becoming positive	5	ACSI 7a.2
Negative	2	ACSI 7a.3

Table 3.20.7a. Coding system for the students' attitude towards reflective practice in general

Explanation	Responses	Code
Successful in mastering the skill	1	ACSI 7b.1
Relatively successful in mastering the skill	5	ACSI 7b.2
Not successful in mastering the skill at all	1	ACSI 7b.3

Table 3.20.7b. Coding system for the students' ability to master the skill of Reflection

Explanation	Responses	Code
Very disciplined	0	ACSI 7c.1
Not very disciplined	7	ACSI 7c.2
Not disciplined at all	0	ACSI 7c.3

Table 3.20.7c. Coding system for the students' discipline to keep a reflective journal

Sub-category	Explanation	Code
Taking responsibility	2	ACSI 7d.1

Not really taking responsibility	4	ACSI 7d.2
Not taking responsibility at all	1	ACSI 7d.3

Table 3.20.7d. Coding system for students taking responsibility for their own learning

Explanation	Response	Code
Definite growth in motivation and ability to reflect deeply	1	ACSI 8.1
Limited growth in motivation and ability to reflect deeply	6	ACSI 8.2
No growth in motivation and ability to reflect deeply	0	ACSI 8.3

Table 3.20.8. Coding system for observing any growth in the students' motivation and ability to reflect deeply

Explanation	Response	Code
Sharing of learning experiences	1	ACSI 9.1
Strategy has positive outcomes	2	ACSI 9.2
Acting as a tool for quality control	3	ACSI 9.3
Improved communication within a group	1	ACSI 9.4

Table 3.20.9. Coding system for an aspect regarding reflective practice as a process that facilitators of learning in the context of training regard as outstanding

Explanation	Response	Code

Explanation	Response	Code
Yes, it can be regarded as evidence of the students' development over time	4	ACSI 10.1
Not really regarded as evidence of a student's development over time	3	ACSI 10.2
No, it can not be regarded as evidence of the students' development over time	0	ACSI 10.3

Table 3.20.10. Coding system for regarding reflective practice as learning strategy to indicate evidence of a student's development over time

Explanation	Response	Code
People's unwillingness and absence of commitment to change	3	ACSI 11.1
Lack of knowledge	1	ACSI 11.2
Limited time available	2	ACSI 11.3
Absence of academic leadership to investigate new strategies	1	ACSI 11.4

Table 3.20.11. Coding system for aspects that contribute to the apparent negligence of reflective practice in the radiography learning environment

Explanation	Response	Code
Regular updating is necessary	7	ACSI 12.1
Regular updating is not necessary	0	ACSI 12.2

Table 3.20.12. Coding system for the necessity to update reflective skills that would equip staff better to facilitate successful reflective learning groups regularly

The responses of the academic and clinical staff at the end of the 10-week reflective practice phase were obtained through asking twelve questions to seven focus groups.

According to the researcher the responses to the twelve questions indicate that the majority of the staff members are of the opinion that:

- reflective practice contributed towards the development of all role players (ACSI 1.1);

- they had gained personal value from the reflective practice phase (ACSI 2.1);

- students dominating the reflective discussion groups is a reality (ACSI 3.1 but it seems as if this does not create problems in practice (ACSI 3.2 and ACSI 3.3) ;

- the ideal size of a reflective learning group is 4-5 students (ACSI 5.2);

- students are not focused enough on the importance of reflecting together (ACSI 4.2);

- student attitudes towards reflective practice in general vary from average to becoming positive (ACSI 7a.2);

- there is not time, especially in the clinical setting, for reflective discussion groups (ACSI 6.2).

Furthermore the responses also revealed the following:

- that students do not really take responsibility for their own learning (ACSI 7d.2).

- they are not disciplined to keep a reflective journal (ACSI 7c.2).

- there is a limited growth in motivation and their ability to reflect deeply (ACSI 8.2).

- role players' apparent negligence is the result of the unwillingness and absence of commitment in all concerned (ACSI 11.1).

- evidence of a student's development over time is achieved through reflective practice (ACSI 10.1).

- staff needs to be regularly updated and skills improved to ensure successful facilitation of reflective learning group discussions (ACSI 12.1).

The analysis of the questionnaires is discussed in section 3.7.4.

3.7.4 Analysis of the questionnaires

Two sets of questionnaires (one for the academic and clinical staff and the other one for the radiography students) were constructed with questions and statements to which respondents were requested to react. Facts and opinions were obtained about the phenomenon of reflective practice and the learning strategy of critical reflection specifically in the context of radiography education from students and from staff members.

A variety of questions and statements relating to the relevant matter were presented simultaneously to the respondents. The response options were indicated on a four-point scale. According to Neumann (2000:182), a scale is described as "a measure in which a researcher captures the intensity, hardness or potency of a variable". In other words, it arranges responses on a continuum.

A limited number of open-ended questions were also included to determine the feelings and experiences from all the role players involved in the education of radiographers.

The rationale for setting and constructing two questionnaires, one for students and one for staff members, was that the researcher needed to obtain the most appropriate, accurate and honest opinion from respondents.

In the case of the students the researcher delivered the questionnaires by hand and in this way much time was saved. The group-administered questionnaire strategy to a confined audience according to De Vos et al. (2002, 174) is "allowing time for completion and immediate collection". The latter led to an increase in response rates, because of the personal contact and the fact that the questionnaires were completed at a conveniently pre-arranged time.

The questionnaires for staff members were handed individually to respondents to be completed and collected.

In view of the comprehensive work involved in classifying and analyzing data collected, electronic facilities provided by the Department of Statistics of the University of Pretoria (STATOMET) were utilised. In order to use a computer for analysis the questions were compiled in a certain manner to facilitate the eventual processing of the data. The questionnaire data was coded and submitted to the data officials to capture the scores of the respondents with reference to the particular variables listed under the different questionnaire

categories. The data computation in the form of frequency scores for each variable with respect to the categories of each question was checked against the two questionnaires. The statistician corrected any errors.

In the quantitative paradigm of data analysis the data was broken down into constituent parts to obtain answers to the research questions. Kerlinger (1986:125) states that interpretation of the data is necessary and continues…"interpretation takes the results of analysis, makes interferences pertinent to the research relations studied and draws conclusions about these relations". The researcher analysed the research results gained from the interviews. Constructing meaning from the results and the resultant interpretation thereof will be focused on in Chapter 4.

In Table 3.21 a summary of the groups and the number of questionnaires distributed and collected is provided as well as the response rate.

Groups	Number of questionnaires distributed	
Academic and staff members	27	
Students	202	
	Number of questionnaires collected	Response rate (%)
Staff	25	92,5 %

Students	170	84, 1 %

Table 3.21. Response rate of data collected (questionnaires)

The response rate of the two sets of questionnaires that were completed by the respondents after the 10-week reflective practice period was respectively 92,5% for academic and clinical staff and 84,1% for students. This is a very high rate and can be justified by the fact that a group-administered questionnaire strategy was implemented.

3.8   ANALYSIS OF LEARNING STYLES AND THINKING PREFERENCES

The available brain quadrant dominance scores (average %) of staff members (highest B and C) and students (highest D) are indicated in Table 3.22.

BRAIN QUADRANT DOMINANCE (average %)			
BRAIN QUADRANTS		**Staff (HBDI)** **n=4**	**Students (NBI)** **n=76**
	A	0	32
	B	50	26
	C	50	5
	D	0	37

Table 3.22. Comparison of participants' average brain quadrant dominance

Limited data is available from only one participating institution with regard to staff or students thinking preferences.

The information of four staff members (n=4) was obtained through utilising the Herrmann Brain Dominance Instrument (HBDI) and information of seventy-six students (n=76) was obtained through the Neethling Brain Instrument (NBI).

Profile 1

Profile 2
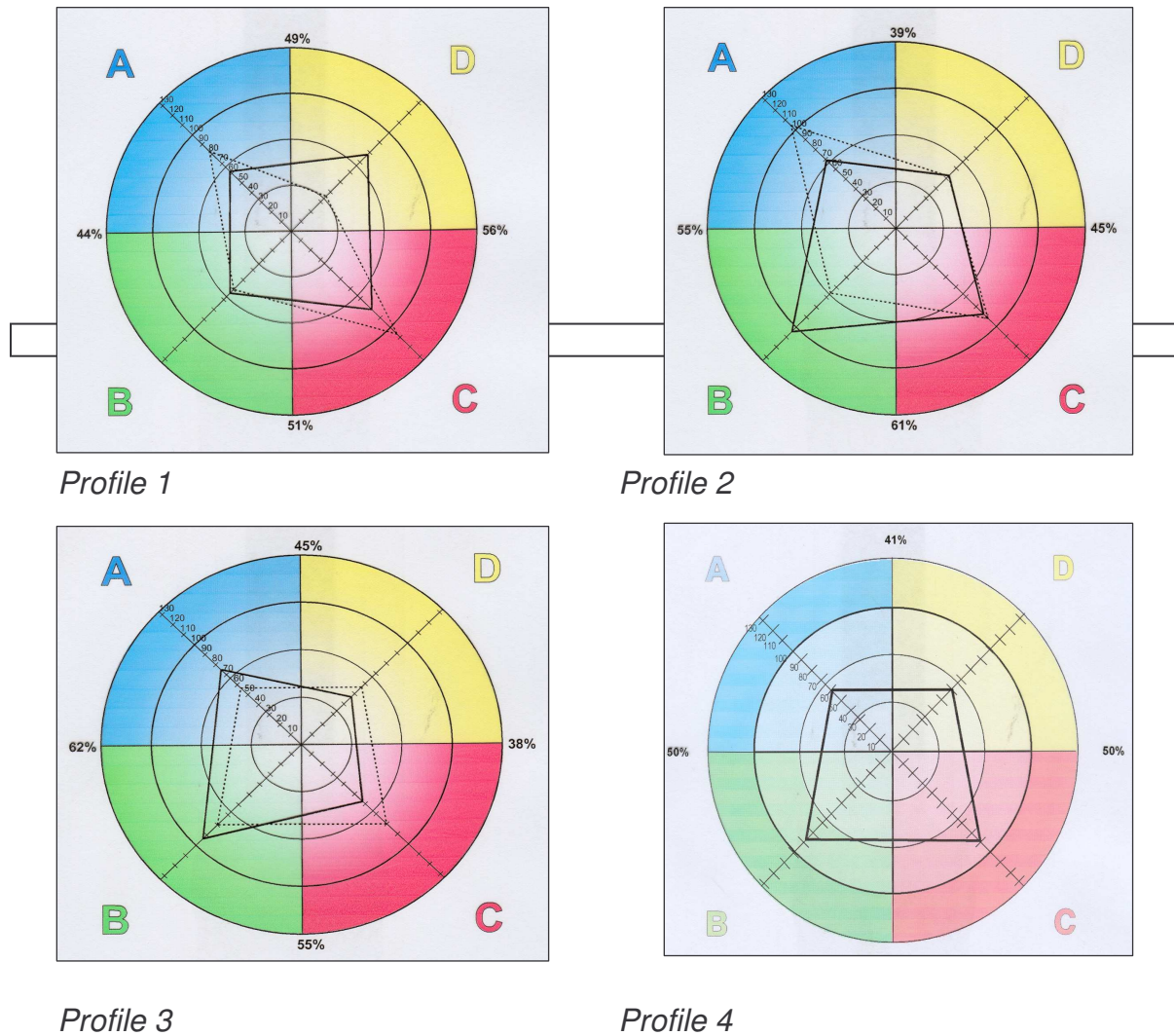
Profile 3

Profile 4

Figure 3.4. HBDI profiles of academic staff members

Profile 1:   This is a double dominant profile that features two primaries in the
              right mode, quadrants C and D, and two secondaries in the left
              mode, quadrants A and B. This profile occurs frequently in the
              population at large and typical characteristics would include the
              ability to be creative, holistic and synthesising. This profile could

also support entrepreneurial behaviour. Most comfortable communication approaches may include providing an overview and giving minimal details, always involving others and anticipating how people feel. The most natural problem solving strategies include intuition, dreaming, sketching, free-flow brainstorming and building on others' ideas. The action research (AR)-opportunity driven learning is experimental, synthesising, conceptual, integrating, holistic and visual. The AR feelings-driven learning is even more significant with characteristics of the emotional, expressive, non-verbal, kinaesthetic, intrapersonal and feeling-based.

Profile 2:   This profile is a triple dominant profile, featuring two primaries in the left mode, both upper left A and lower left B quadrants, and a third primary in lower right C. Characteristics of this profile would be analytic, rational and quantitative processing of upper left A, with controlled conservative, structured and organised processing modes of lower left B. Coupled with this would be the interpersonal, emotional and spiritual aspects. Most comfortable communication approaches may include explanation in writing, empathy for the listener, step-by-step unfolding of the topic and well articulated ideas presented in a logical format. The most natural problem solving strategies include value analysis, gathering facts, time-lines, team processes, step-by-step processing and asking others' input.

The AR results-driven learning is quantitative, theoretical, fact-based, analytical, rational, logical and verbal. The AR task-driven learning is even more significant with characteristics of the planned, detailed, organised, structured, sequential, procedural and methodical. AR feelings-driven learning is furthermore characterised by the emotional, expressive, non-verbal, kinaesthetic, intrapersonal and feeling-based.

Profile 3:   This is a double dominant profile with primaries in the upper left A and lower left B quadrants. This second most common profile in the general population is characterised by a logical, analytic, technical orientation and is effective in rational problem solving. Most comfortable communication approaches may include technical accuracy, well articulated ideas presented in a logical format, step-by-step unfolding of the topic and through explanation with references. The most natural problem solving strategies include defining the problem, factual analysis, rational thinking, time-lines, organisation and a step-by-step process. The AR results-driven learning is quantitative, theoretical, fact-based, analytical, rational, logical and verbal. The AR task-driven learning is even more significant with characteristics of the planned, detailed, organised, structured, sequential, procedural and methodical.

Profile 4:   This profile is a double dominant profile with two primaries falling in the lower left B and lower right C quadrants. It is therefore a double primary in the lower mode. The profile is characterised by very strong preference in conservative thinking and controlled behaviour with a desire for organisation and structure as well as detail and accuracy. The primary in the C quadrant would equally show itself by interpersonal skills and sensitivity to feelings. Most comfortable communication approaches include a step-by-step unfolding of the topic, practical answers to what, why, where, and how, the personal touch and understanding how others will react. The most natural problem solving strategies include step-by-step method, time-line principles, team process and intuitive feelings.

In comparing staff members' dominant brain quadrants in terms of the preferred way of thinking with the students' dominant brain quadrants' thinking preferences, in practice it might indicate that the method of instruction or the facilitation of learning is structured according to the staff members' preferred style and preference, but which is not necessarily the majority of the students' preferred learning style or thinking preference.

The science of cultivating the ability for staff and students to act outside their preferred thinking styles is encouraged. The integration of Whole Brain Thinking according to research (Bunderson, 2004) into curricula can help to increase

educational outcomes and to create a learning community that understands and respects the learning preferences of all role players.

The current limited data available was also measured with two different instruments namely the HBDI (Herrmann, 1996) and NBI (Fowler, 2002), which jeopardised the reliability and validity of the data. When comparing the two instruments it is understandable that the HBDI is much more comprehensive. The NBI consists of 30 questions and the HBDI of 120 questions.

The following information was gathered and obtained as data from 76 radiography students' brain profiles utilising the Neethling Brain Instrument (NBI) at Tshwane University of Technology (2005 & 2006).

PROFILE & QUADRANT	PERCENTAGE
Double Dominance (A & B)	46,8%
Double Dominance (A & C)	14%
Double Dominance (A & D)	0,2%
Double Dominance (B & C)	15,8%
Double Dominance (B & D)	0,01%
Double Dominance (C & D)	13,98%
Triple Dominant Profiles	9,2%
Quadruple Dominant Profiles	0,01%

Table 3.23. Representation of types of Brain Profiles of Radiography Students

Out of a total number (n=76) of students the majority of students were identified as Double Dominant (quadrants A & B). The characteristics of this profile are logical, analytical and rational. Most comfortable communication approaches include brief, clear and precise info, explanation in writing, step-by-step unfolding of the topic and well articulated ideas presented in a logical format. The most natural problem solving strategies include re-engineering, factual analysis, using technology, time-lines and a step-by-step process. Students are results- and task-driven within a structured learning environment. The students expect facts, numbers, data, proof of validity, textbook readings, theory, precise, practical application, clear expectations, clear instructions, evaluation, examples and an organised approach; the facilitator in health sciences needs to plan for these.

Comparing my own profile that is Double Dominant (quadrant B & C) and analysing this with the data in table 3.23 of the students, the following conclusion can be drawn:

Students have a preference for a fact-based and controlled learning environment, which is results- and task-driven, while promoting Learning Style Flexibility (LSF). I, as facilitator of learning have a preference for form and feelings in an intuitive environment. According to Du Toit (2007), the constructing of a theory of learning style flexible Action Research-driven Learning (ARDL) is aligned with the refined outcome of learning in higher education. Learning-centredness necessitates students to become metacognitively (Biggs, 1999) aware of how

they learn and how to manage their own learning. Learning opportunities that provide for using all four modes of the Whole Brain model will ensure that students' preferred learning styles are accommodated and less preferred thinking modes are utilised.

The researcher is of the opinion that the HBDI is a valid, reliable measuring instrument when applied and interpreted in conformity with the four quadrant model and scored with the approved scoring method. Four stable, discrete clusters of preference exist and the scores derived from the instrument are valid indicators of the four clusters.

The brain dominance concept has been strongly validated in a number of different ways. Firstly, through the research and experimentation of leaders in the field including Roger Sperry, Robert Ornstein, Henry Mintzburg and Michael Gazzaniga; secondly, it has been validated by hundreds of EEG experiments carried out personally by Herrmann. It has further been validated by the public demonstrations conducted by Herrmann. It has been validated by specific validation studies by James Olsen, Victor Bunderson and Kevin Ho and parallel with those studies by validation experiments carried out by Schadty and Potvin at the University of Texas (Bunderson, 2004). The use of the HBDI meets high professional standards applied in learning, teaching, counselling and self-assessment settings.

This "whole brain concept" promotes growth rather than a bland acceptance of everyone as different. Role players in the radiography education context can aspire to function together and value others' contributions towards creating and facilitating transformative learning. This concept leads individuals to aspire to greater situational access to less preferred quadrants.

It is clear that there is a challenge for radiography facilitators of learning to build their own as well as the students' skills to function effectively in all four quadrants. Self-awareness of a person's own preferred style and preference will therefore assist staff and students to decide on actions to be taken within the education context in order to expand the field of their thinking preference – ensuring maximum learning effectiveness.

The research done by Fowler (2002) among radiography students to determine their learning styles (section 2.4.4) as well as the limited data currently available with regard to thinking preferences of radiography students and staff, emphasises the urgent need for more research to be done in this field. This will then enable facilitators of learning in higher education and the students in health sciences to have a better understanding of and to create opportunities for effective learning.

3.9   CONCLUSION

This chapter aimed at discussing the research methods and procedures used in this study. The ideas, opinions and experiences of the respondents were coded and analysed.

The next chapter aims at discussing the findings and will include the researcher's reflections on the data collected.

CHAPTER 4

RESEARCH FINDINGS AND REFLECTIONS

4.1   INTRODUCTION

As indicated in Chapter 1 the purpose of this study is to determine whether critical reflection as a learning strategy can successfully be integrated in the education of health science practitioners. The data obtained in this study will be used to explain the role players' opinions, views and experiences with regard to reflective practice and the keeping of a reflective journal. This chapter lists the main findings exposed during the reflective practice phase and substantiates them with findings from the literature.

4.2   RESEARCH FINDINGS OF THE PILOT STUDY

This section deals with the responses generated by the pilot study questionnaire, as discussed in 3.7.1.

Reflections of the researcher with regards to the seven questions/statements included in the pilot study questionnaire are discussed in the next section.

The different sectors the respondents are working in

The ratio in general is 1:9 between participating staff (academic and clinical) and students.

Understanding of terminology with regard to concepts of reflective practice

Critical reflection as a learning strategy in radiography education is most probably under-utilised, resulting in 47% of role players not having an understanding of the relevant concepts. Therefore at least half of the role players in the radiography education context have no idea of what the value of such a learning strategy might be.

Reflection has the value to improve the effectiveness of learning

Although a percentage of respondents indicated little understanding of the research field of reflective practice, 26 % of them are capable of foreseeing that this alternative learning strategy might add value to the effectiveness of their learning.

Opportunities to reflect on experiences to enhance effective and lifelong learning

The learning environment for radiography education consisting of an academic and work-integrated clinical component allows enough opportunities to integrate an alternative learning strategy such as critical reflection to enhance lifelong learning.

Tools/strategies/methods that might be useful to facilitate reflection

The fact that nearly two thirds of the respondents (62 %) could list different ways and means of reflective practice, is perhaps motivation for staff members to be even more creative in facilitating transformative learning.

The necessity of role players in radiography education to be involved in the process of reflection

The majority of the respondents are of the opinion that all stakeholders should be involved in the process of critical reflection.

Factors contributing to the current lack of utilising opportunities of reflective practice in radiography education

Positive response to transformative learning with regard to metalearning (83%) and critical reflection as a priority for effective learning (61%) was received. Workload pressure (75%) and the perception that reflection is hard work (47%) are not conducive to effective and lifelong learning. Obtaining technical skills is one dimension of radiographic competence but 36% of the role players regard the holistic approach of critical reflection more important. This proves that the apparent negative attitude of respondents towards change (transformative learning) is probably due to the lack of knowledge and experience of reflection as a learning strategy.

Opportunities for students to think about their own personal development

Only 21% of the respondents regard opportunities available for students' reflections about their own personal development as insufficient (see Table 3.13 for the influence of workload on facilitating reflective practice).

4.3 RESEARCH FINDINGS OF THE WEEKLY OBSERVATIONS DONE DURING THE 10-WEEKS OF REFLECTIVE PRACTICE

When interpreting the data analysed, the researcher realised that it was necessary to divide the observed information documented by the observers (academic and clinical staff members and the researcher) during the reflective discussions according to the codes in positive as well as negative aspects.

Positive aspects

From the documented observations over a 10-week period the following positive aspects regarding reflective practice became evident. The coding detail of the positive observations is RPOS 04, RPOS 05, RPOS 06, RPOS 11, RPOS 14, RPOS 15, RPOS 16, RPOS 17, RPOS 18 and RPOS 22.

Researcher reflections

The value of working together in a learning group, supporting one another and sharing learning experiences, was a catalyst in terms of motivation, building individual confidence and encouragement. An essential aspect is that the

students need to plan properly to create more time to reflect more deeply and more critically.

Negative aspects

The following aspects for development have been identified. The coding detail of the negative observations is RPOS 01, RPOS 02, RPOS 03, RPOS 04, RPOS 07, RPOS 08, RPOS 11, RPOS 12, RPOS 13, RPOS 19 and RPOS 20.

Researcher reflections

The following aspects were observed during the reflective learning discussion groups (10-weeks):

- The time available in the learning programmes for reflective practice is currently not adequate.

- Sensitivity with regard to the students' learning style preference is lacking in the education of radiography students.

- It seems challenging and problematic to experiment with new/alternative learning strategies.

- The attitudes and willingness of senior students to be more flexible in their learning styles are meaningful.

- Critical reflection within a group in the academic and clinical setting resulted for some students to feel uncomfortable.

- Students also lack the skills to express themselves verbally and to acquire the discipline of documenting reflections on a regular basis.

- An alternative learning strategy such as critical reflection can be successfully included in existing learning programme outcomes, especially from the first year of study.

- Students need to be orientated in a proper, detailed session regarding the positive outcomes and effectiveness of this strategy.

4.4 RESEARCH FINDINGS ON THE STRUCTURED FOCUS GROUP INTERVIEWS

This section deals with the responses generated by the focus group interviews conducted according to the selection criteria indicated and the detail of the structured focus group interviews outlined in sections 3.5.3 and 3.7.3.

The influence of reflective practice on the development of students

The responses are represented in Figure 4.1.

As many as 79% (SI 1.1 & ACSI 1.1) of all the focus groups (students, academic and clinical staff) indicated that they regard reflective practice as a contributing factor to their own development. Only 17% (SI 1.2 & ACSI 2.1) of all the respondents were uncertain whether the outcome of the 10-week period of reflective practice could be assessed. As few as 4% (SI 1.3 & ACSI 3.1) of all the

respondents said that reflective practice did not add any value to their own personal development.
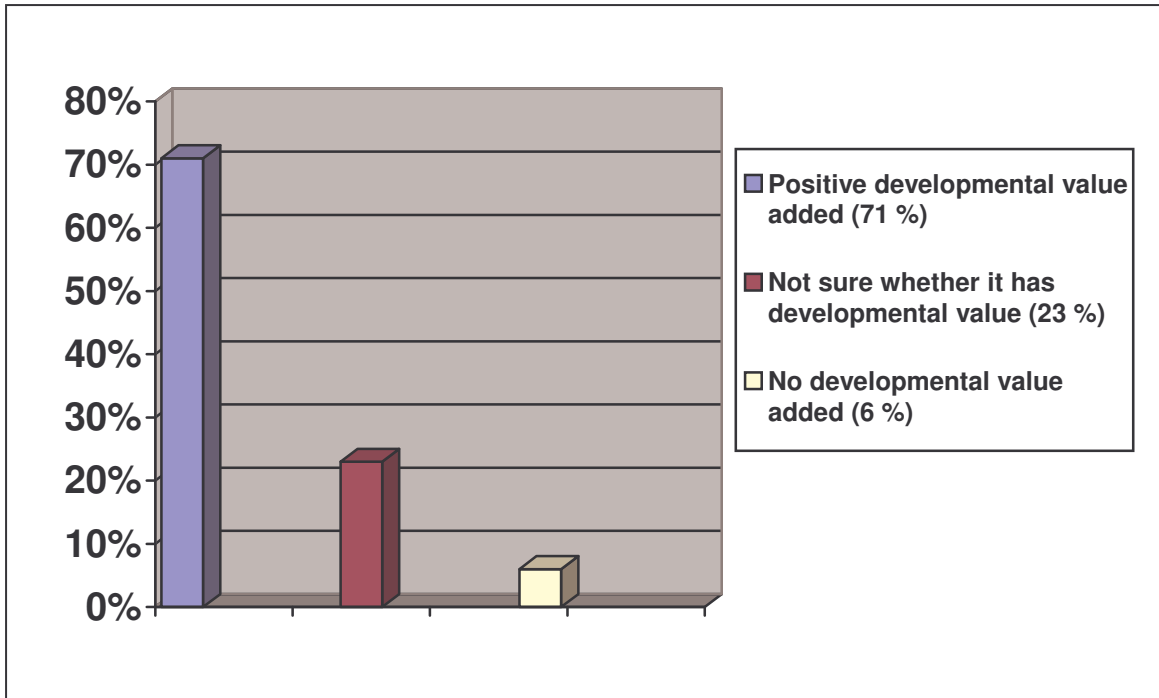
Figure 4.1. The opinion of the students regarding the influence of reflective practice on their own development

Personal value gained by staff members, through the weekly reflective practice observation sessions

The responses are represented in Figure 4.2.

A small percentage (14%) of staff (ACSI 2.2) said that they had not really gained any value as a role player in radiography education, from these observation sessions. All in all 86% staff members (ACSI 2.1) indicated that they had

definitely personally gained value from observing the reflective group discussions

on a weekly basis.
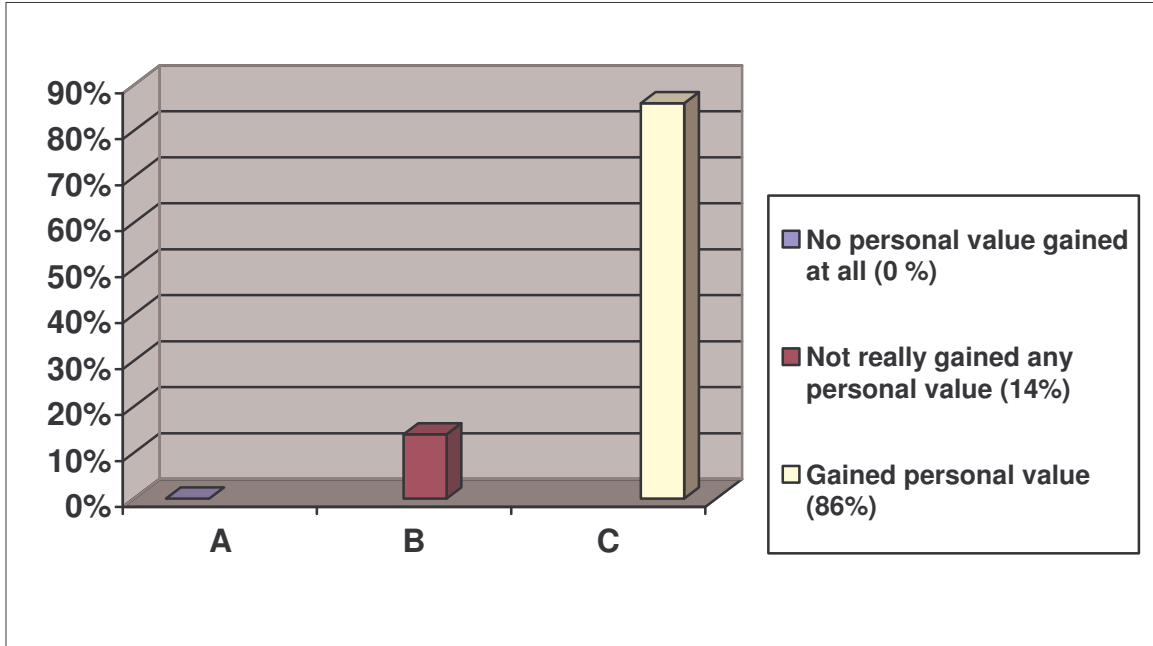
Figure 4.2. Value gained by staff members through observing reflective discussions

The discipline of students to documenting their reflections
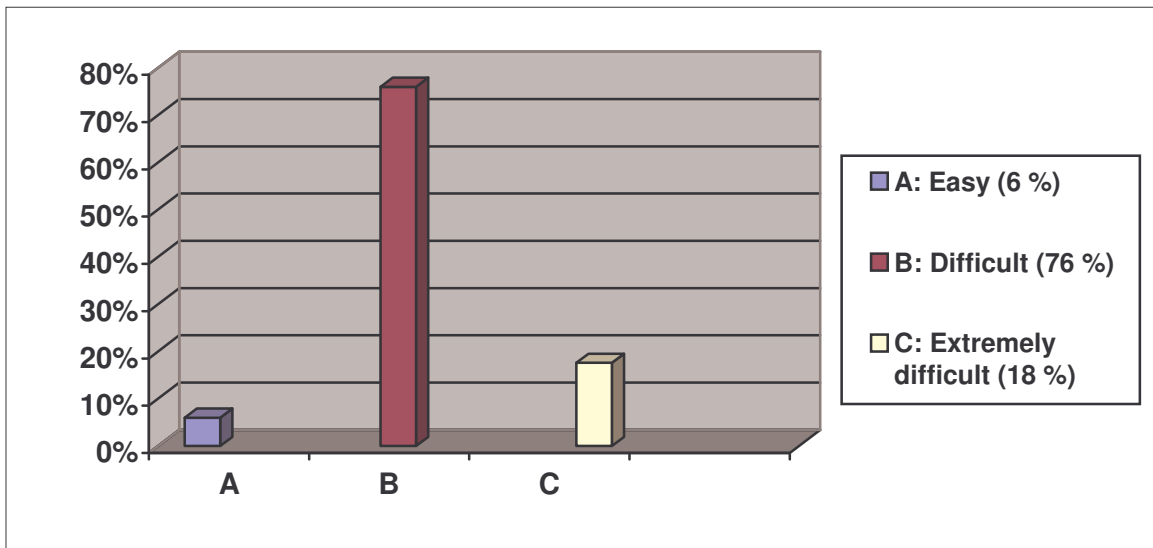
*Figure 4.3. The students' discipline to keep a reflective journal*

As indicated in Figure 4.3 the majority of the student focus groups indicated that it was a difficult process (76%) to document their reflections (SI 2.2). Furthermore, 18% of the respondents said it was an extremely difficult process to be disciplined to document (SI 2.1) their reflections. Only 6% said that to get into the habit of documenting their reflections had not been a problem (SI 2.3).

Staff members' observation of students dominating the reflective discussion group sessions
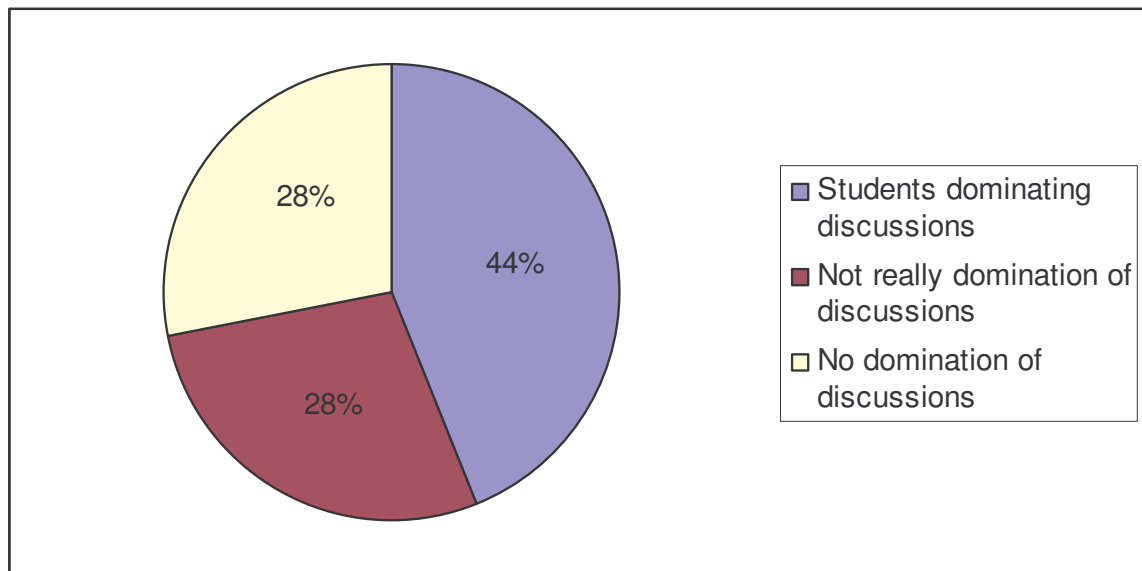
Figure 4.4. Staff members' opinion of students dominating reflective discussions

The breakdown of the staff members who experienced students dominating (ACSI 3.1) the reflective discussions (44%) is provided in Figure 4.4. In total 28% of the staff members are of the opinion that domination of discussions by some students did take place (ACSI 3.2), but with effective facilitation of the situation, students not actively participating were encouraged to participate more. As many

as 28% of the staff indicated that domination of reflective discussions (ACSI 3.3) did not occur.

Difficulties experienced by students in keeping a reflective journal

All students identified difficulties and challenges they were confronted with during the 10-week reflective practice phase in keeping a reflective journal. It was noted that all the students identified a problem area while keeping a reflective journal.

As indicated in Figure 4.5 42% of the students (SI 3.4), lack effective writing skills. 29% of the respondents indicated that to find time during their daily programmes for reflecting and documenting was extremely challenging (SI 3.1).

The student focus groups (SI 3.3) highlighted the fact that to express one's learning experiences and feelings were difficult and time consuming. Only 6% of the students said that they had to plan their daily activities with caution, allowing enough time for critical reflection and journal keeping (SI 3.2).
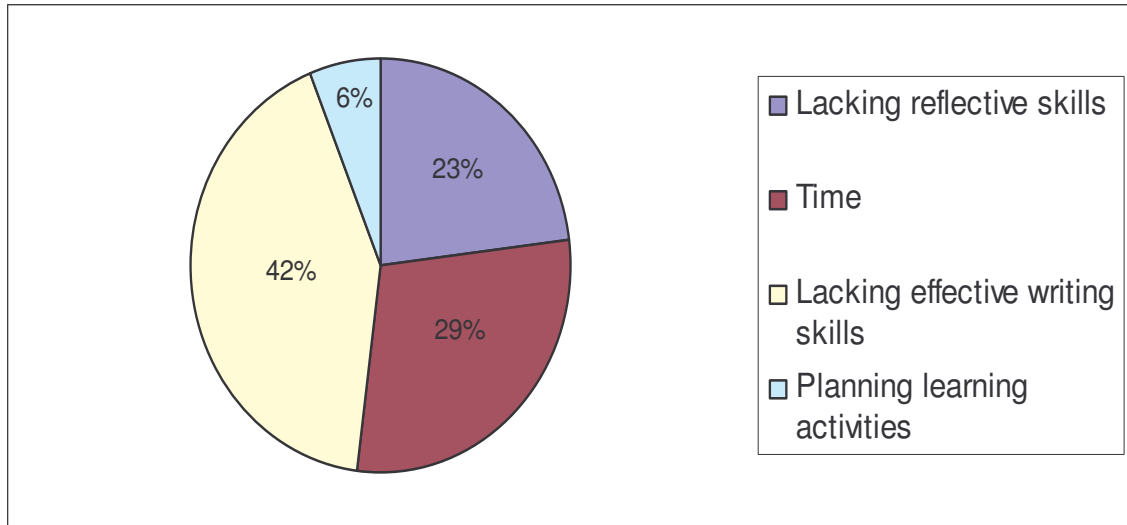
Figure 4.5. Difficulties experienced by students while keeping a reflective journal

The different values students attached to a reflective learning group
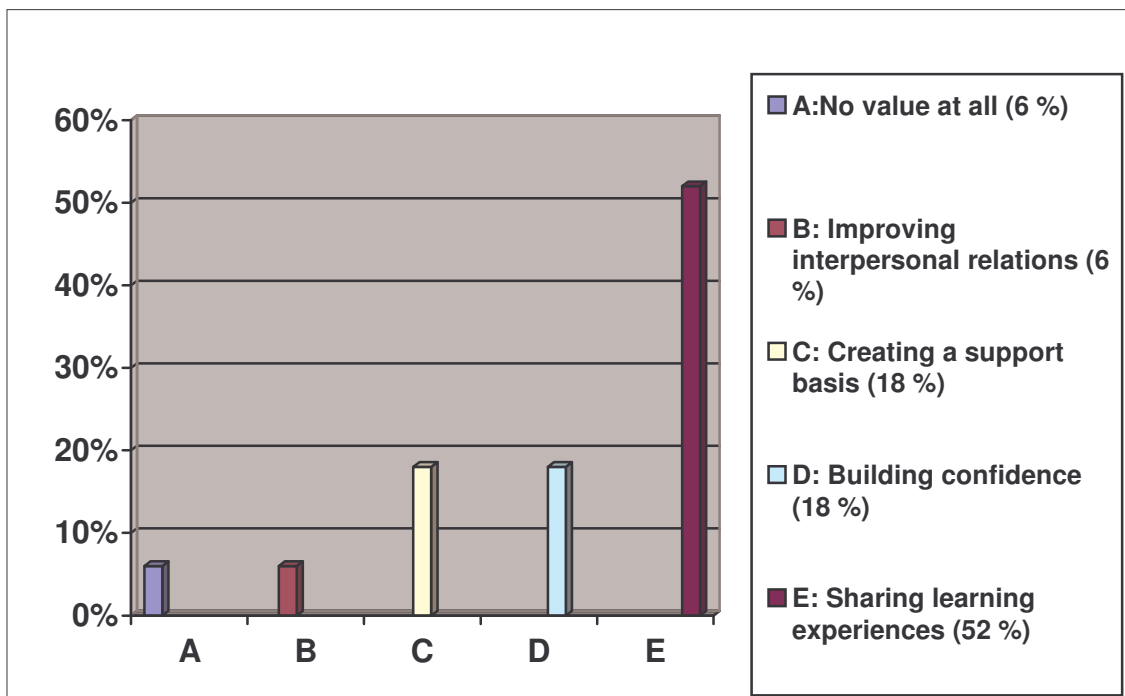
Figure 4.6. Different values students attach to a reflective learning group

In Figure 4.6 the majority of the students 52% (SI 4.1) were of the opinion that by sharing learning experiences, especially experiences from the clinical setting, they were enabled to learn from more available information. This phenomenon contributed towards an 18% increase in confidence (SI 4.2) and a 6% improvement in interpersonal relations (SI 4.4). The value of reflective discussion groups where a support basis has been created (SI 4.3) was indicated by 18% of the focus groups. It is clear to the researcher that different students gained different values from reflective groups.

Sufficient basic reflective skills of students
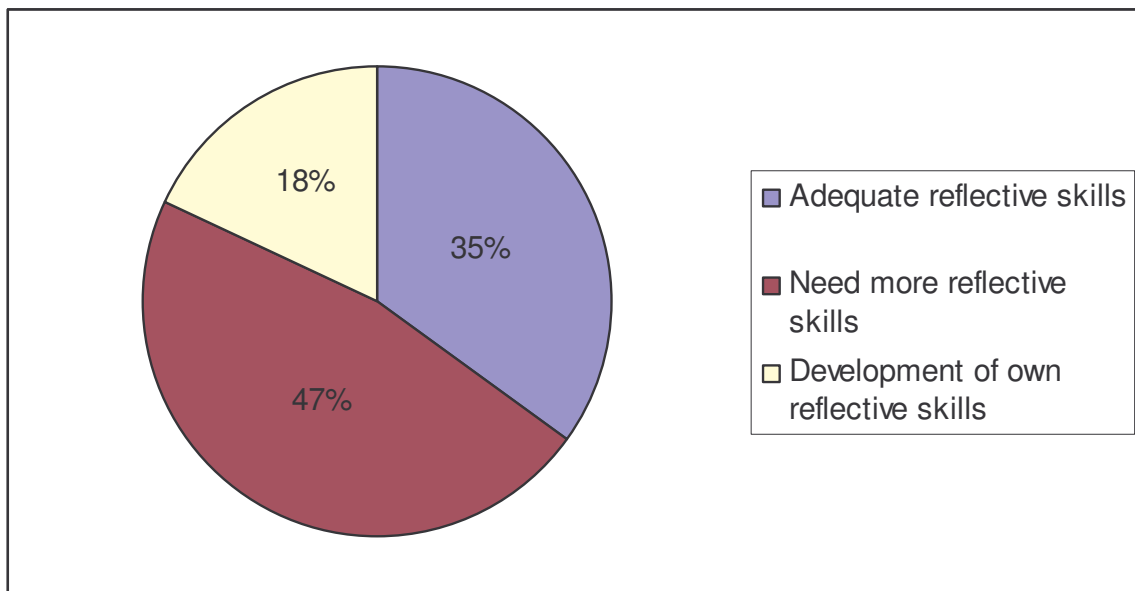
Figure 4.7. Students' basic reflective skills

The responses represented in Figure 4.7 are a pie chart breakdown to indicate whether the students' basic reflective skills are sufficient. In total 47% said that

they needed definitely more knowledge and skills to reflect better and more deeply (SI 5.2), while a further 35% indicated that they felt they had adequate reflective skills (SI 5.1). 18% of the students said that they had developed their own reflective skills in the 10 weeks of reflective practice (SI 5.3).

Students' understanding of the importance to reflect together as a learning group
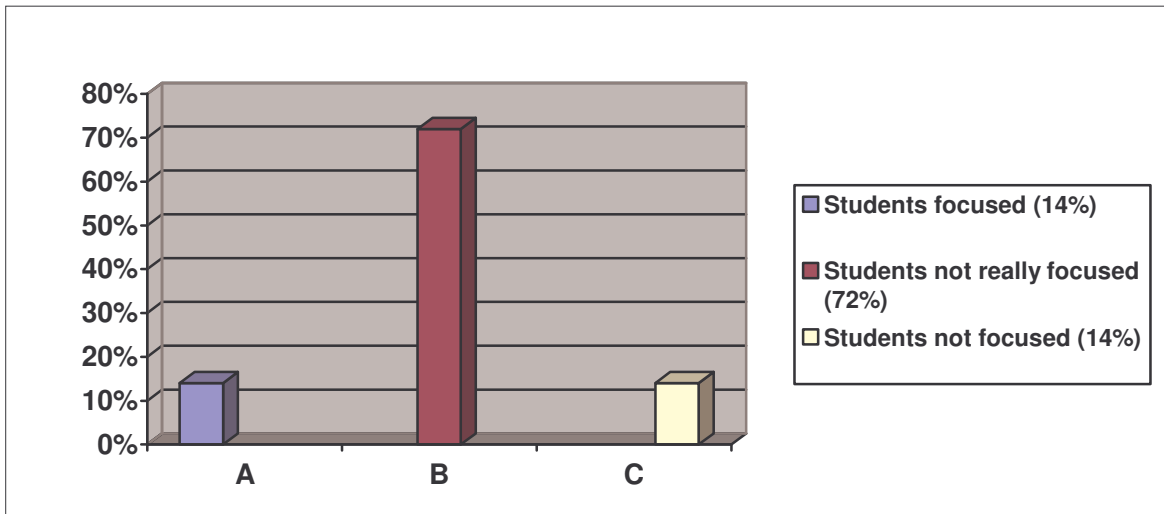
Figure 4.8. Students' understanding of the importance of reflective discussion groups

The staff members' perception and their observations indicated that 72% of the students were not really focused on the importance of group reflections (ACSI 4.2). As few as 14% respectively were either much focused or not even interested at all (ACSI 4.1&4.3). The responses are indicated in Figure 4.8.

Staff members' perspective on the ideal size (number of students) per reflective learning group
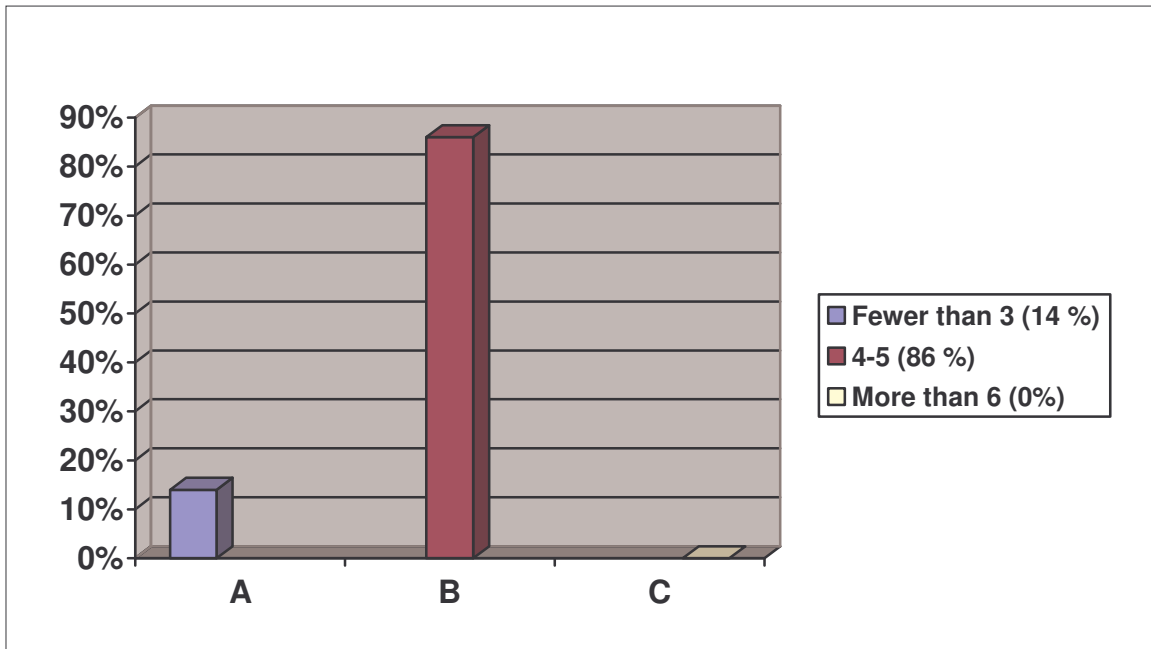
F*igure 4.9. The ideal number of students per reflective learning group*

As indicated in Figure 4.9 as many as 86% of the staff members said that the apparent ideal number of students per group to be effective, functional and encourage participation is 4-5 students per group (ACSI 5.2). Only 14% said that fewer than three students per group might be the most appropriate number (ACSI 5.1).

Time available for reflective discussion group sessions

All the respondent students (100%) indicated clearly that there is no time available, especially in the clinical setting, for reflective group discussions (ACSI

6.2) as indicated in Figure 4.10. Radiography education is nationally structured in such a way that cooperative or work-integrated learning forms a large component of the curriculum. The serious shortage of radiographers also contributes to overworked staff and very limited time for anything additional. This is unfortunately not a positive factor in/of transformative learning.
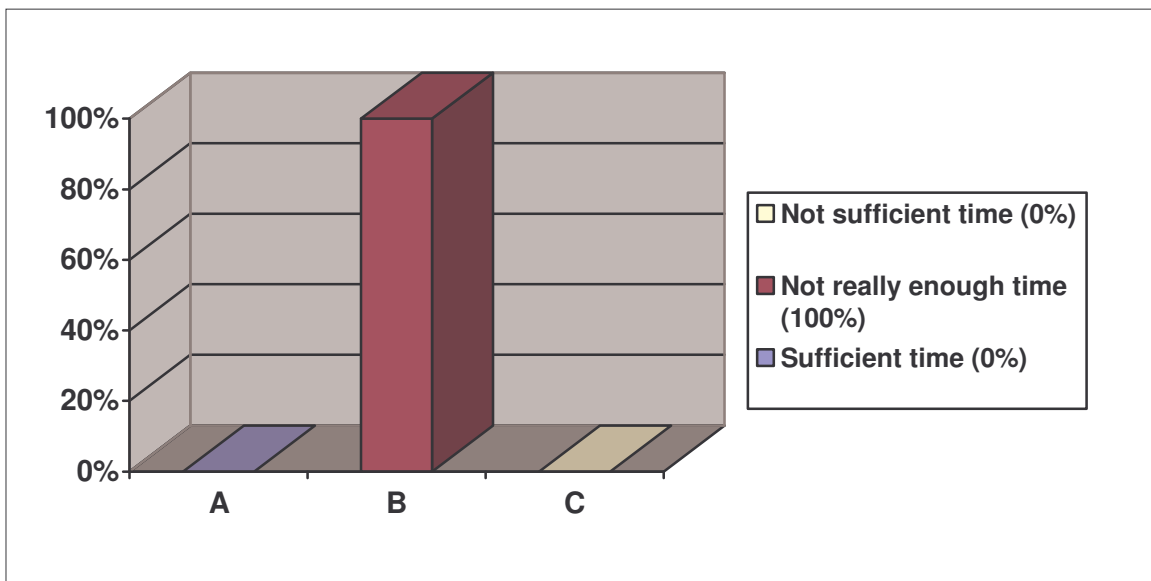
Figure 4.10. Availability of time for reflective discussion groups

The general feedback from the staff members during the reflective learning group discussions regarding the attitude of students towards reflective practice in general

As indicated in Figure 4.11, when the process of 10 weeks of reflective practice was implemented (ACSI 7a.2) the feedback was that students were not really as positive (72%), but they became more positive when realising the value of critical reflection as a learning strategy. The feedback obtained is that 28% of the

respondents were negative (ACSI 7a.3) and 0% of the students were positive (ACSI 7a.1) at the outset of the 10-week phase.
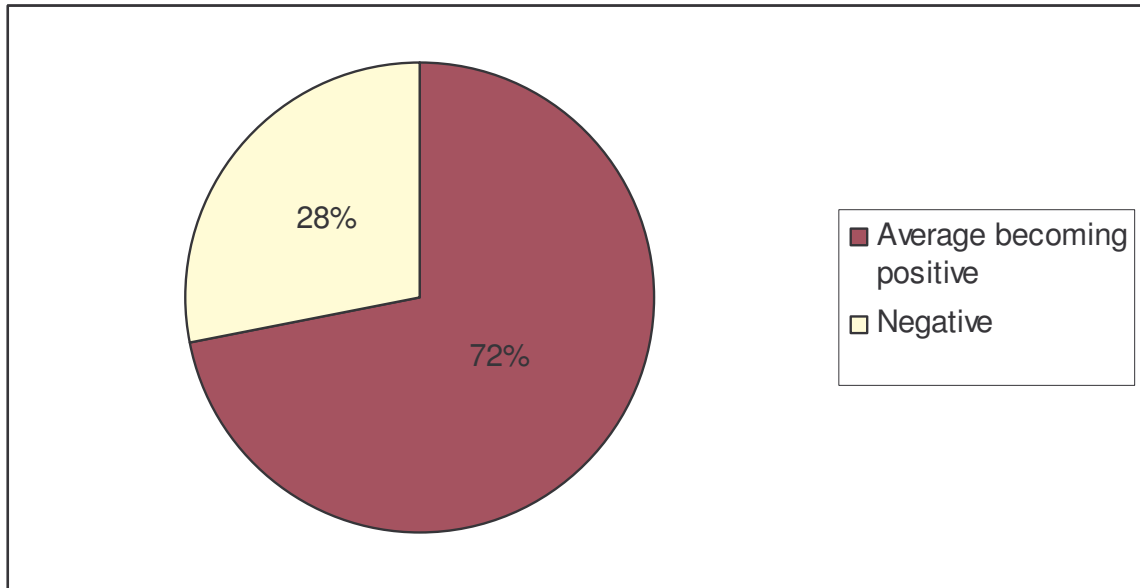
Figure 4.11. The attitude of students towards reflective practice in general

The observations of staff members during the reflective learning group discussions, regarding the students' ability to master the skill of reflection

It was observed that 72% of the students demonstrated the ability to master the skill of reflection relatively well (ACSI 7b.2). Furthermore 14% were very successful in mastering the skill of reflection (ACSI 7b.1). It was observed that 14% of the students did not manage the ability to master the skill of reflection (ACSI 7b.3). The responses as observed during the reflective learning group discussions are indicated in Figure 4.12.
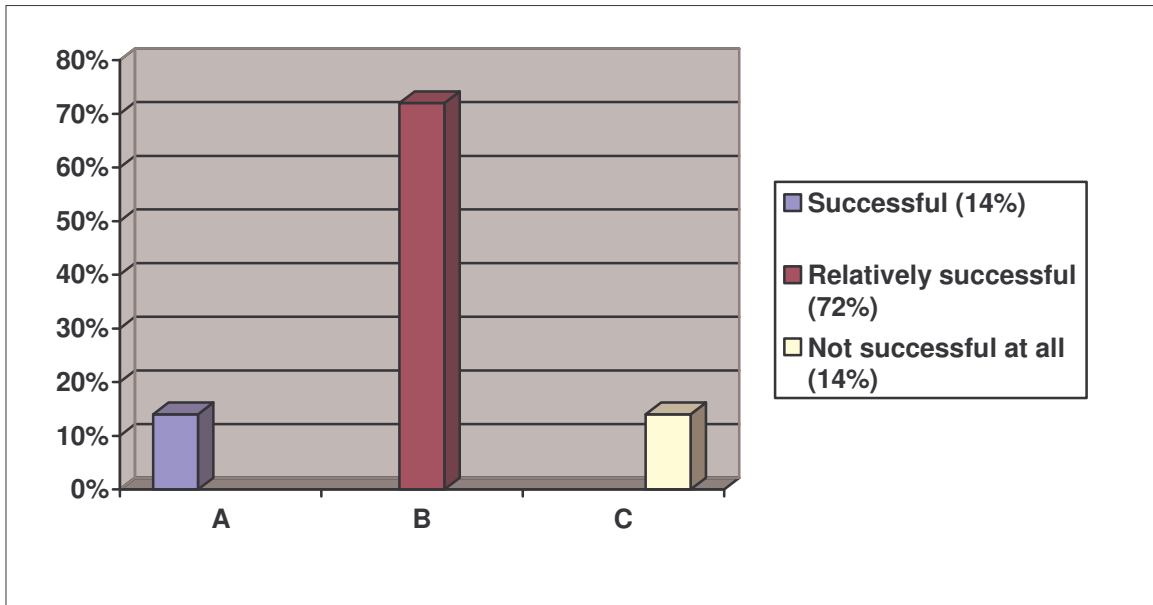
Figure 4.12.   The ability of students to master the skill of reflection

Students' discipline to keep a reflective journal
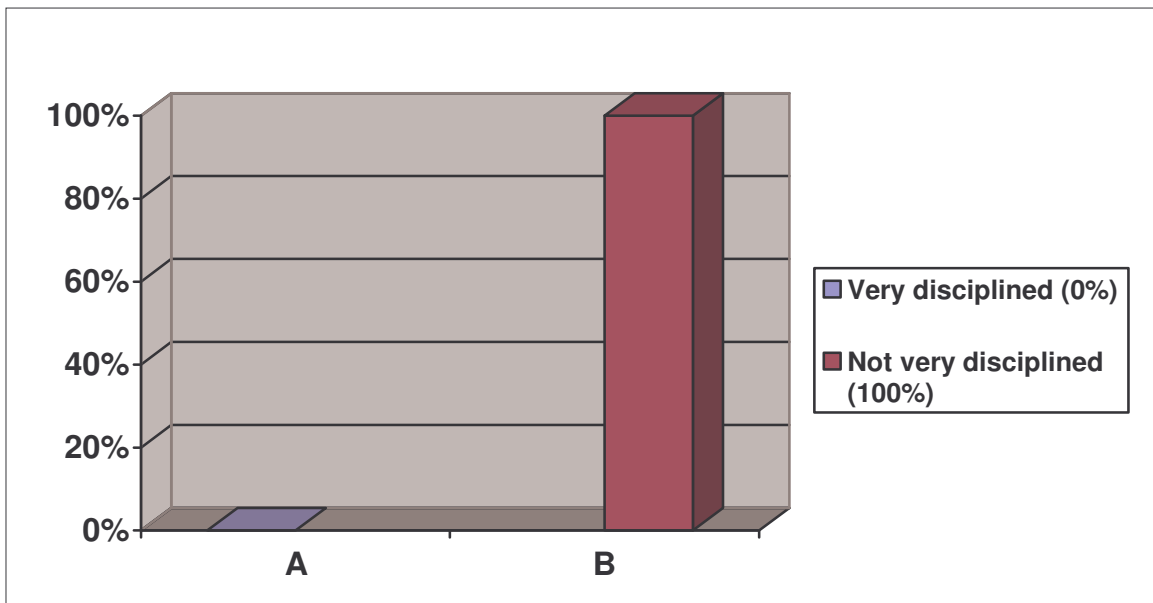
Figure 4.13.   The discipline of students in keeping a reflective journal

Figure 4.13 shows that as many as 94% of the students found it difficult or extremely difficult to be disciplined. During the weekly discussions it was noted that in general no students (100%) were much disciplined in keeping a reflective

journal. (ACSI 7c.2) as indicated in Figure 4.13. This is a concerning issue that might be an indicator of the attitude of students in general regarding their motivation for learning and obtaining a qualification.

Students' understanding the importance of the concept of meta-learning

Only 18% of the students (SI 6.1) indicated that it is important that they take responsibility for their own learning while 12% said that they realised through reflective practice that learning is a holistic but personal process (SI 6.3). Only 29% appreciated the fact that reflective practice made them aware of mistakes/faults that can be corrected (SI 6.2). As few as 12% of the focus groups realised that they do have an ability to adapt to alternative learning strategies (SI 6.5). The fact that reflective practice improves planning of learning activities expresses learning experiences in words on paper and builds confidence (SI 6.5), was seen as part of the principles of the concept of metalearning by some of the respondents (29%). The responses are indicated in Figure 4.14.

A: Flexibility for adapt to alternative learning strategies (12 %)

B: Improving planning, expressing oneself and building confidence (29 %)

C: Realising learning is a holistic and personal process (12 %)

D: Evaluating and correcting own learning
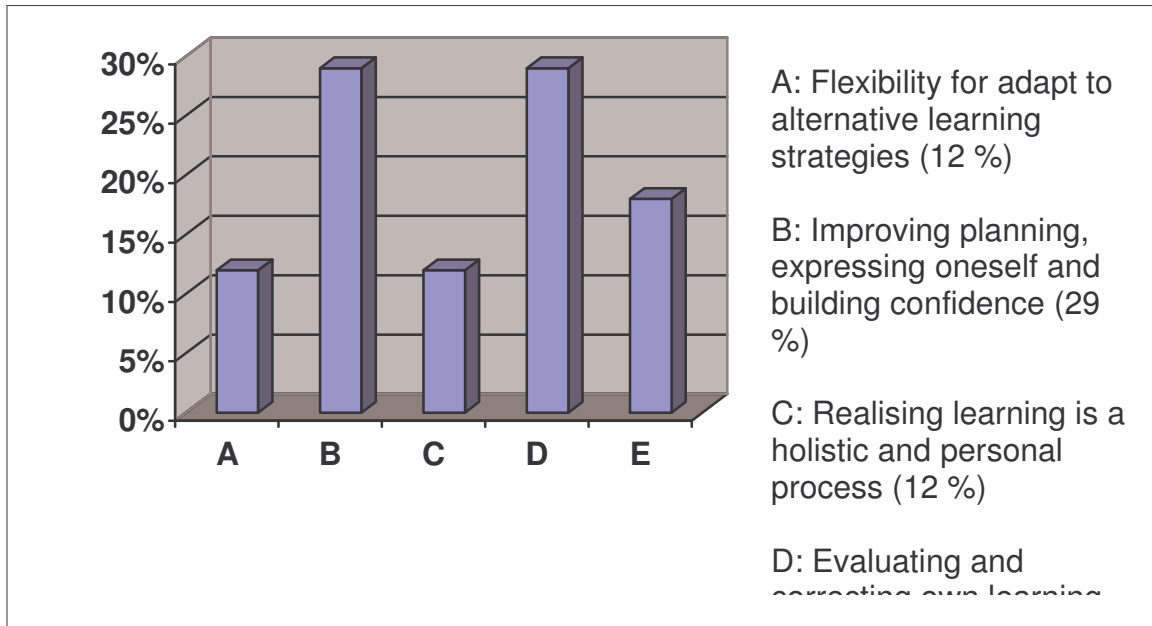
Figure 4.14. Students' understanding of the importance of the concept of metalearning

Students taking responsibility for their own learning as observed by staff members

In Figure 4.15 only 28% of the respondent student focus groups indicated that they realised the importance of taking responsibility for their own learning. As observed during the weekly reflective sessions 58% of the students did not really take any serious responsibility (ACSI 7d.2) and another 14% of the students did not take responsibility for their own learning at all (ACSI 7d.3). Positive feedback was obtained from 28% of the students showing interest and accepting responsibility for their own learning (ACSI 7d.1).
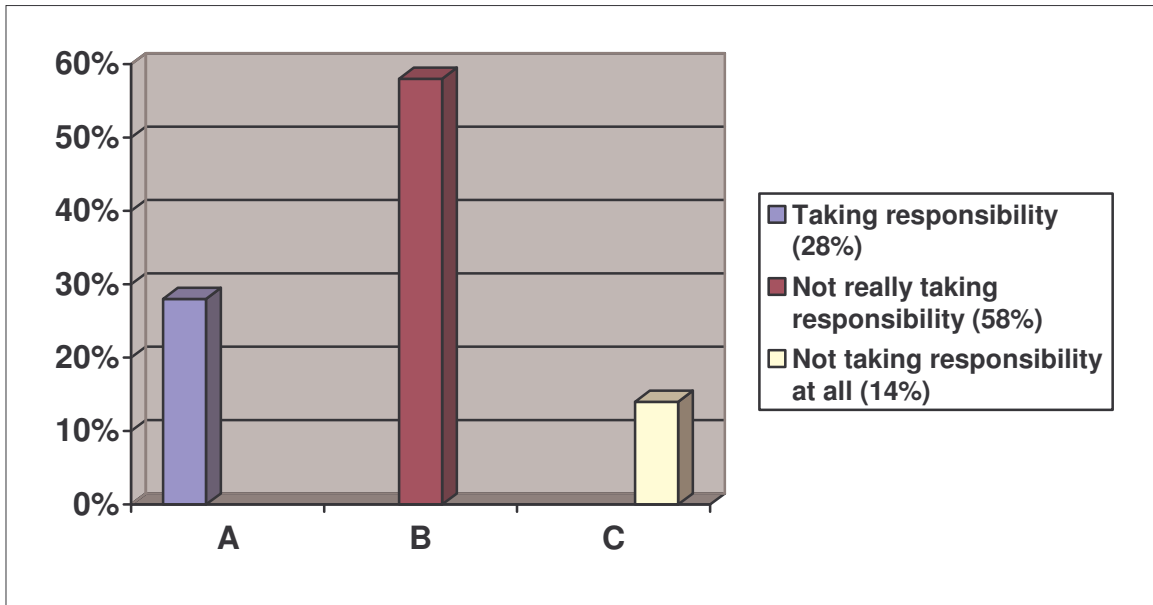
Figure 4.15. The responsibility of students to take responsibility for their own learning (metalearning)

Reflective learning groups providing a forum where learning experiences
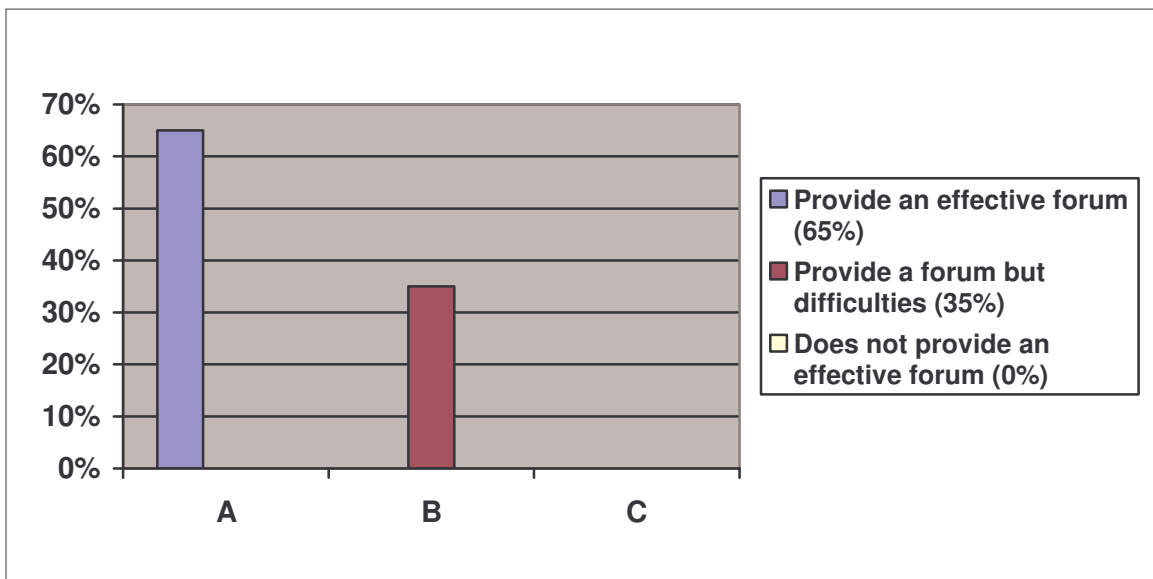
can be shared

Figure 4.16.   Reflective learning groups act as forum where learning experiences can be shared

The majority of the student focus groups (65%) said that reflective learning groups could act as an effective forum for sharing learning experiences (SI 7.1). Furthermore, another 35% of the respondents indicated that it is the case, but added that they had experienced minor difficulties with the reflective learning groups, such as differences in language and learning styles (SI 7.2). According to the researcher the conclusion to the abovementioned is that reflective learning groups can be an effective forum for sharing learning experiences within the radiography context.

Opportunities available for sharing personal reflections during the reflective discussion group sessions
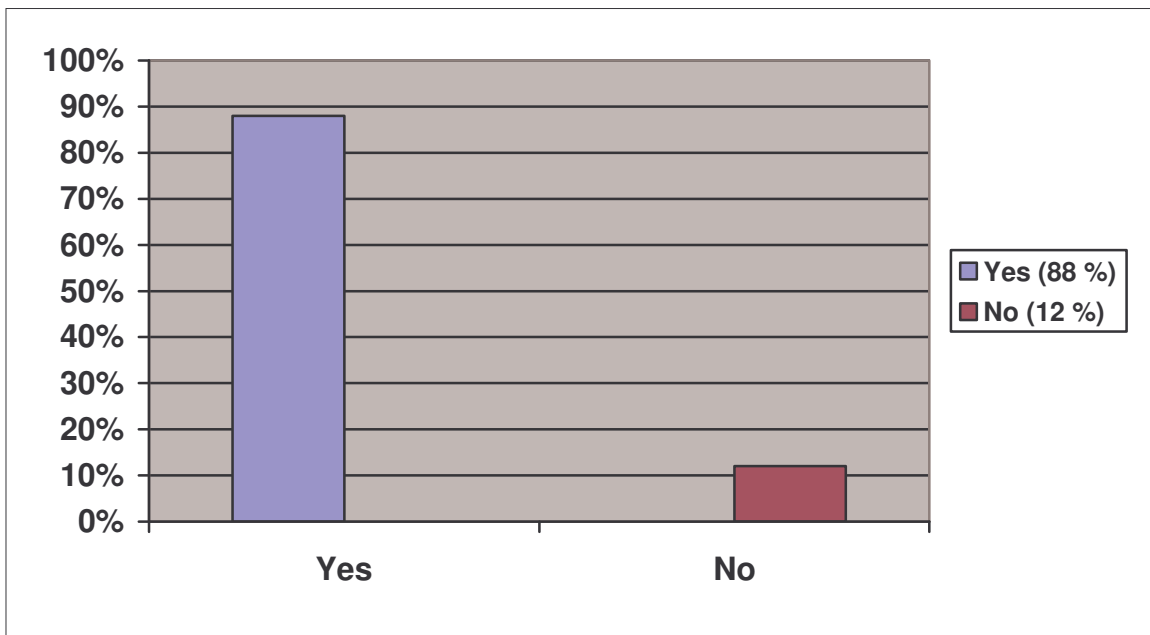
Figure 4.17. Sufficient opportunities to share personal reflections

In Figure 4.17 an overwhelming 88% of the student focus groups said that there were ample opportunities to share personal reflections within the group (SI 8.1),

some with the provision that it was out of free will. Only 12% said that there was no time during the weekly reflective discussions to share personal reflections (SI 8.2)

Observing proof of growth in the students' motivation and ability to reflect deeply
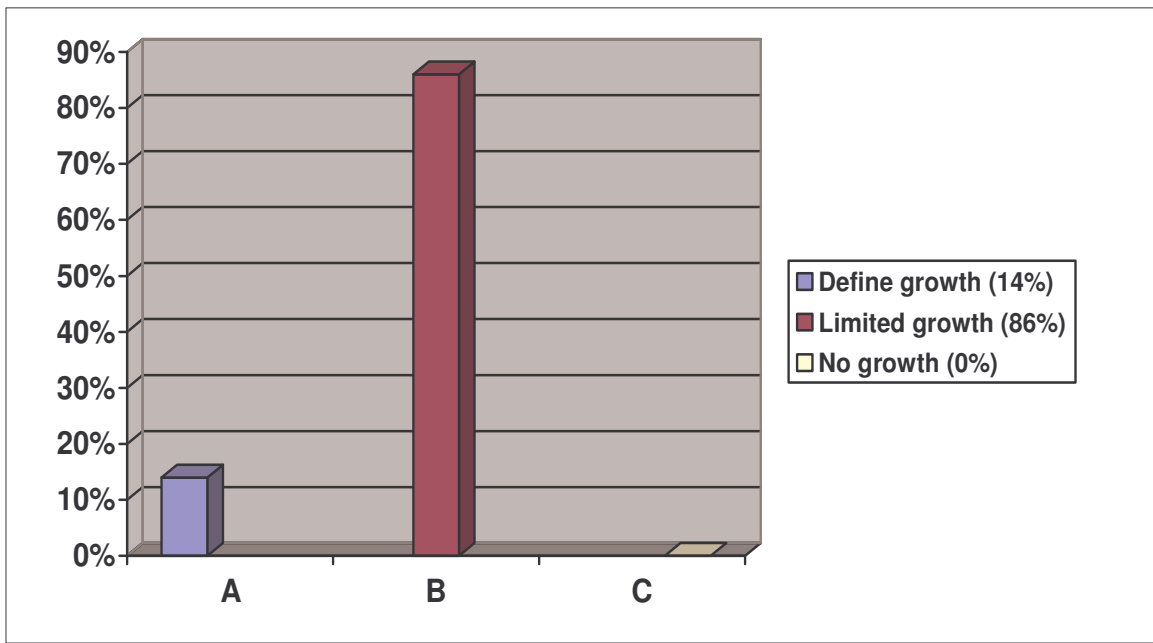
Figure 4.18. The students' growth in motivation and the ability to reflect deeply

The respondent staff members and the researcher observed 14% definite growth in motivation and ability to reflect more deeply (ACSI 8.1) by students and 86% limited growth (ACSI 8.2). A more positive process started (although slowly) to develop over a period of time where students maybe starting to realise the value of critical reflection in terms of their own learning.

Outstanding aspects regarding reflective practice as a process as observed and experienced by the other role players

In total 44% of the respondents as indicated in Figure 4.19 regarded the reflective process as a tool for quality control purposes (ACSI 9.3). Critical reflection as a learning strategy was seen by 28% of the respondents as having positive outcomes (ACSI 9.2). Furthermore, 14% of the respondents regarded reflective practice as an opportunity to share learning experiences (ACSI 9.1) and to improve communication within the specific reflective learning group (ACSI 9.4).
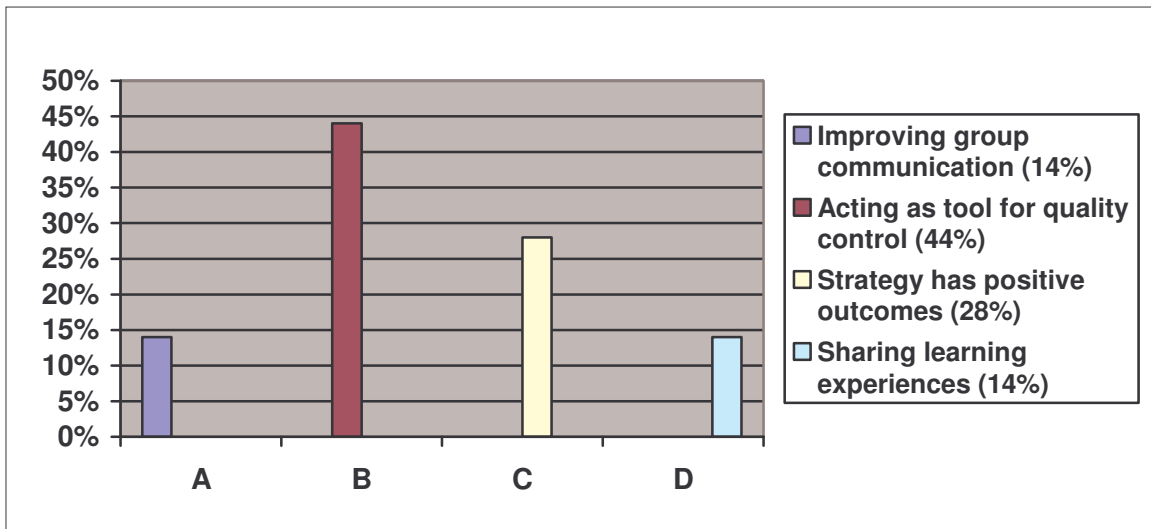
Figure 4.19. Outstanding aspects of the reflective practice process as regarded by staff members

**Critical reflection as a learning strategy to indicate evidence of a students'
development over time**
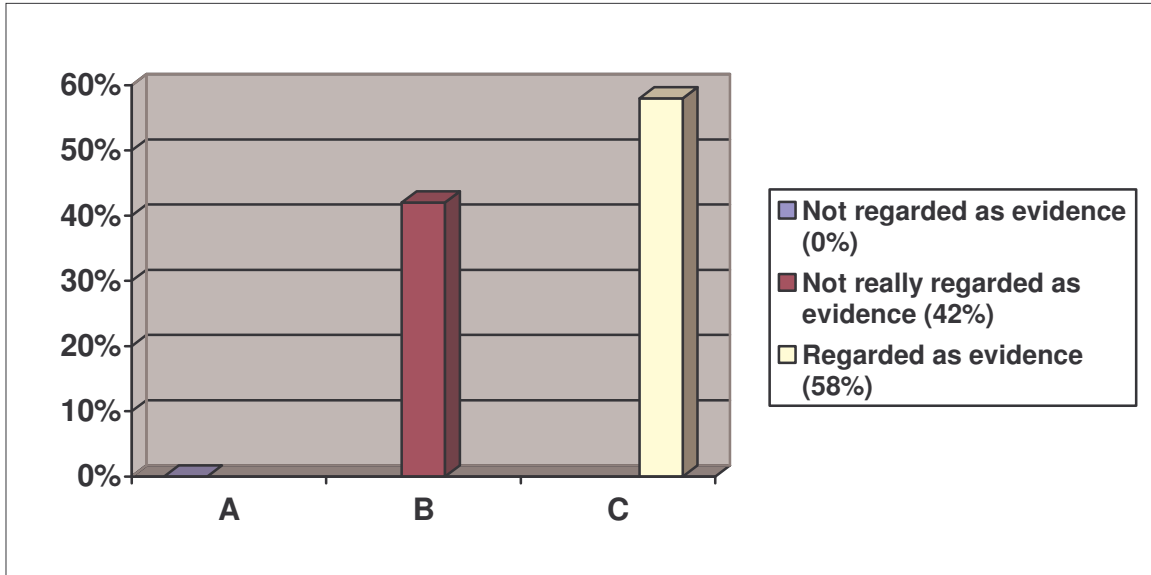
*Figure 4.20.   Critical reflection indicating evidence of a student's
development*

Figure 4.20 indicates that there is a difference in opinion on whether reflective
practice can be regarded as evidence of a student's development (ACSI 10.1 &
ACSI 10.2). As many as 57% of the respondents viewed reflective practice as
evidence of a student's development over time. Another 43% of the respondents
indicated that it is not really possible to indicate a student's development in
reflective practice (ACSI 10.2).

Aspects contributing to the apparent negligence of reflective practice in the context of radiography
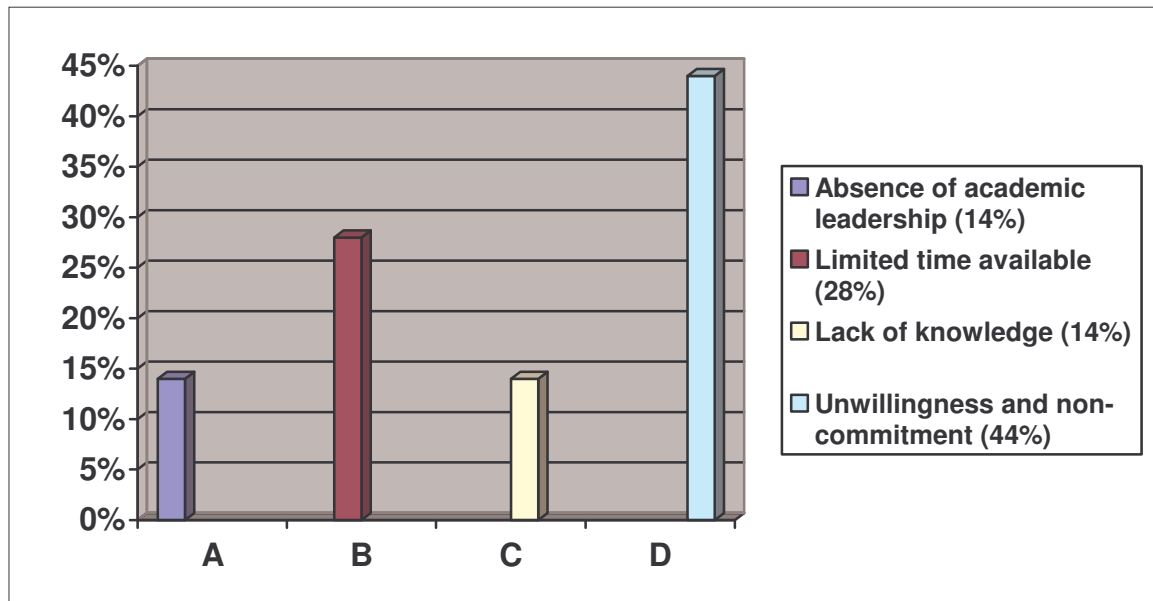
Figure 4.21. Aspects contributing to the negligence of reflective practice in the context of radiography

In Figure 4.21 a total of 44% of the respondents were of the opinion that the absence of commitment from students to investigate alternative learning strategies (ACSI 11.1) contributed to the negligence of reflective practice. Limited time for reflection indicated by 28% of the respondents especially in the clinical setting is due to a shortage of qualified radiographers. Only 14% of the role players in the radiography context (ACSI 11.4) identified the lack of knowledge as a possible pitfall. The absence of academic leadership (14%) regarding the investigation/implementation of alternative learning strategies contributes towards the negligence of reflective practice (ACSI 11.4).

Staff members need to be equipped with knowledge and skills on a regular basis to facilitate reflective practice successfully

All the academic and clinical staff respondents (ACSI 12.1) said that to equip them to facilitate reflective practice in the context of radiography education regular updating of knowledge and skills is absolutely necessary.
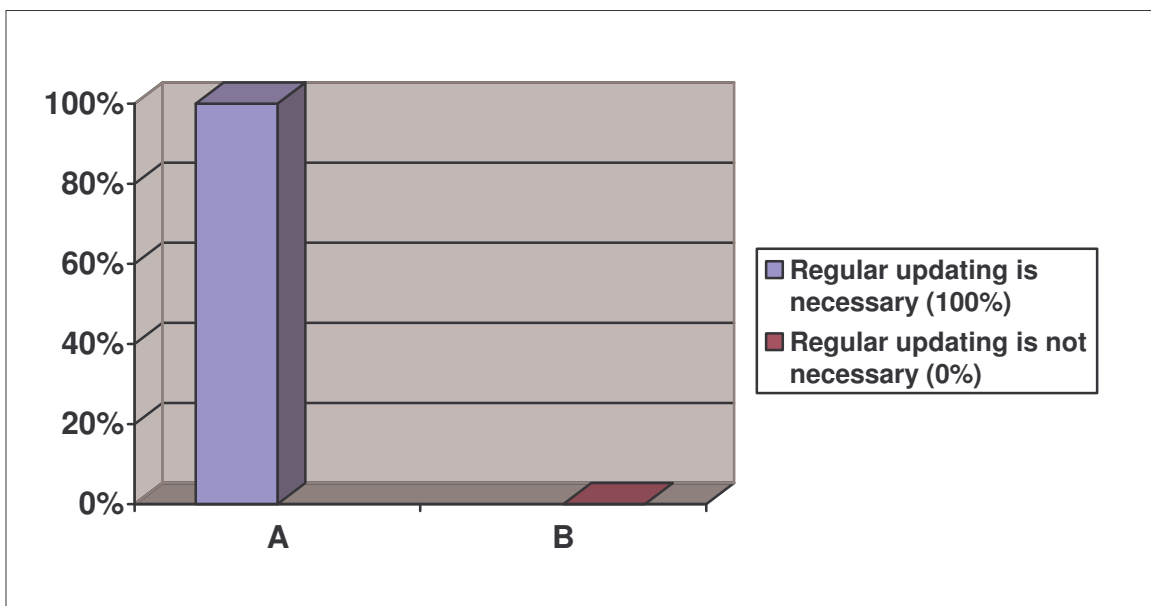
Figure 4.22.   Regular updating of knowledge and skills to facilitate reflective practice successfully

The systematic integration of reflection as an integral part of learning activities

All in all 71% of the student respondents said that they would definitely integrate reflective practice as an integral part of their daily learning activities (SI 9.1). As many as 23% of the student focus groups indicated that they were still unsure

and hesitant whether or not to integrate critical reflection as a strategy in their own learning (SI 9.2). Only 6% of the respondents would not consider integrating reflective practice in their daily learning activities (SI 9.3). The responses are indicated in Figure 4.23.
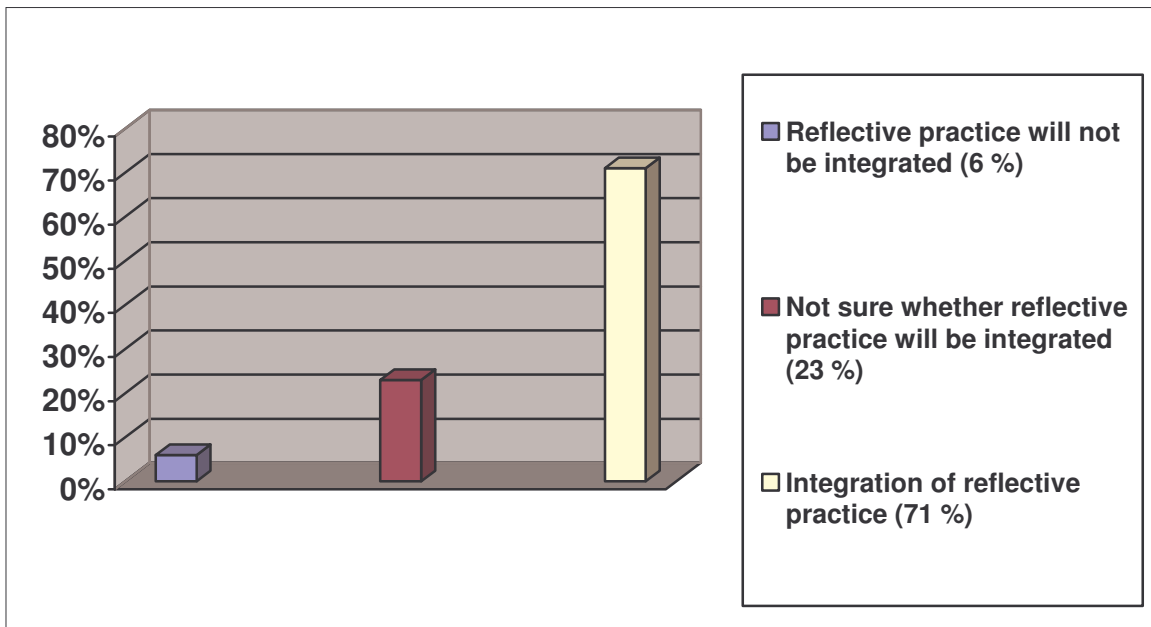
Figure 4.23. *Integration of critical reflection as part of daily learning activities*

4.5 RESULTS AND FINDINGS OF THE QUESTIONNAIRES

Biographical data of the respondents

The biographical questions served as an introduction and helped to set the respondents at ease to answer the rest of the questions. The tables below (Table 4.3 to 4.7) contain data regarding the position held, institution of higher learning, staff's highest qualifications and professional development of staff.

Table 4.3 indicates that 15 respondents (60%) were academic staff members whereas 10 respondents (40%) were clinical staff members. Slightly more first year students (49%) than second (36%) and third year students (15%) took part in the research. No fourth year students participated.

Position	Percentage
Academic staff	60
Clinical coordinator/tutor	40
First year student	49
Second year student	36
Third year student	15
Fourth year student	0

Table 4.1. Positions held by participants in the context of radiography

Institutions of higher learning

From the eight institutions in this country involved in the education of radiographers, four participated in the research.

Institution of higher learning	Percentages	
	Staff members	Students
Central University of Technology Free State	32	29
Tshwane University of Technology	12	25
University of Limpopo (Medunsa)	40	20
University of Pretoria	16	25

Table 4.2. Institutions of higher learning

There was on average an equal distribution of participating students among the four institutions. Only 3 staff members (12%) of Tshwane University of Technology and 10 academic and clinical staff members (40%) of the University of Limpopo (Medunsa) participated.

Highest qualification obtained by staff members

The academic and clinical staff involved in radiography education that took part in the research have a wide spectrum of qualifications. The researcher wanted to determine whether staff members are appropriately qualified to be involved in the education of students.

Qualification	Percentage
National Diploma Radiography	24
B Rad Radiography	16
National Higher Diploma Radiography	0
B Tech Radiography	16
B Rad (Hons) Radiography	24
M Rad Radiography	8
D Rad Radiography	0
Other	12

Table 4.3. Highest qualification obtained

Six staff participants had obtained basic radiography qualifications (360 credits) and six staff members had obtained qualifications on the 480-credit level (post basic qualification). Three staff members (12%) had obtained higher

qualifications in the discipline of Nuclear Medicine (Radiography) and in Health Education.

Institutions of higher learning involved in staff development programmes

It is accepted that all academic institutions should have a specific department committed to staff development and support.

Statement/Question	Option	Percentage
Offering of staff development programmes	Yes	64
	Not really	24
	No	12

Table 4.4. Availability of staff development programmes

Staff development programmes are offered at 64% of the institutions with 24% not clear about the activities and programmes available to staff to enhance their knowledge and skills. Another 12% indicated that no such staff development programmes are offered. The responses are indicated in Table 4.4.

Staff attendance of programmes regarding new teaching and learning strategies

The attendance of programmes in innovative and transformative teaching and learning strategies by staff members in the past twelve months is indicated in Table 4.5. The researcher wanted to determine whether staff members are informed about the latest trends and strategies regarding teaching and learning.

Statement/Question	Option	Percentage
Attendance of teaching programmes during the last 12 months	Yes	48
	No	52

Table 4.5. Attendance of programmes regarding new educational strategies

More or less half of the staff members (12) attempted to be updated on the latest educational trends; the other half (13) did not attend programmes regarding innovative and transformative teaching and learning strategies.

Respondents' general approach to learning

The researcher's intention with the following ten statements was to determine the general approach of students and staff members towards learning.

S1 – Staff members
S2 – Students

Statement/Question	Percentages			
	Not at all	Disagree slightly	Agree to some extent	Fully agree
I consider myself a lifelong learner				
S1	0	0	12	88
S2	1	5	35	59
Reflective practice is a method for quality improvement				
S1	0	0	8	92
S2	10	18	50	31
Critical reflection facilitates the integration of theory and practice				
S1	0	0	12	88

	S2	1	16	54	19
Reflection encourages a holistic approach to patient care					
	S1	0	4	12	84
	S2	3	15	51	31
Reflection leads to an acceptance of professional responsibility					
	S1	0	4	16	80
	S2	2	12	42	44
Enhancement of self-esteem occurs through the learning strategy of critical reflections					
	S1	0	4	20	76
	S2	3	14	52	31
Reflection provides the opportunity for continual re-focusing of work activity					
	S1	0	0	0	100
	S2	0	10	45	45
The reflective journal is an effective learning instrument					
	S1	0	4	40	56
	S2	9	29	41	21
When reflecting together, as partners in the learning environment, trust-building increases the effectiveness of reflective practice					
	S1	0	4	8	88
	S2	4	18	48	30
I consider myself as a "natural" reflector					
	S1	0	4	60	36
	S2	14	22	42	22

Table 4.6. Respondents' general approach to learning

Respondents agree (12% and 35%) and agree fully (88% and 59%) that they consider themselves as lifelong learners. This is positive in terms of the fact that all the role players in the radiography context view continuous improvement of competence as an integral part of being a professional.

Overwhelming 23 staff members (92%) reckon reflective practice can be a method for improving quality. Half of the students (50%) agree to a certain extent that reflective practice can be applied in this regard.

Staff members felt strongly about the fact that critical reflection facilitates the integration of theory and practice very well (88%). In total 54% of the students agree about this only to some extent.

A holistic approach to patient care can be encouraged by reflection according to 21 staff members (84%) and 52 students (31%). Staff members are starting to realise the value of reflection as a learning strategy supporting the holistic approach to patient care. After 10 weeks of reflective practice the majority of the respondents acknowledged that reflection leads to the acceptance of professional responsibility. 76% of the staff members admitted that enhancement of their self-esteem occurred through critical reflections. As many as 89 students (52%) acknowledged the importance to enhance the self-esteem.

The opportunity for continual re-focusing was indicated by all 25 staff respondents (100%) and student respondents (45%).

At least 56% staff members in comparison with 21% of the students regarded the reflective journal as an effective learning instrument.

Partners in the learning environment reflecting together can increase trust building within the reflective group as indicated by 22 staff members (88%) and 82 students (48%).

All respondents were hesitant to rate themselves as complete "natural" reflectors (42% and 60% respectively).

The researcher is of the opinion that academic and clinical staff members' perspectives, experiences and feelings about the value that can be obtained through the implementation of reflective practice, differ from the view of the students. The reason for this might be the fact that learners are not exposed to the principles, application and benefits of reflective practice at school level.

In general the students were not as positive and enthusiastic about the concept of learning as well as that of critical reflection as a learning strategy in comparison with the staff members. Research is based on the premise that research should lead to change; change should be incorporated into the research process itself. As the period of reflective practice was only 10 weeks, the cycles of action research (planning, acting, and reflecting) should actually continue in which thinking, doing and observing can be interwoven and repeated (spiral-principal). This pre-defined or logically sequential process might then change students' perceptions and experience of the value of critical reflection and journal keeping.

Furthermore, the fact that only 47 respondents consider themselves as "natural reflectors" convinced the researcher to foster critical thinking and reflection in such a way through different learning activities to contribute towards transformative learning. Critical reflection as a learning strategy stimulates all four quadrants of the brain. (Whole Brain Model Hermann, 1994). The challenge, therefore, to educators is to plan learning strategies, which will vary brain activities so that learners of different preferences may be more inclined to enter into learning events.

Respondents' perspective on the reflective process

The reason for asking the questions in this section of the questionnaires is to determine the essence of the process of reflection, the most effective way to record reflections and to determine whether critical reflection assists the students in the concept of metalearning.

S1 – Staff
S2 – Students

Questions/Statements	Percentages

		Not at all	Disagree slightly	Agree to some extent	Fully agree
To what extent will reflection simply occur?					
By knowing about it	S1	8	24	36	32
	S2	8	18	43	31
Writing a reflective journal	S1	0	4	40	56
	S2	11	28	43	18
Through clinical supervision	S1	0	12	32	56
	S2	11	20	44	25
Writing a reflective journal encourages … a student's own personal development	S1	0	4	16	80
	S2	8	21	40	31
sharing a student's development with others	S1	4	4	24	68
	S2	9	21	41	29
There are many ways of recording reflections. To what extent can the following methods be useful in radiography?					
Portfolios	S1	4	0	24	72
	S2	17	27	39	17
Discussion groups (learning groups)	S1	4	0	24	72
	S2	4	13	47	36
Incident file (clinical)	S1	0	16	36	48
	S2	5	28	49	18
Case study (group work)	S1	0	8	32	60
	S2	6	18	44	32
Feedback is an essential element of the reflective process. To what extent will the following feedback mechanisms be useful?		0	8	52	40
Peer feedback	S1	3	22	50	25
	S2	0	0	40	60
Reports by staff members	S1	6	18	46	30
	S2	0	4	48	48
Self-assessment	S1	4	18	41	37
	S2	4	12	52	32
Group feedback	S1	2	18	48	32
	S2				

To what extent did reflection assist you as a student in constructing meaning from your learning experiences? (metalearning) S1 + S2		5	21	53	21
The way in which facilitation of reflective practice is done, is most effective when it is …					
one-to-one with a staff member	S1	44	-	-	-
	S2	35			
in a group with a staff member	S1	56			
	S2	65			
The process of reflection is…					
a personal process	S1	32	-	-	-
	S2	37			
a social (group) process	S1	0			
	S2	6			
both	S1	68			
	S2	57			
The best time to introduce/implement reflective practice in the learning programme is …					
as soon as possible	S1	68	-	-	-
	S2	61			
in the first year	S1	20			
	S2	18			
in the second year	S1	0			
	S2	0.5			
in the third year	S1	0			
	S2	0.5			
in the fourth year	S1	0			
	S2	0			
there is no specific time	S1	12			
	S2	20			

Table 4.7. Perspective on the reflective process

After completion of the data analysis with regards to the perspective on the reflective process, and only during the process of presenting the above data in table format the researcher then realised that a minor problem in the structural layout of the questionnaire, resulted in the appearance of the data in table 4.7.

It is interesting that the frequencies expressed as percentages are distributed equally between knowing about it, writing a reflective journal or through clinical supervision. Staff members though, are of the opinion that reflection occurs by keeping a reflective journal (56%) as well as through clinical supervision (56%) in the clinical facility (work place). In comparison the students are much more uncertain about when reflection will simply occur (43%).

Students once again are not sure whether writing a reflective journal encourages one's own development or sharing it with others. (40%) while staff members feel strongly that writing a journal (80%) and sharing it with others (68%), encourage a student's own development.

According to staff members the following methods can be used in radiography to record reflections: portfolios (72%), discussion learning groups (72%), incident files (48%) and case studies (60%). Students (26%), however, are on average of the opinion that the abovementioned methods can be used successfully.

Feedback forms an essential part of the reflective process. Respondents are not convinced that mechanisms such as peer feedback (40% & 25%), reports by staff members (60% & 30%), self-assessment (48% & 37%) and group feedback (32% & 32%) are effective and sufficient.

Students are of the opinion that facilitation of reflective practice is most effective when done in a group with a staff member (65%). Staff members also feel that facilitation of reflective practice in a group is more effective than on a one-to-one basis (56%).

Most of the respondents (staff 68% and students 57%) indicated that they had experienced reflection as a personal process that is complemented by a group dimension or social process.

Staff (68%) and students (61%) are quite convinced that the best time to implement reflective practice at higher education level is as soon as possible after commencement of the learning programmes.

Student respondents are of the opinion that reflection assisted them to some extent in constructing meaning from their learning experiences (53%).

It is clear from the data regarding the reflective process that reflections must be recorded in such a way that it will assist the student to construct meaning from learning experiences. This process of reflective practice must be introduced as early as possible in learning programmes in the first year of study and feedback needs to be more effectively facilitated in a group. Finally, it was evident that reflection is regarded as a process that is characterised by a personal and a group dimension.

Respondents' perspective on critical reflection as a learning strategy (academic and clinical staff)

This section of the questionnaire was about the perceptions, experiences and opinions of the participants with regard to critical reflection as a learning strategy. The questions and statements for staff and students are different, but in essence the outcome to be reached was the same.

Statements	Percentages			
	Not at all	Disagree slightly	Agree to some extent	Fully agree
Staff members' responsibility (role) in creating an open and supporting atmosphere for reflective practice	0	0	12	88
The sensitivity of staff members towards diverse learning styles of students	0	0	52	48
The creation of equitable learning environments for students by staff members to develop their own reflective skills	0	0	56	44
Reflective practice can be a method for evaluating the purpose of instruction	0	0	28	72
Reflective practice can be a method for evaluating the effectiveness of instruction	0	4	12	84
The assessment policy of the training institution does make provision for reflective assessment methods	0	8	52	40
A reflective journal can be a method to assess whether a student is learning effectively	0	4	32	64

Staff members need to be alerted to the difference between personal disclosure and evidence of reflective practice	0	4	24	72
Staff members lack reflective skills	12	16	40	32
Time available in the learning programmes for reflective practice is sufficient	8	20	32	40
Resistance experienced by staff members after the implementation of reflective practices	12	20	48	20
Staff members' perspective on aspects which have an influence on reflective practice:				
• Cognitive ability of the student	8	12	20	60
• Willingness to engage in the process of reflective practice	0	0	16	84
• The influence of orientation to change	0	0	36	64
• Inconsistency of measuring the outcomes of critical reflection	8	8	24	60
• Language skills of the student	12	12	28	48
• The promotion of discourse	4	8	40	48
After 10 weeks of reflective practice, staff members reflect on:				
• the increase effectiveness as a professional practitioner;	0	0	20	80
• assistance to students to learn effectively;	0	0	36	64
• facilitation of planning instructional activities;	0	8	48	44
• change initiation to the existing practice;	0	0	40	60
• better understanding of students' learning style preferences	0	8	32	60
Critical reflection as a learning strategy has had more success in the:				
lecture room	48	0	0	0
clinical setting	52	0	0	0

Table 4.8. Academic and clinical staff members' perspective on reflection as a learning strategy

The staff respondents indicated that academic and clinical staff needs to take responsibility to create an open and supporting atmosphere (88%) for reflective practice.

Reflective practice can be a method to evaluate the purpose of instruction (72%) and its effectiveness (84%). Staff members need to create equitable learning environments (56%) and be sensitive to differences in learning style preferences (52%).

According to the data the participating institutions do provide, at least to a certain extent (92%), methods for reflective practice in their assessment policies.

As many as 68% of the staff that had already implemented reflective practice (to a certain extent), experienced slight resistance to it. This can be due to the fact that the concept of critical reflection as a learning strategy has not yet been widely implemented. Another possibility is that the spiral effect of action research should continue so that its application and value can be proved to all concerned.

Staff respondents (64%) indicated that a reflective journal can be utilised to assess effective learning and 72% said there must be an alertness of personal disclosure and evidence of reflective practice (72%). Only 40% of the staff felt the time available for reflection is not sufficient. Timetables and clinical work

schedules need to be compiled with a view to allow more time for reflective practice.

Staff members feel to some extent that they lack reflective skills; another 32% are of the opinion that they really need updating on reflective skills. Notwithstanding their apparent lack of reflective skills, the success of reflective practice is still acknowledged in the lecture room (48%) and in the clinical setting (52%).

According to the staff respondents, aspects such as cognitive ability (60%), the students' willingness to engage in the reflective process (64%), language skills (48%) and the promotion of discourse (48%) may influence reflective practice.

A change in learning strategies (60%) and the inconsistency of measuring the outcomes of reflective practice (60%) have a negative influence on reflective practice as such.

After the 10-week implementation period of reflective practice, the staff members' reflections were positive and an increase in effectiveness of staff (80%) and the facilitation of instructional activities (60%) was visible.

As many as 60% of the staff respondents did acquire a better understanding of learning style preferences. Assistance and support of students (64%) can also be a contributing factor (44) towards reflective practice.

Respondents' perspective on critical reflection as a learning strategy (students) incremental

Statements/Questions	Percentages			
	Not at all	**Disagree slightly**	**Agree to some extent**	**Fully agree**
Students experience the process of reflection and journal writing as progressive	8	35	36	21
The implementation of the reflective journal as a learning method is challenging	5	22	38	35
Students experienced the feeling of "ownership of learning" by completing a journal	11	32	37	20
The reflective journal assists students to "make sense" of what they learn	7	25	39	29
Personal progression could be noticed after a period of time	11	29	36	24
Students feel comfortable about students and staff members who might read or look at their journals	23	25	28	24
Students need to realize the importance to be more flexible in their approach to learning	6	21	44	29
A more comprehensive orientation regarding journal writing and reflective practice could have made life easier.	4	31	44	21

Students' reflections are regarded as deep rather than superficial	5	21	49	25
Critical reflection is regarded as a "personal awareness discovery process"	9	16	47	28
Students are taken to higher levels of reflection by keeping a journal	10	26	36	28
The successful managing of "making sense" in the light of past and future experiences	5	21	45	29
To what extent do the students reflect critically with:				
integrity	1	11	54	34
openness	3	15	51	31
commitment	4	25	37	34
fear	18	35	37	10
compromise	7	29	44	20
defensiveness	10	29	48	13
not one of the above	60	12	15	13
Letting go of my familiar learning methods during the 10 week reflective practice period left me rather…				
anxious	25	30	32	13
uncomfortable	19	26	28	27
struggling	16	27	31	26
satisfied	17	33	34	16
excited	25	38	25	12
uncertain	16	29	34	21
hopeful	15	28	31	26
Aspects regarded as positive after the period of reflective practice (10 weeks):				
increase in learning motivation	8	17	48	27
recognising individual progress	6	18	52	24
enhancement of confidence	8	22	41	29
increase in learning independence	8	22	38	32
During self-confrontation, I managed communicating with myself …				
easily	42	-	-	-
sometimes problematic	48			
difficult	10			

Communicating with peer group members on a weekly basis was experienced as:				
open and relaxed	73	-	-	-
challenging and difficult	27			
Engaging in the writing task of keeping a journal was:				
very easy	30	-	-	-
challenging and difficult	70			
The time spent per week by students reflecting on learning experiences:				
• Reflecting in a journal				
10 minutes	57	-	-	-
20 minutes	33			
more than 30 minutes	15			
• Documenting and writing in the journal				
10 minutes	56	-	-	-
20 minutes	22			
more than 30 minutes	11			
• Participation in reflective learning groups:	11			
15 minutes	56	-	-	-
30 minutes	32			
more than 30 minutes	12			

Table 4.9. Students' perspective on reflection as a learning strategy

In total 33% of the students did not experience reflective practice as progressive but personal progression could be noticed after a period of 10 weeks of reflective practice.

Students experienced keeping a reflective journal as challenging (73%), although 48% of the students felt uncomfortable about students and staff reading their journals.

Students (to some extent) agreed that reflective learning and keeping a journal assisted them in making sense of what they had learnt (68%). Only 20% of the students experienced the feeling of ownership of their learning.

As many as 73% of the students realised that they needed to be flexible in their learning approach and 75% of the students regarded reflection as a "personal awareness discovery process".

Students (74%) were of the opinion that a more comprehensive orientation towards reflection would have been a great help. Keeping a journal proved to students (74%) that they could take their reflections to a higher and deeper level over time.

Students did not critically reflect while keeping a journal with integrity (34%), openness (31%), commitment (34%), but with fear (10%), compromise (20%) and defensiveness (13%). Firstly students need to be better orientated regarding the principles, value and benefit of this alternative learning strategy before they will be committed to this process of transformative learning.

After the period of reflective practice the respondents regarded the following aspects as positive: increase in motivation for learning (73%), recognising individual progress (76%) and enhancing confidence (70%).

Student respondents sometimes found communicating with themselves during the self-confrontation phase problematic (48%); a further 10% of the students found it difficult. Human beings never like the mirror image where one is confronted with reality. It was challenging and difficult for students (70%) to engage in the writing task of keeping a journal.

Students utilised twenty minutes and less to do reflection on learning experiences per week. In total 56% of the respondents took 10 minutes to document/write in the journal, with 22% taking 20 minutes. On average a further 15 minutes per week were spent reflecting together as a learning group (56%). In total 32% of the respondents spent 15 minutes on participating in a reflective learning group.

4.6   CONCLUSION

This chapter provided the data obtained by means of the pilot study questionnaire, observations, structured focus group interviews and the final questionnaires. Staff members observed the 10-week period of reflective practice where students had to keep a reflective journal and attended weekly reflective learning groups.

The objective of the research process was to determine whether critical reflection as a learning strategy could be of value in the radiography teaching and learning

environment as well as to all the role players involved in this process. Different methods of analysis were utilised to make sense of all the qualitative and quantitative data obtained.

The next chapter aims at discussing the findings, draws conclusions and makes recommendations.

CHAPTER 5

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1   INTRODUCTION

In this chapter the researcher concludes the thesis with a discussion of the integrated results obtained through a process of triangulation of research participants (students, academic and clinical staff) and through quadangulation of data collection. The focus is on reflective discussion of the methodology as well as on the conclusion of the research findings. The researcher offers recommendations on how health science facilitators of learning can expose the students to effective and transformative learning strategies such as critical reflection to become lifelong practitioners that will take responsibility for their own learning within the health science domain.

5.2   REFLECTIVE DISCUSSION OF THE METHODS

This research study inevitably focused on all the role players in health science education. "Health professionals in general try to answer research questions facing them in their daily practice, as they try to respond to the current rapidly changing social scene in South Africa" (Van Rooyen, 1998:79).

A mixed methods design with a combination of qualitative and quantitative approaches to the research proved to be the most appropriate technique. An action research approach was also included in the research design. I as the researcher needed to be an active "learner" watching, communicating, experiencing, and reflecting with the other role players.

A mixed methods research approach can answer a broader and more representative range of research questions because the researcher is not confined to a single method or approach. It can also provide stronger evidence for a conclusion through convergence and corroboration of findings (this is the principle of tri- and quadangulation). Qualitative and quantitative research can add insight and understanding that might be missed when only a single method is used. This research approach therefore produces more complete knowledge necessary to inform theory and practice.

According to De Vos et al. (2002:423), "a more holistic understanding and better ways of achieving change is possible with an action research approach". This principle of self-development is evident, where all the role players (students, academic and clinical staff) must organise themselves to reach the specified outcome of effective transformative learning.

Furthermore, this study functions on a multi-disciplinary approach and a shared conceptual framework in which all role players are involved.

The research study implies a process of collective reflection and self-realisation in order to assist students to regain confidence in their own learning. In this way participants are encouraged to share their learning experiences, to reflect critically and to make adjustments if and where necessary.

The quadangulation of data collection methods allowed this research to fit in with the "dominant-less-dominant" design of Creswell (1994). In the overall research the qualitative paradigm dominated with the observations and interviews, but in the evaluative phase a traditional quantitative questionnaire was very appropriately utilised.

5.3   RESEARCH QUESTIONS, AIM AND OBJECTIVES OF THE STUDY

This chapter presents a summary of the findings of the research. The research aim and objectives as indicated in Chapter 1 are highlighted again.

The purpose of this study is indicated and discussed in Chapter 1, namely to evaluate strategies:

- of facilitating effective learning,
- to promote the concepts of ownership and reflection on learning,
- for promoting a learning-centered approach,
- to integrate theory and practice through a reflective learning approach.

It is important to realise that facilitators of learning in health sciences can actively contribute towards effective learning by planning learning strategies and creating learning opportunities that will enhance the possibility of each student to construct his/her own meaning.

Critical reflection is embedded in all quadrants of the metaphoric Four-Quadrant Brain Model of Herrmann (1996) and can therefore be considered a holistic learning strategy that is planned by the facilitator. During the 10-week reflective practice session students weekly engaged in reflective discussions, in which certain actions continuously surfaced and that may be assigned to the four quadrants of the whole-brain. Reflective learning group discussions may therefore be considered and categorised as a whole-brain learning strategy.

In health science education critical reflection can blend learning through experience with theoretical and technical learning to form new knowledge construction and insight.

In Chapter 1 the following overarching research question and sub-questions were posed:

How can health science training institutions integrate critical reflection through action learning to add value to in-depth, independent, self-regulating and lifelong learning?

- To determine the value of integrating critical reflection in the learning outcomes.
- To determine the relationship between the students' learning style and critical reflection as a learning strategy.
- To develop and implement different tools to create learning opportunities for reflective learning.

- To evaluate whether critical reflection as a learning strategy can be applied to stimulate and inform practice.

- To promote the principles of lifelong learning for health science students through critical reflection

5.4 MAIN FINDINGS OF THE RESEARCH

The purpose of this section is to present the findings of the research in relation to the questions and rationale of the study as outlined in the section above (section 5.3) and the literature review presented in Chapter 2.

Research sub-question 1

What is the value of integrating critical reflection in the outcomes of learning programmes in health science education?

Literature as discussed in Chapter 2 shows that a researching-while-teaching approach (Schartz, 1993) is needed to be able to improve teaching and learning in general. The intention is to improve professional practice through action learning and research.

Currently in health science education the emphasis is still on the "technical rationality" model of professional education (Schön, 1983) with the focus on teaching technical expertise and systematic procedures. To be able to break down these barriers, value must be added to the learning outcomes of

programmes by means of effective and appropriate learning strategies to strengthen the learning-centred approach.

Health science education in general is characterised by a work-integrated learning component. The importance of integrating theory and practice, as well as learning from experience is therefore evident. There is a necessity to follow a cyclic process of actions and reflections-on-actions.

A reflective approach to learning and learning facilitation, which will enable students to understand the importance and value of their own learning needs and to take the responsibility for their own learning, is called for.

To create the dynamics of enhanced effectiveness and individual understanding (Gray, 2001), the integration of a reflective learning cycle with action learning is promoted. Furthermore, the integration of reflective thinking as an aspect of learning (Dewey, 1993) should be part of the outcomes of the learning programme.

Literature indicates that reflective discourse is the medium by which critical reflection can be put into action to promote and develop transformative learning (Taylor, 1998).

In terms of research question 1 this study shows that 47% of the respondents in the pilot study indicated that they did not have a proper understanding of the relevant concepts such as reflection, reflective practice, etc. but 74% of the respondents agreed that critical reflection can add value to effective learning (section 4.2). 81% of respondents indicated that the value of reflection for all the role players is dependent on the active involvement and commitment of all concerned.

During the 10-week reflective time period it was observed that the utilisation of critical reflection as a learning strategy is more valuable if it is integrated in the outcomes of the learning programme at an early stage (first year of study).

From the interviews it is evident as illustrated in Figure 4.1 and 4.2 that as many as 71% of the students and 86% of the staff members gained personal and developmental value from the 10-week reflective practice period. During this period students kept a reflective journal and attended a weekly reflective learning group session observed by staff members and the researcher.

From the information obtained from the questionnaires at the end of the action research process it was clear that students' motivation increased (75%), individual progress was recognised (76%) and enhancement of confidence (70%) and the increase in learning independence were evident (Table 4.9).

Furthermore 52% of the students were of the opinion that value was added to their own learning through sharing learning experiences (Figure 4.6) in a small reflective learning group of 4-5 students, as indicated by 86% of the respondents (Figure 4.9).

Students indicated that it was important that they took responsibility for their own learning (18%), with 12% that said that they realised through reflective practice that learning is a holistic, but personal process. In total 29% appreciated the fact that reflective practice made them aware of mistakes/errors that could have been avoided in this way (Figure 4.14).

In Figure 4.15 it is indicated that only 18% of the student focus groups realised the importance of taking responsibility for their own learning. As observed during the weekly reflective sessions 58% of the students did not really take any serious responsibility. Positive feedback obtained from the observation is that 28% of the students showed interest and accepted responsibility for their own learning.

Research sub-question 2

What is the relationship between the learning styles and critical reflection as a learning strategy?

According to Knowles (1990), effective learning takes place if the whole brain is involved in learning. Lumsdaine and Lumsdaine (1995) documented four learning modes highlighting whether a learner is a whole brain person or not.

From the questionnaires it was clear that respondents were hesitant to rate themselves completely as "natural" reflectors, but 36% of the staff members and 22% of the students rated themselves respectively as "natural" reflectors (Table 4.6). The need to discuss and explore the students' learning experiences and to develop their thinking skills further may not be achieved through writing reflective journals alone, and therefore other learning tools/methods need to be investigated.

During the interviews and after the completion of the reflective phase of 10-weeks 71% of the students indicated that despite being unaware and uninformed about their learning styles and thinking preferences, they would integrate reflective practice in their daily learning activities.

Research sub-question 3

Which learning tools/methods can facilitate opportunities for reflective learning?

Literature states that different learning tools are conducive to transformative learning, specifically if a learning strategy such as critical reflection is utilised. According to Gravett (2005) several learning tools such as portfolios, case studies, incident files, etc can be implemented to enhance critical reflection.

62 % of the respondents (Table 3.11) identified the following opportunities to reflect learning experiences utilising the following tools/methods:

reflection reports on experiential learning in the work place, group discussions, case study presentations, problem-solving tasks, simulations, portfolios and image critique sessions (evaluation of radiographic images).

During the 10-week reflective practice time period students had to keep a reflective journal and then needed to attend a weekly reflective learning group that was observed. The reflective journal as a learning tool/method was decided on by the researcher because of practical issues such as providing a journal to all students, and keeping a journal laid the foundation for reflective discussions.

Student focus groups indicated that 76% found it difficult and 18% found it extremely difficult to keep a reflective journal (Figure 4.3). Aspects contributing to the difficulties experienced by the students were lacking writing skills (23%), limited time available to document reflections (29%) and lacking general reflective skills (47%). These are represented in Figures 4.5 and 4.7. The total absence (100%) in terms of students' discipline to keep a reflective journal is a real concern (Figure 4.13).

Gray (2001) identifies how a reflective learning cycle can be integrated with action learning in the learning programme of nursing to create the dynamics of enhanced effectiveness and individual understanding. McKay (Ember, 2001)

indicates the inter-relationship between the cycles in the radiography programme where learners are encouraged to keep reflective journals and use clinical experience to inform tutorial discussions.

Research sub-question 4

Can a learning strategy such as critical reflection be applied to inform and promote practice?

Reflection can be a tool for directing and informing practice setting or for transforming and reconstructing the social environment (Williamson, 1997). The social environment implicates the different clinical settings within a medical context.

Students in health sciences need to take greater responsibility for both their learning and their understanding of the relationship between theoretical learning and its application in clinical placements.

The acquisition of critical reflective and creative thinking skills results in the development of competencies. Students therefore acquire skills that will develop the practice, based on intellectual commitment, of using those skills to direct behaviour (Shriven, 2000). Taylor (1998) considers critical reflection as the distinguishing attribute of adult learning and as a vital process in transformative learning.

The study has revealed that the learning environment for radiography education consisting of an academic and work-integrated clinical component offers enough opportunities for integrating an alternative learning strategy such as critical reflection. A 100% of the students indicated that there was clearly no time available, especially in the clinical setting, for reflective learning group discussions in practice (Figure 4.10). The serious shortage of radiographers also contributes to overworked staff and very limited time for any additional learning activity. This unfortunately does not contribute to transformative learning in the clinical work-integrated learning environment. It was revealed in the questionnaires that students spent only ten minutes on average doing personal reflection (self-confrontation), writing a journal or participating in reflective discussion (Table 4.7). Students used a calculated total of 45 minutes per week on average for personal reflection during the phase when reflective practice was implemented.

The information in Figure 4.10 obtained during the interviews, indicates that the time available for reflective practice seems to have an influence, especially in the clinical setting. However, students' unwillingness and lack of commitment to investigate alternative strategies to enhance learning effectiveness (44%), the lack of knowledge regarding alternative strategies to promote the concept of metalearning and effective learning (28%) as well as the absence of academic leadership in terms of promoting transformative learning (14%) are major concerns.

It was furthermore observed that an aspect like available time in the clinical setting for reflective discussion might hinder or limit the value and effectiveness of critical reflection to inform practice. In Table 3.13 comments such as: "…the reality of having to work and to study simultaneously, there is not a lot of time to do something else like reflection…" (RPOS 09) are listed.

Positive comments are proof of the value of critical reflection as a learning strategy to integrate theory and practice: "… the integration of knowledge and skills in the work place gives me a positive feeling and it is easier to reflect on it…" and "…I need to learn quickly in practice, through reflection I can identify my mistakes more easily…" (Table 3.13, RPOS 14). The following comments emphasise the value of critical reflection to inform and direct practice:

 "…reflecting critically by keeping a weekly record was a good method to evaluate my integration of theory and practice…" and "…I feel more comfortable with the principles of reflective practice (week 7)…"(Table 3.13, RPOS 22)

In the questionnaires staff members felt strongly about the fact that critical reflection facilitates the integration of theory and practice very well (88%), and another 54% of students agreed about this only to some extent (Table 4.6). The successful integration of reflective practice in the lecture room is acknowledged by 48% of the staff members and by 52% in the clinical setting (table 4.8).

Research sub-question 5

Does critical reflection promote the principles of lifelong learning in health sciences?

The Continuous Professional Development (CPD) system, which is a prerequisite for annual professional registration with the Health Professions Council of South Africa (HPCSA), requires an accumulated number of points that reflect the fact that a certain level of knowledge, skills and competencies has been acquired in a prescribed time. Furthermore, in the medical environment there are increasing demands from the Department of Health as well as the employers in the private sector for reflective clinical practice, skills and attitudes appropriate to professional practice.

Health science education has traditionally focused on the assimilation of vast amounts of knowledge and on clinical apprenticeship as the "hallmark"of good education, and has undervalued reflection in learning (Pee et al., 2000). Today, however, health science education needs to prepare student for lifelong learning and to achieve this, a more reflective approach to learning is called for.

Higher education has been identified to play a vital role in economic and social development (UNESCO, 1995:3). Maintaining the relevance of education and the need to be lifelong students necessitate a change in focus from teaching to learning. The students have to be actively involved in constructing their own

knowledge and therefore a different educational approach, which is more learning-centred, has to be introduced.

Technology expansion, knowledge and educational innovations require a graduate who will be able to cope, adapt and continue learning in the world of work (Fielden, 1998). Crouse (1988:1) therefore suggests that students "be prepared by systematically developing their abilities in order to equip them for lifelong learning and creative application of knowledge on a high intellectual and scientific level". There is an urgent drive to shift the emphasis from teaching to learning, in other words from lecturing to the facilitation and management of learning.

In the findings of the study the value of working together in a learning group, supporting one other and sharing learning experiences, is a catalyst in terms of promotion, building individual confidence and encouragement through reflective practice. The aforementioned aspects observed during the 10-week reflective action-learning phase can be regarded as building blocks for successful implementation and enhancement of the concept of lifelong learning.

The study indicates that 72% of the students demonstrated the ability to master the skill of reflection relatively well and another 14% were very successful in mastering it (Figure 4.12). Figure 4.7 underscore the importance for students to continue with the process to master and improve reflective skills.

As indicated in Figure 4.19 reflective practice does not only enhance lifelong learning, but it is also a tool for quality purposes. Staff members (92%) indicated that they regard reflective practice as a tool for quality control to determine the effectiveness of their own facilitation of learning (Table 4.8).

Furthermore, critical reflection as a learning strategy was regarded by 28% of the respondents as having positive outcomes, such as the opportunity to share learning experiences (14%) and to improve communication within a specific reflective learning group (14%).

During the focus group interviews 71% of the students indicated that they would definitely integrate reflective practice as an integral part of their daily learning activities (figure 4.23). This could be an indication of the intension of students to become lifelong learners.

Respondents agreed (staff 88% and students 59%) that they considered themselves to be lifelong learners (Table 4.6). This is positive in terms of the fact that all the role players in the radiography context view continuous improvement of competence as an integral part of being a professional.

All (100%) the staff respondents (academic and clinical members) indicated that regular updating of knowledge and skills is absolutely necessary to be able to facilitate reflective practice and lifelong learning effectively (Figure 4.22).

The research findings to the overarching research question will be presented in the next section.

Overarching research question

How can health science training institutions integrate critical reflection through action learning to add value to in-depth, independent, self-regulating and life-long learning?

The research findings indicate that to become self-directed, flexible, metacognitive learners in health science education and for health science lecturers to become reflective practitioners themselves, students must apply the following action learning principles: analysing concrete, real-life situations; undertaking independent study; encouraging student-facilitator partnership; acting promptly; emphasising time on task; high expectations and developing diverse talents and ways of learning.

In this study learning tools, such as reflective journals and small reflective learning group discussions were investigated as learning strategies to integrate critical reflection in health science training. The research findings indicate that both methods can be utilises effectively to facilitate effective learning.

5.5   RECOMMENDATIONS FOR INTEGRATING CRITICAL REFLECTION AS A LEARNING STRATEGY INTO LEARNING PROGRAMMES

This section presents the recommendations of this study for integrating critical reflection as a learning strategy into learning programmes in health sciences.

Recommendations regarding students

- Students need to be orientated properly and in-depth orientated, with regards to the implementation of alternative learning strategies resulting in a better understanding, willingness and commitment from their side.

- The positive aspects, e.g. increased motivation, enhancement of confidence, recognition of individual progress, increased learning independence and sharing of learning experiences, need to be communicated to all health science students to highlight the value of critical reflection as a learning strategy.

- Students must be educated concerning the value and importance of metalearning as part of transformative learning in the current educational paradigm of a learning-centred approach.

- Students have to develop basic reflective and writing skills when a reflective journal is utilised as learning tool to facilitate critical reflection. The focus of the reflective journal is the thinking process of students; development of reflective writing skills facilitated by the reflective journal encourages students' active involvement in and taking responsibility for their own learning. When utilising tools such as a reflective journal and portfolios, the narrative mode of analysis needs to be developed.

- Effective time management and planning of reflective learning activities are essential to optimise the value of critical reflection. Students need to utilise the limited time available in especially the clinical setting where integration of theory and practice culminates in engaging in reflective practice.

- Students need to be aware of their learning styles and preferences to promote their thinking preferences. The areas that are less preferred need to be developed.

- The continuous improvement of reflective skills needs attention, even in professional practice in order to function as lifelong learners.

Recommendations regarding academic and clinical staff members

- In alignment with the South African educational approach of Outcomes-Based Education, transformative learning should be promoted and included in curriculum design.

- The effective integration of critical reflection as a learning strategy should be implemented from the first year of study and can be utilised with success in the clinical setting and in the lecture room.

- To be able to take responsibility for their own learning students need to be assisted to gain insight into their preferred learning style and thinking processes.

- Designing the curriculum, writing learning outcomes and structuring learning activities to incorporate all four quadrants of the whole-brain model will facilitate the development of the full potential of a student.

- The integration of a variety of alternative learning tools to facilitate critical reflection in health science education needs to be investigated through the introduction of more research projects on a national and inter-disciplinary level.

- To facilitate reflective discussions where critical reflection stimulates and directs practice, the work-integrated component of the learning programmes should be revised and adjusted.

- Regular updating of staff members' skills to facilitate reflective learning should be a focus point for institutions involved in health science education.

- Capacity building staff members regarding their knowledge of principles, the application and value of alternative learning strategies (e.g. critical reflection), as well as the development of academic leadership should be encouraged to ensure meaningful lifelong learning.

- The support and development needs of clinical staff members involved in the delivery of learning programmes and their capacity to endorse and promote the process of reflection should be facilitated.

The limitations of this study are discussed in the next session.

5.6   LIMITATIONS

The study was limited to institutions involved in radiography learning programmes only. A wider inter-professional approach would give a bigger sample that is more representative and could be used as a generalisation of how critical reflection as a learning strategy can be integrated in health science education. Future studies should therefore examine a more diverse section of health sciences.

The inclusion of an in-depth analysis of students' learning style flexibility and staff members' thinking preferences by means of the Herrmann Brain Dominance Instrument would provide results that could enrich clarification of the relationship between learning and thinking preferences and critical reflection as a learning strategy.

The limited number of empirical studies done in other health science programmes in this country (e.g. physiotherapy, occupational therapy, etc.), to demonstrate the value of integrating critical reflection as a learning strategy could have complemented this research study in terms of comparing similarities and differences.

There are recommended areas of research that emerged from this study and these be highlighted in the next session.

5.7 RECOMMENDATIONS FOR FURTHER STUDY

Conducting this study has indicated that the study is not an end in itself but it has opened up ample opportunities for further research. The following aspects are presented as recommendations:

- The investigation of applicable and effective learning activities and methods other than reflective journals and reflective learning groups to facilitate critical reflection.

- Skills to facilitate reflection at deeper levels to guide students to the developmental level of reflection need to be clarified through participatory action research projects.

- Empirical research that aims at determining the level and extent of reflection and learning by analysis of reflective journals needs to be encouraged. More debate and exploration are therefore needed in evaluating the effectiveness of sharing experiences and reflective journals.

- The possibility to accommodate reflection using computer-based technology, for example virtual chat rooms, should be investigated.

- Curriculum design and development should take opportunities and time available for reflective practice into consideration.

- Facilitators of learning in health science education could be encouraged to get involved in multi-disciplinary and inter-disciplinary action research projects to facilitate critical reflection and promote lifelong learning.

5.8   CONCLUSION

The findings of this study undoubtedly present a challenge to all the role players in health science education in South Africa to ensure that the learning programmes are aligned with community needs, educational requirements and the expectation of students and other stakeholders like employers and industry.

A variety of learning strategies should be adopted to encourage reflection in health science students. Embedding critical reflection as a learning strategy within learning programmes necessitates a shift in philosophy from teaching in a didactic sense to facilitating learning. Embedding critical reflection within the learning programmes means time is of the essence. A crammed learning programme and limited time in clinical practice are not conducive to facilitating reflection. However, facilitation represents a new role for health science educators within both higher education and health science practice contexts.

It is trusted that the recommendations of this research will be taken into consideration and implemented by the stakeholders concerned. It is my hope that facilitators of learning in the health sciences will respond to this challenge to demonstrate academic leadership and implement critical reflection as a learning strategy in the outcomes of learning programmes as well as to facilitate transformative learning in the promotion of a more learning-centred approach that will enhance lifelong learning.

The researcher wishes to conclude with the following quotation by Beaty (1997:8) to all facilitators of learning in higher education and specifically health sciences:

We should not rely solely on our natural process of reflecting

on experiences, but actively seek ways to ensure that reflection

itself becomes a habit, ensuring our continuing development

as a professional in higher education.

CHAPTER 6

RESEARCHER'S REFLECTIONS ON THE RESEARCH PROCESS

6.1 INTRODUCTION

As an educator I untwisted a willingness to adopt a reflective approach towards health science education in order to improve my professional competence. It is extremely difficult to encourage students to learn reflectively unless the educator embodies such an approach.

For me it is essential to look for ways in which to further my knowledge and expertise and to adapt or modify my role as facilitator of learning. This internal motivation led to this research study and it became clear that in order to do so would require time and commitment.

The reflective lessons I have learnt from this research journey are rich and varied. Those offered in the next section concern my reflection on the research process.

6.2 CRITICAL REFLECTION

The following aspects relating to the research process followed materialised during the completion of the thesis:

- The finalisation of my research proposal was difficult because of my inexperience as a researcher.

- The process to get institutions of higher learning orientated, motivated and committed to participate in the research study was extremely difficult – I experienced academia as insecure and scared to open up their educational domain of practice.

- The planning and organisation of the 10-week reflective cycle was a logistical challenge – the reality is that two groups of students (e.g. 1st and 3rd years) per institution were involved, with each group and each institution having its own specific academic calendar and activities; this required intensive and detailed planning of reflective activities.

- The orientation sessions for the research participants at the four institutions had to be planned carefully – participating students and clinical staff specifically were from five provinces as far as Polokwane, Kimberley and Bloemfontein.

- The guidance of observers at two of the four institutions was time-consuming and intense – clinical staff members do not necessarily have the knowledge and experience required for a project of this nature.

- The lack of motivation and commitment of students to keep a reflective journal for 10 weeks was daunting. The students were all employer students working in clinical facilities and studying at the same time.

- The analysis and integration of data were challenging due to the vast amounts of data (Pilot study questionnaire, observations, structured interviews and questionnaires).

- The absence of information regarding the students' and staff members' learning styles and thinking preferences had a negative impact on one of the research questions.

- Presenting the research in a second language created challenges of its own.

Having done some critical reflection on the process of research, I identified the following positive aspects:

- The enthusiastic cooperation of some learning institutions to improve health science education to be more learning-centred was prominent.

- The interaction with students and staff members of other institutions during the reflective cycle of the research strengthened existing relationships; the researcher fostered an increased awareness of the demands that facilitators of learning in higher education are facing.

- The enthusiasm of the majority of participating role players in radiography education that became apparent when the value of critical reflection as a learning strategy was realised at the end of the 10-week reflective practice cycle, was encouraging.

- The realisation that this research study has the potential to stimulate other learning programmes within health science education to engage in action learning research of this nature to enhance effective and lifelong learning.

- The research project challenged me to overcome personal barriers in order to grow intellectually.

- Through the research I realized that I am even more challenged to take cognizance of the research done on learning style flexibility and to develop ways of facilitating learning, which I normally would avoid.

- The realization of the importance of communication and the implication thereof on understanding, remembering and learning is now more clear.

- I became aware of my own thinking preferences and the implications thereof for my own teaching/training practices.

- As a health science facilitator I realized the value of critical reflection as process and underlying skill, necessary to achieve specific outcomes.

- The fact that I can construct my own meaning on how students learn and how I myself like to learn will also help me to monitor my own professional development.

6.3   CONCLUSION

At the conclusion of this research study and having engaged in critical reflection myself, I once again realised that to develop excellence in higher education is a learning process in itself.

In the context of contemporary higher education I would like to conclude with the quote by Schön (1982:66), who says:

> *"Every facilitator of learning must, by regarding every imperfection in the*
> *student's comprehension not as a defect of the student, but as a*
> *defect in his own instruction, endeavor to develop in himself*
> *the ability of discovering new methods".*