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.

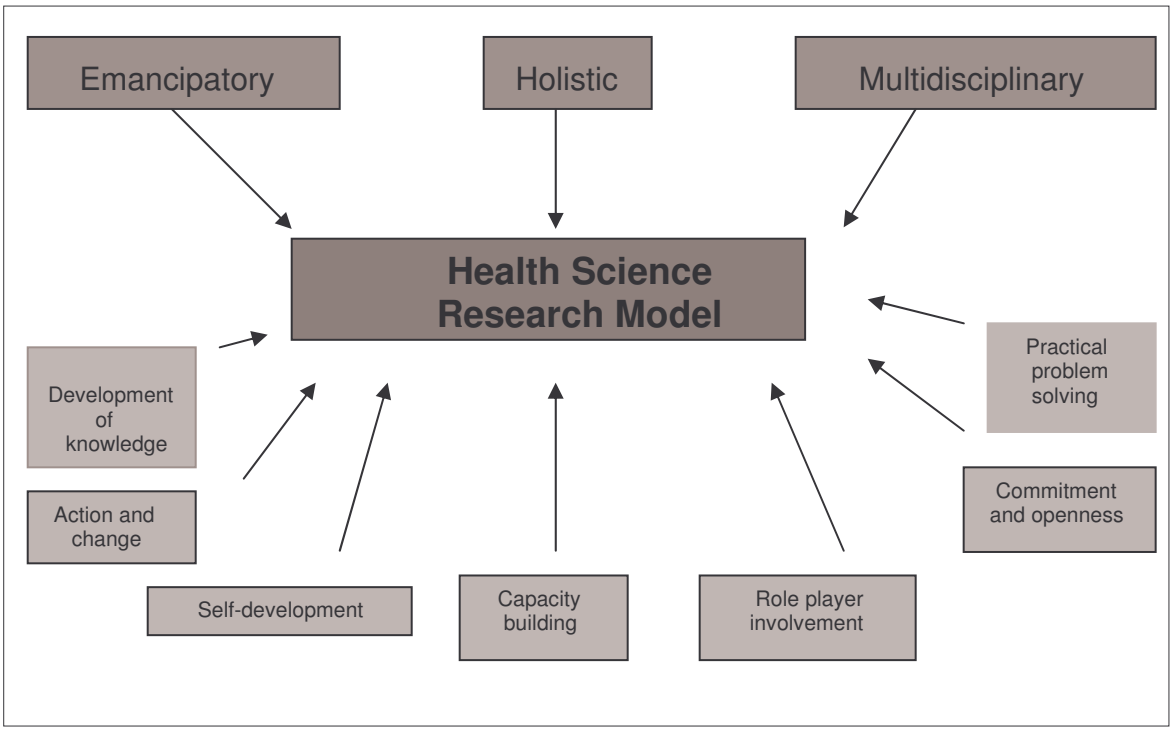

Figure 3.1. Health Science Research Model (adapted from Collins, 1999; Denzin & Lincoln, 2000; Green, 1998)

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.

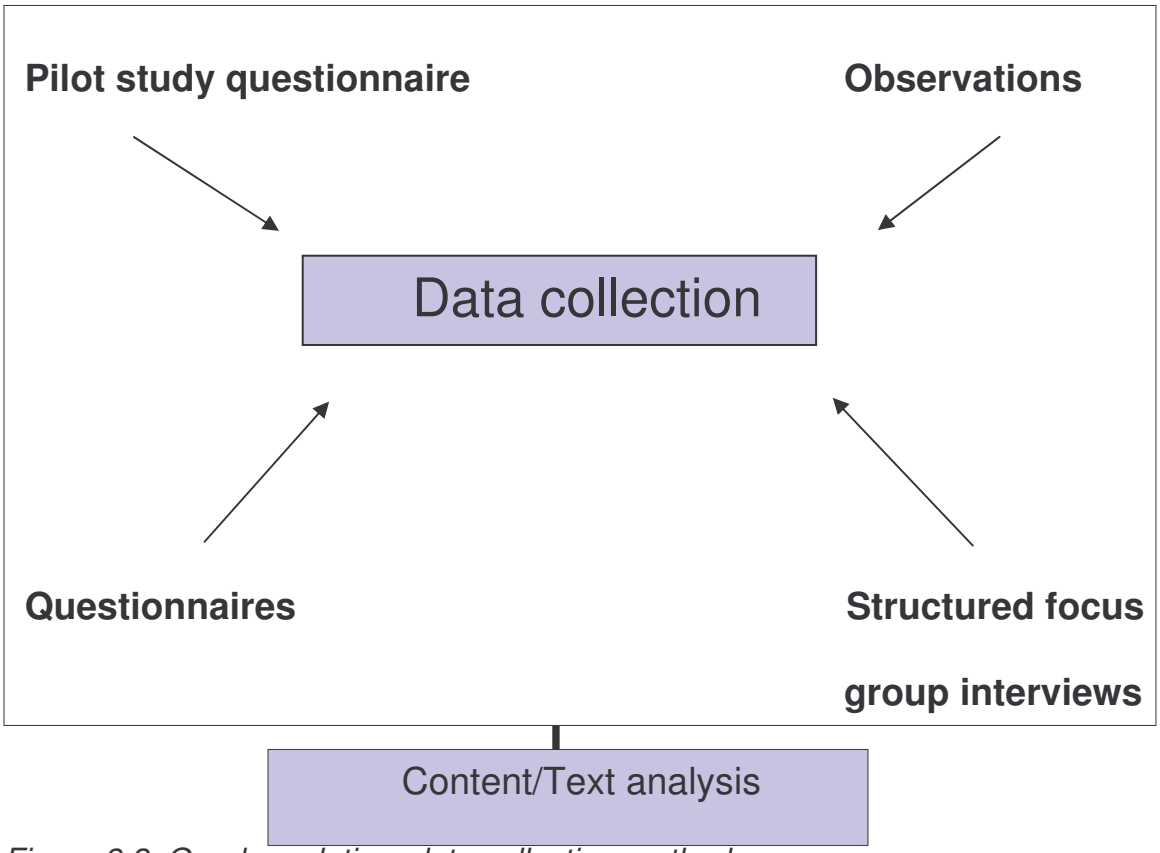

Figure 3.2. Quadangulation: data collection methods

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** 23-10-2006	**4** 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.

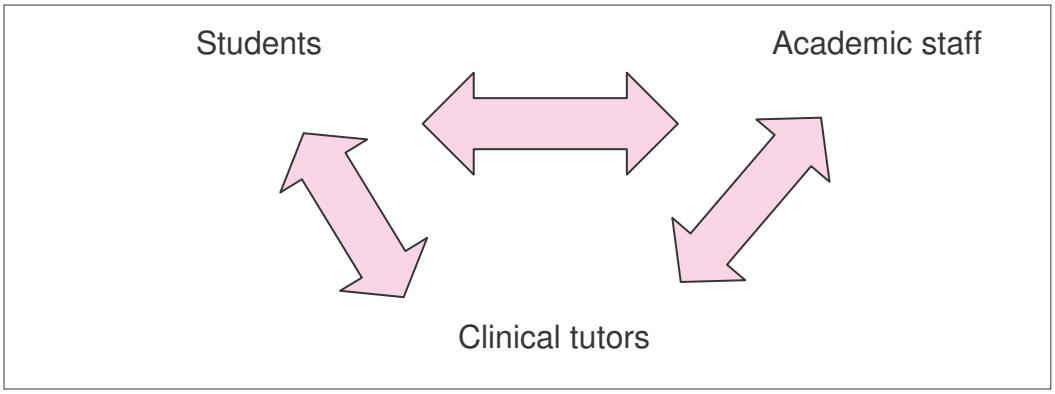


Figure 3.3. Triangulation: research participants

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 %

Yes	81 %

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

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

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

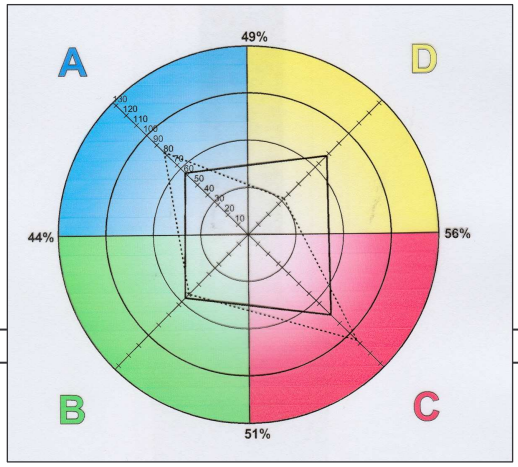
The available brain quadrant dominance scores (average %) of staff members (highest B and C) and students (highest D) are indicated in Table 3.22.

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

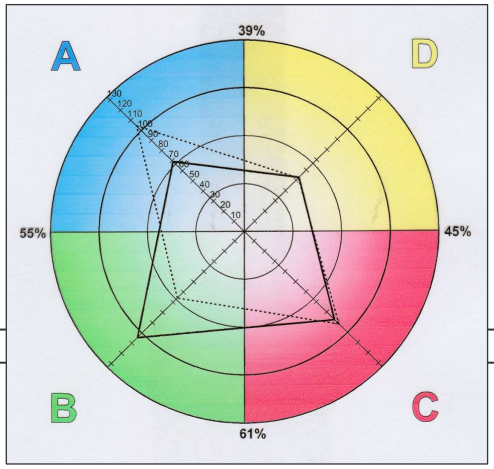
Table 3.22. Comparison of participants' average brain quadrant dominance

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

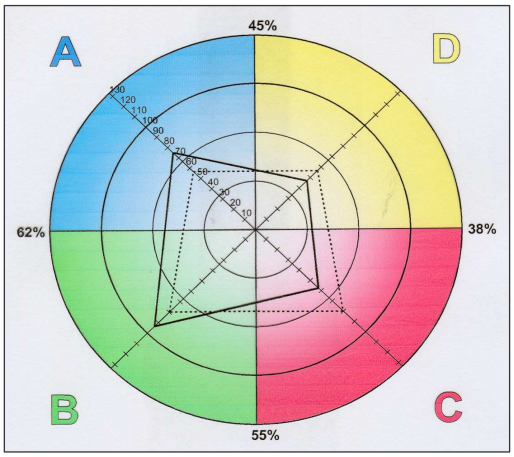
The information of four staff members (n=4) was obtained through utilising the Herrmann Brain Dominance Instrument (HBDI) and information of seventy-six students (n=76) was obtained through the Neethling Brain Instrument (NBI).



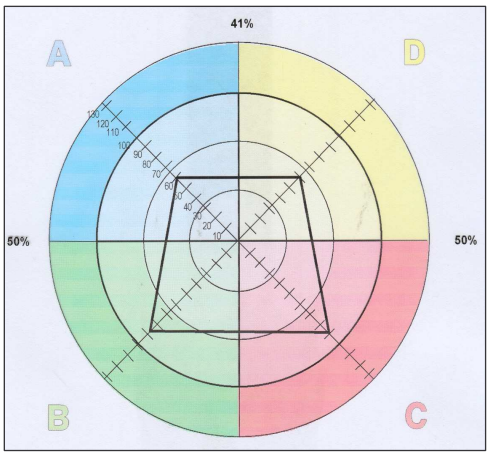
Profile 1



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.