Undergraduate Therapeutic Radiography:

Perceptions on Curricula Delivery and Preparedness for Practice using an Appreciative Inquiry Approach

By

Sue Murray

A thesis submitted in partial fulfilment of the University's requirements for the Degree of Doctor of Education

September 2020

Buckinghamshire New University
Coventry University

Copyright

Abstract

This qualitative study used appreciative inquiry (AI) to explore educational experiences that students and graduates found conducive to learning for the role of a therapeutic radiographer. Participants were final year students on a three-year undergraduate programme from one University and graduates from three radiotherapy departments in England. Data collection involved focus groups and interviews; data was analysed using thematic analysis with reference to learning principles and theories. Ethical approval was granted by NHS Trust Research Departments and the Research Ethics Committee at Buckinghamshire New University. Data acquired during the *discovery* and *dream* stages of AI indicated that active authentic teaching in academia, such as simulation, is useful prior to placement, particularly when peer and reflective learning processes are employed. Emotions and skills acquisition associated with peer learning should be explicit and advertised as part of the learner journey. Placement learning embodied socio-cultural processes facilitating acceptance into the placement culture and environment. Students were seen to form relationships with patients, peers and practitioners, yet, learning afforded from the groups differed significantly. Patients engendered feelings of worth giving impetus to learning. Supervisors and mentors who portrayed professional values and student empathy, formed positive relationships with students and empowered learning. The effects of practitioner role-modelling should not be underestimated as this was instrumental in the development of learners' professional identity, professionalism and competence. A no-blame culture, positive attitude and behaviour encouraged learning as did learner self-regulation and a positive mindset. Elective placements broadened students' minds, engendering critical thinking and aspiration. Negative and positive emotions have key roles to play in empowered learning. Participants' comments were used to create a framework of educational activities that they believed empowered learning, however, further study into treatment planning education is necessary.

Contents

List of Figures

List of Tables

Acknowledgements

I would like to give special thanks to my supervisors Gulen and Ina for their encouragement, inspiration and feedback. Gratitude must also go to Keiran who has been there throughout my doctoral journey.

Thanks also to Janet High, my former teacher and mentor, my past and present colleagues, friends and students for their interest, influences and good-natured indulgence that enabled me to complete these studies.

Finally, and most importantly, thank you to my family - I could not have done it without you!

Author's Declaration

I declare that this thesis and the work presented in it are my own and have been generated by me as the result of my own original research. I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University.
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
3. Where I have consulted the published work of others, this is always clearly attributed.
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
5. Where elements of this work have been published or submitted for publication prior to submission, this is identified and references given at the end of the thesis.
6. This thesis has been prepared in accordance with the Coventry University and Buckinghamshire New University.
7. I confirm that if the submission is based upon work that has been sponsored or supported by an agency or organisation that I have fulfilled any right of review or other obligations required by such contract or agreement.

Sue Murray

1. Introduction

This qualitative research explores a sample of final-year students' and recently-graduated therapeutic radiographers' perceptions of learning experiences on undergraduate radiotherapy programmes that educates them for their professional role. An appreciative inquiry (AI) approach has been adopted, an argument for this choice is presented later (section 3.3).

1.1. Structure and presentation of the thesis

The thesis is structured as follows:

Chapter one: introduction Chapter one provides an overview of the radiotherapy profession and the educational requirements that confer eligibility for practitioner status as a therapeutic radiographer. I also present the origins of the study and note the influences on its development. A personal reflection that embodies my beliefs, together with justification for the study design, is also included. Finally, I present the research question and the aim and objectives of the study.

Chapter two: literature review The literature review discusses evidence related to: the role of the therapeutic radiographer; therapeutic radiography curricula and methods of delivery; learning theories applicable to professional programmes and professional knowledge acquisition. Evidence includes a range of sources: peer-reviewed articles; text books; professional and statutory body documentation; radiotherapy undergraduate programme specifications and website information taken from all Higher Education Institutions (HEIs) offering undergraduate radiotherapy programmes in England in the year 2017.

Chapter three: research design and methodology Chapter three highlights how the research methodology and methods were determined, describing how the principles and stages of the appreciative inquiry (AI) cycle were employed in the study. It explains how participants were recruited, outlining the steps taken to minimise coercion and power-authority dynamics. The chapter also presents a critique of data analysis methods and proffers explanations on how the themes were extracted from the raw data. The ethical imperatives associated with the study, alongside a reflection on my position as researcher, are also included.

Chapters four: findings Chapter four presents the findings from the study within the context of learning theories and principles, citing implications for future education and practice, where appropriate. Data from the *discovery* and *dream* phases of the AI cycle have been combined rather than presented separately because similar themes arose during both phases and this approach minimised repetition. The three main themes arising from the data were:

- perspectives on teaching and learning activities;
- relationships in learning;
- the learner journey.

Of note is that emotion plays a part in each of the above aspects of learning; it is therefore discussed relevant to each theme where the contexts are presented and explored. Finally, this chapter presents a framework of intrinsic factors and educational activities that appear conducive to developing the professional identity, knowledge, skills and understanding of a therapeutic radiographer.

Chapter five: conclusions, reflections and recommendations The final chapter reports on the extent to which the research question has been met and concludes with personal reflections and recommendations for future study.

1.2. Undergraduate radiotherapy education

Radiotherapy is a specialist profession employing therapeutic radiographers who use high energy ionising radiation and imaging modalities to plan and treat patients with cancer (Society of Radiographers, 2017b). Precision and accuracy are needed to ensure that the radiation targets tumour cells whilst avoiding as much normal and sensitive tissue as possible (Khan *et al.*, 2016). To become a therapeutic radiographer in the United Kingdom (UK), it is necessary to undertake a degree programme (BSc (Hons) or MSc) accredited and approved by the Health and Care Professions Council (HCPC). Theoretical components of the vocational programme are delivered in academic blocks, whereas the technical precision and professional skills are predominantly acquired experientially through attendance at radiotherapy clinical placement sites (College of Radiographers, 2013; Health and Care Professions Council, 2014; Society of Radiographers, 2017b).

During the past few decades, there has been considerable development in the radiotherapy field with imaging playing a major role in treatment delivery and verification (Ahmad *et al.*, 2012; Baskar *et al.*, 2012; Perez and Mutic, 2013; Citrin and Mitchell, 2017). Technological advances that improve the conformity of radiotherapy to smaller tissue volumes have become more automated, requiring the radiographer to follow locally-defined protocols and systems of work so that patient safety is enhanced

(Shafiq *et al.*, 2009). Although such practices aim to minimise risk to patients by decreasing the chances of random error, automated processes can preclude recognition of the link between theory and practice and learners struggle to appreciate and apply underpinning principles to specific radiographic skills (Caruana and Plasek, 2006).

The knowledge, skills and outcomes of undergraduate radiotherapy programmes align to the HCPC Standards of Proficiency (SOPS) (Health and Care Professions Council, 2013), the Standards of Education and Training (SETS) (Health and Care Professions Council, 2014) and the College of Radiographers Education and Career Framework for the Radiography Workforce (College of Radiographers, 2013). However, the College of Radiographers 'promotes flexibility in the design and delivery of education' (Society of Radiographers, 2017b,p.1) and standards and frameworks are loosely defined in outcomes-based language. Thus, curricula content and delivery are open to interpretation, resulting in a rich variety of teaching, learning and assessment methods and curricula adopted by Higher Education Institutions (HEIs) in the UK.

An example of this relates to research; the University of Liverpool delivers research modules in years one and two, and a research project is undertaken in year three (University of Liverpool, 2017). In contrast, the curricula of the Universities of Hertfordshire and Sheffield Hallam include an introduction to research methods in year two with a research proposal or dissertation in year 3 (Sheffield Hallam University, 2017; University of Hertfordshire, 2017).

Examples of differing teaching and learning strategies are also apparent in undergraduate radiotherapy programme specifications. The University of Portsmouth (2017) lists learning and teaching methods utilised specifically for practical skills as: practical workshops; clinical demonstrations; clinical tutorials; student centred practical classes; special clinical placements; experiential learning in the clinical department; presentations; seminars; workshops; final year project. Whereas St Georges

University of London (2017) states that practical skills teaching includes: practicals; demonstrations; case studies; discussion groups; peer-assisted learning; self-directed learning; independent study; observational placements; problem based learning; clinical practice. When considering assessment strategies, the University of Portsmouth (2017) states that practical skills are assessed via a combination of clinical assessment, assignment, objective structured clinical examination (OSCE), final year project and assessed presentations. St Georges University of London (2017) notes that essays, reports, presentations, examinations, OSCE and objective structured practical examinations (OSPE), clinical portfolio and reflective report/diary are the methods used to assess practical skills. Whilst some of these strategies are expected, for example, utilising clinical practice to develop practical skills, the extent to which the range of teaching and learning activities aid development of the underpinning professional knowledge and skills required of a therapeutic radiographer is unknown and it is these aspects of learning that this study explores.

Currently there is a paucity of evidence in radiotherapy education that considers how core concepts are learnt and the underpinning educational theories on which teaching and learning strategies are based. This study considers curricula delivery methods by exploring positive learning experiences of a select sample of recently-qualified graduates and final-year students; experiences are explored within the context of the role of the radiographer.

1.3. Origins of the research question

The research idea originated through a casual conversation with a therapeutic radiography graduate who asked why different radiotherapy programmes use various ways of teaching and assessing students when, on qualification, everyone then went on to do the ‘same job’. After considerable reflection, I realised I had no ready answers.

Although I had over twenty-eight years' experience in radiotherapy education, I had given cursory attention as to how learning and knowledge from the two different settings: academic and clinical practice were integrated into a curriculum that prepared a graduate for the role of therapeutic radiographer.

Further informal conversations with student and therapeutic radiography communities identified other perceptions including: radiotherapy degree programmes were 'all different'; some teaching activities 'helped you learn', were 'useful' and 'positive', whereas others were less so; learning and assessment at some HEIs was 'easier' than others. I found these comments curious, having never before fully appreciated the perceptions of those in the field on the diversity of curricula delivery; subsequently I undertook a search of literature to explore what was known about radiotherapy curricula and how it was delivered, only to discover that such studies in the UK were lacking.

Some articles found focussed on clinical education such as those by Williams *et al.* (2006) and Ng *et al.* (2008). Whilst these made mention of teaching and learning theories, the authors did not define or discuss them in any great depth. Williams *et al.* (2006) investigated factors impacting on the quality and capacity of placements and, although they concluded that there needed to be logical links between theory and practice and coordination of learning strategies was necessary when students from different HEIs attended one placement, discussion of learning theories and strategies was absent. Similarly, Ng *et al.* (2008) omitted commentary on teaching and learning theories in their study which sought to establish effective means of measuring competence. The authors intimated that reflection was a useful learning strategy in the development of practical skills, an opinion shared by Chapman *et al.* (2009) in their Australian study of workplace diaries, yet, neither study explained or related their findings to pertinent learning theories.

One study, authored by Beldham-Collins and Milinkovic (2009), suggested that learner-centred experiential learning is a preferred method of curriculum delivery, citing that simulation and reflection, by means of a diary, are key teaching and learning strategies. Although they did not highlight simulation learning theory in any great depth, they did acknowledge that learning is a continuum referring to elements of Benner's Novice to Expert theory (Benner, 1984). This highlighted to me that teaching and learning strategies may alter according to time and experience; phenomena of which I may need to be mindful.

Having an interest in pedagogy and working on the premise that all undergraduate programmes share the same end-point: to produce graduates with knowledge, understanding and practical skills that once successfully acquired confer eligibility to register with the HCPC as a therapeutic radiographer, I embarked on my Doctoral journey. There was a gap in the evidence-base on educational theory and learning interventions used to deliver radiotherapy curricula and a dearth of studies linking radiotherapy learner experiences to perceived 'effective' education strategies. Thus, there was an opportunity to conduct a research study which would give some description to and understanding of signature pedagogic theory related to undergraduate radiotherapy curricula and its perceived effectiveness to the professional role. This fitted well with the aims of the professional doctorate where emphasis lay on conceptualising research within professional practice and education.

1.4. Influence of academic peers and practice partners

Dialogue with academic and practice colleagues ensued, during which time individuals expressed thoughts and theories on undergraduate curricula and its delivery. Not all comments were positive, yet, there appeared a general consensus that some curricula learning activities were more 'useful' than others. Opinions from practice partners were of particular value as, although practitioners concurred that a study of radiotherapy curricula was intriguing, their interests lay not in the curricula itself but rather in how it prepared a graduate to fulfil the role of a therapeutic radiographer. Indeed, a number of practice staff were of the opinion that they could have a 'good guess' from which HEI a newly-qualified practitioner had graduated because of the strengths and weaknesses displayed in particular skill sets. One practice staff member claimed that they were able to anticipate a graduate's needs by knowing the institution from which they graduated. These claims mirrored some aspects of previous discussions: that radiotherapy degree programmes were 'all different' in the way they were taught and student's learnt, however, practice colleagues brought to light a new significance, namely, the impact and consequences of curricula delivery in relation to the development of key professional skills.

Discussion with practitioners made me appreciate the wider professional context and moved the study in a slightly different direction. The original intention of the research was to study the pedagogy of radiotherapy curricula and the teaching and learning strategies opined by individual HEIs. However, following discussions with practice staff, I realised that radiotherapy pedagogy could not be divorced from the role of the therapeutic radiographer as ultimately the goal of all radiotherapy programmes was to produce graduates fit for purpose. The study therefore needed to consider radiotherapy pedagogy not only within the context of curricula delivery and teaching and learning strategies, but also with reference to the role of the radiographer and contemporary radiotherapy practice.

1.5. Justification for the study

My fundamental belief, which mirrors some students' and practitioners' opinions, is that some learning activities appear more conducive than others to developing knowledge, understanding and practical skills required of a therapeutic radiographer. However, studies in this area are lacking which, as Yardley *et al.* (2012) suggest, could be explained by an academic-practice divide. Menter (2014) notes that considerable effort is required to deconstruct knowledge related to professional learning and neither academia nor placements take full responsibility for its exploration. There appear to be some accepted norms, for example, that placement attendance is a key component to undergraduate radiotherapy education (College of Radiographers, 2013; Society of Radiographers, 2017b; 2019) and, historically, this has always been the case (Bentley, 2005; Price, 2009). However, educational activities that encourage positive learning of the required professional knowledge and skills, have not been clearly defined. Westbrook (2016) suggests that academic-practice tensions exist which could explain why neither academia nor placements fully deconstruct learning to identify the methods by which it successfully occurs. Indeed, there are multiple requirements that impact on professional programmes including: fitness for purpose (what the employer wants from practitioners); fitness for practice (the requirements for registration asserted by the profession-specific and statutory bodies); and fitness for award (the requirements needed by HEIs to validate the award). These overt drivers and competing demands could explain, not only the dissonance between academic and practice learning, but also why less attention is given to teaching and learning strategies that span the academic and practice environments (Westbrook, 2016). Thus, research exploring educational strategies and activities which consider academic and practice knowledge and skills in a meaningful way are needed (Westbrook, 2016).

The impact of educational activity on learning is an under-explored part of general teaching evaluation and thus the evidence-base is weak (Zhao and Gallant, 2012; Evans *et al.*, 2015). Yet, on a professional programme, the impact of curricula delivery is significant, as the pedagogy forms the basis on which key skills, including lifelong learning, knowledge and understanding, are built (Yardley *et al.*, 2012). I believe (and anecdotal evidence from informal discussions suggests) that this directly affects a graduate's skills and thus impacts on their ability to fulfil the requirements of the professional role.

Aside from a feeling of professional obligation to provide the best opportunities for radiotherapy learners, there are external drivers increasing the accountability being placed on education providers. In the UK, the Government has introduced the Teaching Excellence Framework (TEF), the aims of which, as identified in the 'The Teaching Excellence Framework: Assessing Quality in Higher Education' (2016, p. 5), are to:

- encourage excellent teaching for all students;
- promote improvement by highlighting exemplary practice;
- promote cultural change to recognise teaching as equal in status to research;
- provide clear information on teaching quality to assist student choice;
- provide clear information to help employers recruit students with better and known skills;
- recognise and respect the diversity of provision and different types of excellence.

Thus a study that justifies and promotes exemplary teaching and learning practices in radiotherapy curricula is timely and would be of benefit to HEIs that offer radiotherapy undergraduate programmes as well as the wider radiotherapy profession.

1.6. Personal reflections and assumptions

A background in radiotherapy education and wider professional roles also helped shape the research. For over ten years, I held the position of Programme Leader with responsibility for the delivery and evaluation of a three-year undergraduate radiotherapy programme; thus, some expertise in that area had been gained. Although this was at one HEI in England and could be regarded as insular, external professional activities, including being External Examiner to undergraduate radiotherapy programmes and an Assessor of undergraduate and postgraduate programmes for the College of Radiographers, have provided me with an appreciation of the diversity in the delivery of radiotherapy curricula. Although I am aware of the differences in teaching, learning and assessment strategies and frequently engage in dialogue about these with academic and practice staff, in-depth discussion on the impact of teaching activities on a learner from the learner's point of view has only been superficially considered, mainly through feedback surveys. The graduate who questioned me about teaching and assessment delivery 'discrepancies' between programmes caused me to pause and reflect objectively on whether there were optimum ways of delivering radiotherapy curricula and whether these could be explained and supported by teaching and learning theories.

I approached the research with a wealth of experience from the perspective of a lecturer delivering and evaluating curricula from an academic perspective, but I have neither been a learner on a radiotherapy degree programme nor am I a practitioner currently working in the rapidly-changing field of radiotherapy practice. The research was to focus on an exploration of radiotherapy pedagogy within the context of the radiographer's role, contemporary radiotherapy practice and curricula delivery; thus it was logical to seek the views of practitioners working as therapeutic radiographers and degree students engaging with learning activities. As I was positioned outside of the learning and practice circles, my role within the research was initially intended to be as a facilitator exploring the perceptions of others, but, as discussed in section 3.3, no qualitative study can be said to be free of researcher influences (Miles and Huberman, 1994; Cohen *et al.*, 2011).

In line with opinions gained through informal discussions with graduates and practitioners, this study assumes that positive learning is desirable and there are teaching and learning interventions that better aid development of the knowledge, understanding and practical skills required of a therapeutic radiographer. It also acknowledges that radiotherapy education may be explained through teaching and learning theories and encompass personal learning trajectories. Finally, it presupposes that students and practitioners have participated in positive experiences and that, not only are they able to critically reflect on and describe these, but also that they are able to interpret specific experiences as forms of learning.

1.7. Research question

This research explores the following: what positive learning experiences facilitate the development of knowledge, skills and understanding required of a qualified therapeutic radiographer?

1.8. Aim and objectives

The aim of the study is to explore and evaluate positive learning experiences that prepare students for the role of a therapeutic radiographer with a view to present examples of activities that may be used as exemplars in the delivery of undergraduate radiotherapy education. The research objectives are to:

- Identify activities that radiotherapy learners define as positive learning experiences;
- Establish where and how learning takes place;
- Establish whether learning activities reflect teaching and learning theories;

- Create a framework of educational activities that are conducive to developing the skills required of a therapeutic radiographer.

2. Literature Review

2.1. Introduction

In this chapter I detail how the literature for the study was gained and provide an overview of the therapeutic radiographer role, undergraduate radiotherapy education in England and key teaching and learning theories applicable to professional education. A conscious decision was made to limit the study to three-year honours degree programmes in England as this gave greater consistency in terms of length of study and education models; it also allayed differences associated with funding. This chapter presents and evaluates evidence related to:

- professional knowledge and the role of the therapeutic radiographer;
- therapeutic radiography curricula and methods of delivery;
- learning theories utilised in the delivery of professional programmes.

One of the issues when exploring the literature was that there was little evidence related to learning theory and utilising learner perspectives within the radiotherapy profession. Thus, I drew on literature from the medical, nursing, social work, teaching and allied health professions.

2.2. Conducting the literature review

2.2.1. Searching the databases for evidence

Literature reviews occurred at two distinct stages of the study: prior to data gathering and during the analysis of the findings when further theories were explored which would explain aspects of learning. Silverman (2016) suggests that a comprehensive literature search undertaken prior to commencement of a study can influence the direction in which the study goes. Whilst a pre-study review affords advantages such as identifying gaps in the evidence, it prevents the researcher from viewing the study area from a unique, impartial perspective which could preclude originality and consciously or subconsciously impact on the scope of the research (Silverman, 2016). However, Greenhalgh (2014) suggests that a broad, detailed search of existing literature is necessary to underpin an in-depth study of a topic area. Thus, all aspects of the topic are considered and 'no stone has been left unturned' (Greenhalgh, 2014, p.17). I therefore undertook an extensive literature review prior to the commencement of the study as this helped to inform the context and influences that surround radiotherapy curricula and professional programmes and enabled me to refine the scope of the study and research aim. The following processes describe the search strategy adopted prior to undertaking the study. Key words and synonyms used in the literature search (presented in Table 2.1 on the facing page) were derived from considering the research question, the intentions of the study and through reviewing the literature. The main concepts initially defined were: radiotherapy curriculum; learning theories; professional role. Programme evaluation, student satisfaction and appreciative inquiry were concepts added later to the literature search when considering the data collection methods.

The Boolean operator 'AND' was used to combine terms, thereby making the searches

Table 2.1.: Concepts, key words and synonyms used in the initial literature search

Radiotherapy Curriculum	**Learning theories**	**Professional role**
Undergraduate / pre-registration curriculum	Professional learning / Work-based /workplace learning	Therapeutic radiographer / radiotherapy radiographer / radiographer
Radiography curriculum	Theory-practice /practice learning	Radiotherapist
Radiotherapy curriculum	Experiential learning	HCPC Radiography standards
Radiography programme / course	Simulation theory	Society / College of Radiographers standards / frameworks
Radiotherapy programme / course	Collaborative learning	Professional standards / frameworks
Radiation therapy	Education / Practice /clinical education	Practitioner
	Emotions in learning	National Occupational Standards
	Assessment theory	Key Skills Framework / KSF
	Pedagogy	

Table 2.2.: Summary of inclusion and exclusion criteria for retrieving literature from databases

Inclusion criteria	**Exclusion criteria**
English language	Literature not published in English
All types of original research, literature reviews, professional guidelines and standards, articles from peer-reviewed journals related to one or more of the concepts	Literature not related to the concepts
Full text available	Abstract only
Evidence published since 1980	Evidence published prior to 1980 unless it was deemed core to one of the themes and/or provided historical context

more efficient and effective. To provide structure and give transparency as to how sources were retrieved, inclusion and exclusion parameters were defined (listed in Table 2.2). The year 1980 was chosen as an appropriate limiter as this would permit exploration of diploma delivery, the educational model utilised for radiotherapy education prior to the introduction of the degree model in the 1990s.

Databases and sources systematically searched included: EBSCO (Education research database); PsychNet; CINAHL Plus; PubMed; Science Direct; ERIC; SAGE. Using electronic databases predominantly resulted in retrieving journal articles related to primary research of the three concepts. The abstracts of articles were scanned for appropriateness to the topic area. An article was included if it had relevance to one or more of the key themes or intended methodology. Evidence published before 1980 was retrieved if it was considered to be a seminal text; most often this was realised through snowballing techniques. Figure 2.1 on the facing page provides an example of the process undertaken.

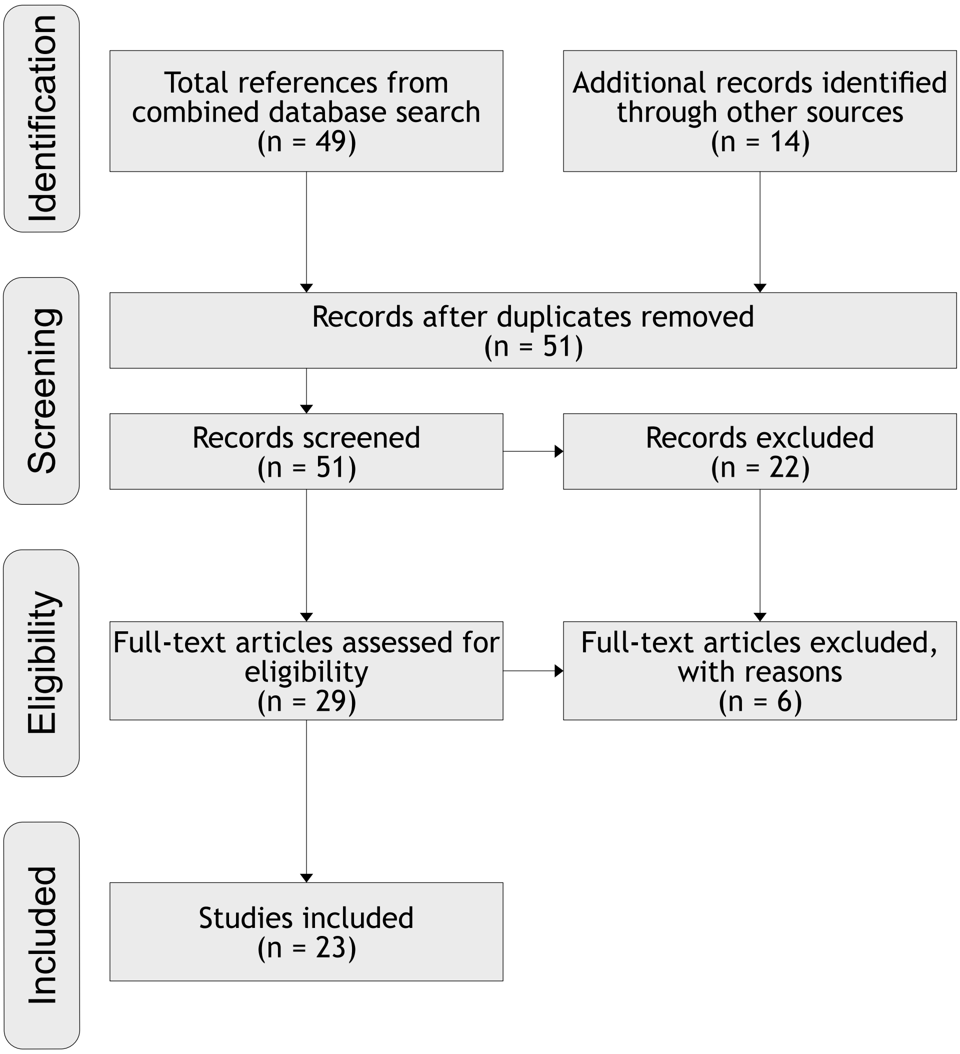


Figure 2.1.: An example of a Database Search: Appreciative Inquiry AND Education, adapted from Moher *et al.* (2009)

Having established the number of HEIs in England offering 3-year undergraduate radiotherapy programmes by searching the HCPC database of approved radiotherapy programmes (Health and Care Professions Council, 2015), I undertook an internet search looking for information related to each individual course (n = 10). I was able to access programme specifications for all programmes on-line, however, the date for one programme specification was 2008 which was likely to be obsolete. After further searching on the internet, I found a handbook (dated 2016) for this specific programme which gave information aligned to the programme specification. This document was more up-to-date and was therefore used when reviewing programme data.

Being aware that programme specifications may be written according to prescribed institutional templates and therefore may not fully detail contemporary teaching and learning strategies employed by programmes, I subsequently accessed and downloaded data from HEI programme websites (see Appendix A on page 257). Individual programme websites were useful as they provided succinct summaries of up-to-date programme curricula and gave an overview of teaching, learning and assessment as well as the facilities employed in programme education. To supplement website summaries and gain further detail on each radiotherapy programmes' teaching and learning information, I accessed the Unistats website which is owned by the Higher Education Funding Council for England (HEFCE) and presents data on behalf of all funding councils in the UK (HEFCE, 2017). The Unistats site was helpful as it provided data related to programme delivery and assessment in a standardised format. A comparison of programme data was undertaken and is discussed later in this chapter. Table 2.3 identifies the data acquired from the internet searches.

It was necessary to explore radiotherapy professional and statutory body documentation as this supplied information related to the role of the therapeutic radiographer

Table 2.3.: Undergraduate radiotherapy programme information gathered from the internet search (March, 2017)

HEI	**Name of Degree**	**Programme Specification (PS)**	**Programme Website Information**	**Unistats data**
Birmingham City University	BSc (Hons) Radiotherapy	2014-15 and 2017-18	2014-15 PS is current prog & resembles website data - downloaded 20/3/17	Yes
City, University of London	BSc (Hons) Radiography (Radiotherapy and Oncology)	2016-17	Downloaded 19/03/17	Yes
Hertfordshire	BSc (Hons) Radiotherapy and Oncology	2016-17	Downloaded 22/3/17	Yes
Kingston & St George's	BSc (Hons) Therapeutic Radiography	2016-17	Downloaded 20/03/17	Yes
London South Bank	BSc (Hons) Therapeutic Radiography	2010-11	Downloaded 20/03/17	Yes
Liverpool	BSc (Hons) Radiotherapy	2014-15	Downloaded 19/03/17	Yes
Portsmouth	BSc (Hons) Therapeutic Radiography	2016-17	Downloaded 20/03/17	Yes
Suffolk	BSc (Hons) Radiotherapy and Oncology	2016	Downloaded 20/03/17	Yes
Sheffield Hallam	BSc (Hons) Radiotherapy and Oncology	2008 PS and 2016 Prog Handbook	Downloaded 20/03/17	Yes
University of West England, Bristol	BSc (Hons) Radiotherapy and Oncology	2016-17	Downloaded 20/03/17	Yes

and educational requirements. A detailed search was undertaken of the College of Radiographers' and Department of Health websites. Data obtained here mainly took the form of strategies and plans, radiography-specific standards, frameworks, guidelines and codes, some of which contained links to evidence. In addition, the HCPC website was searched for education and training standards as well as standards of proficiency specifically related to radiography. The National Occupational Standards (NOS) for Radiotherapy were accessed from the NOS website (National Occupational Standards, 2017) and reviewed for specific information related to the role of the radiographer. Obsolete guidelines and standards were excluded.

Finally, books were used to provide information on teaching and learning theories, professional learning, appreciative inquiry methodology and the historical context of radiotherapy education and practice.

2.3. The role of the therapeutic radiographer

Defining the unique characteristics of a profession and the professional knowledge that underpins it, is not always straightforward as a profession embraces elements of how knowledge and learning is conceptualised (Young, 2014; Young and Muller, 2014). Embedded cultural knowledge permeates professions through cultural socialisation, thus, professionals within particular fields inherit specific beliefs and behaviours which may be hard to explain explicitly to those outside the field (Eraut and Hirsh, 2007). Bernstein (2000) suggests professional knowledge is different from pure theory and practice in that it not only embodies hierarchical knowledge structures derived from mathematic and science disciplines, but also segmented knowledge found within the social sciences and humanities. The uniqueness of knowledge associated with a specific profession lay within the different combinations of knowledge structures (Bernstein, 2000). The radiographic profession takes knowledge from the sciences (one knowledge structure) and combines them with content from the humanities (another knowledge structure) to create its own unique field of practice that constructs new knowledge from within the existing structures. This combination of science and humanity subjects is evident in the professional and statutory-body standards and frameworks associated with the role (College of Radiographers, 2013; Health and Care Professions Council, 2013). Bernstein (2000) suggests that professional knowledge not only extends beyond the binary paradigm of composite knowledge structures and practice, but also that there is more than one knowledge structure. He terms these singulars, fields of practice and regions (Moore *et al.*, 2006; Young, 2014). A singular refers to knowledge which is pursued for its own sake, for example, knowledge that is related to finding ‘true’ meaning (Bernstein, 2000; Young, 2014). In the field of radiography, examples of singulars include physics and genetics both areas of which embrace positivist tradition. The fields of practice are the defining features and activities which are specific to the professional context (Young, 2014); for example, features that characterise the radiographic profession include knowledge and understanding of ionising radiations which inform how it is safely applied to patients during routine imaging and radiotherapy delivery. Thus the field of practice links the concepts to the context (Young, 2014). Regions, however, comprise a number of concepts combining discrete subject matter for a specific purpose, for example, physics concepts being input into engineering which results in transforming the field of practice, i.e. engineering. Thus regions can be regarded as multi-disciplinary which describes well the profession of therapeutic radiography and explains why curricula content and the role of the radiographer is wide-ranging and varied.

The Society of Radiographers (2019) career information on its website notes that therapeutic radiographers:

> are responsible for the planning and delivery of accurate radiotherapy treatments using a wide range of technical equipment. Accuracy is critical, for example, the aim of treatment may be to treat a tumour and destroy diseased tissue while minimising the amount of radiation exposure to surrounding healthy tissue (Society of Radiographers, 2019).

A range of knowledge, behaviours and practical skills are required to successfully and competently deliver radiotherapy, not least of which are the excellent interpersonal, communication and team-working skills required, as well as empathy and compassion appropriate to patients with cancer. However, radiotherapy is a highly technical treatment that requires precision and dexterity in its application. This is because ionising radiation can produce harmful, unwanted side-effects and its use is strictly controlled by the *Ionising Radiation Regulations 2017* (SI 2017/1075) and the *Ionising Radiation (Medical Exposure) Regulations* (UK Houses of Parliament, 2017a) (SI 2017/1322). Therefore therapeutic radiographers work to prescribed protocols and must be cognisant of and fully compliant with all regulations that govern practice.

As intimated in the introduction, standards and frameworks relevant to the role are described using outcomes-based language. The role of the radiographer is therefore described in broad terms of what they should do, know and how they should behave. The College of Radiographers' Education and Career Framework (2013) lists thirty-three outcomes, two of which are irrelevant to this study as they apply to diagnostic radiography only. The outcomes can be broadly grouped into the themes of: safety; professionalism; practice; personal skills. The fifteen listed items in the Standards of Proficiency for Radiography (Health and Care Professions Council, 2013) are similarly themed, although the list of knowledge domains and clinical context and applications are less detailed than those provided in the Education and Career Framework (College of Radiographers, 2013). Core clinical contexts include processes related to radiotherapy pre-treatment and planning as well as safety processes such as treatment verification that form part of radiotherapy delivery. There is also emphasis on personal and professional skills, including good communication, professional autonomy and professional judgement. The National Occupational Standards (NOS) for Radiotherapy (2017) and NHS Knowledge and Skills Framework (Department of Health, 2004) are standards used by clinical departments to ensure that practitioners continue to meet the requirements for registration with the HCPC. Unsurprisingly, the information contained within these publications resembles that within the Education and Career Framework (College of Radiographers, 2013) and the Standards of Proficiency for Radiography (Health and Care Professions Council, 2013), although focus is on specific radiotherapeutic procedures, such as, how to acquire and assess images for treatment planning and verification, which, in today's imaging-focussed radiotherapy delivery, are a key part of the therapeutic radiographer's role.

Although professional standards and frameworks describe what a therapeutic radiographer should know and the activities they should perform, each radiotherapy programme has a unique curriculum. The next section explores how this has arisen and presents the historical context within which teaching and learning methods have been developed.

2.4. Therapeutic radiography curriculum

2.4.1. Overview and history

Undergraduate radiotherapy education has been delivered at degree level since the 1990s, having previously been provided via a Diploma of the College of Radiographers (Therapeutic) (DCR(T)) first offered in the 1950's (Bentley, 2005). The DCR(T) was delivered by small Schools of Radiography located within teaching hospitals and followed a standardised syllabus, set and assessed by the Society of Radiographers (Flinton, 2015). Schools of Radiography trained both diagnostic and therapeutic radiographers with some core subjects, such as physics and anatomy, being delivered to both cohorts despite the variation in the two discrete professions. This meant that some subjects were taught with little context and application to the professional role. Learning typically involved sitting in a lecture with no active student participation taking place during the teaching session: didactic rather than interactive delivery was employed (Flinton, 2015). Knowledge and understanding of subjects were assessed by written examination held at regional assessment centres (Flinton, 2015). Informal discussions with Diplomates suggests that preparation for examination tended to involve rote learning and storing information in semantic memory which was later reproduced in the end-of-syllabus written examination.

With regard to a student's ability to perform as a therapeutic radiographer in the clinical department, skills were learnt 'on the job'. There was no prescribed teaching and learning other than a log book in which 1000 radiotherapy treatments, performed aided or unaided, were recorded (McPake, 2018). Records were signed by a radiographer with whom the student had worked. The log book was then submitted for a viva voce examination which formed part of the final-year qualifying examination, yet, as McPake (2018) in her dissertation on radiotherapy practice placement models notes, the logbook together with the viva voce examination was the only form of clinical assessment and it did not measure performance in the clinical environment.

Some effort to address this was made by Schools of Radiography in the South East who collaborated in the development of a pilot London and Home Counties Assessment Scheme (LHCAS); this attempted to define clinical competencies for specific radiotherapy techniques (McPake, 2018). Although I remember taking part in this scheme as a student, successful completion of an assessment did not contribute in any way towards my completion of the DCR(T); indeed after the 1980s, the LHCAS seemed to disappear which, as noted by McPake (2018), could be attributed to the move from DCR(T) to degree education and the beginning of disparate curriculum delivery.

Change to degree level occurred in the 1990s, following a review by the Higher and Further Education Working Party, initiated by the Council for Professions Supplementary to Medicine (CPSM) (subsequently the Health and Care Professions Council) (Price, 2009). Radiography 'training' delivered by Schools of Radiography became radiography 'education' delivered by HEIs with the degree curricula being overseen by the CPSM. Bentley had proposed a degree lasting four years and five months, however, practitioners from within the profession believed that the role of the radiographer did not justify degree qualification; concerns were expressed that the basic grade role of a radiographer would not coincide with graduate expectations (Price, 2009). Practitioners were also of the opinion that moving academia from local hospitals to a remotely-located HEI would increase the theory-practice gap (Price, 2009); however, such anxieties appear muted and there is little evidence in history that describes effective counter-argument and rebuke of professional concerns.

With degree status, HEIs were able to move from the prescribed syllabus of the DCR(T) to setting their own curriculum (Flinton, 2015). Core subject areas of anatomy and physiology, radiotherapy physics, cancer and its management, radiotherapy practice and patient care continued to be embedded in curricula, however, further subjects, including research skills, critical reflection and personal and professional development, were added which meant that, for the first time, graduating radiographers had the skills to expand professional knowledge and expertise (Nixon, 2001).

2.4.2. Radiotherapy curricula and their relationship with professional and statutory standards and frameworks

Radiotherapy curricula remains bound to statutory and professional body standards and frameworks including the HCPC Standards of Proficiency for Radiography (Health and Care Professions Council, 2013) and Standards of Education and Training (Health and Care Professions Council, 2014). These provide a common set of criteria which describe core subject-specific information and inform professional behaviour. However, standards employ an outcomes-based language; they, therefore, do not prescribe how subject areas and skills should be packaged, taught or delivered, noting only that after successful completion of a programme a graduate should, for example, 'be able to communicate effectively' (Health and Care Professions Council, 2013, p.9).

One of the limitations of outcomes-based language is that it is subject to different interpretations by educators and learners; detail and context are required to link an outcome to an area being studied or assessed (Holmboe *et al.*, 2017). Taking the example of 'communicating effectively', a student may be assessed as competent in year one, yet, should this student not develop their communication skills during years two and three, it is unlikely they will be deemed competent. To determine whether a student communicates effectively, each level of assessment requires supplementary guidance, context and definition (Holmboe *et al.*, 2017). On radiotherapy programmes, guidance is specific to individual HEIs which gives rise to variations across the sector; hence, outcomes-based standards contribute towards the variety of teaching, learning and assessment practices that exist on undergraduate radiotherapy programmes.

The College of Radiographers' Education and Career Framework claims to be 'non-prescriptive', providing 'indicative curricula where relevant' (College of Radiographers, 2013, p.1). It identifies the outcomes that a practitioner should demonstrate in their professional practice and lists the core subjects in which practitioners should gain knowledge and understanding: biological, physical and social sciences. The lack of context and detail regarding how subjects and skills are taught and assessed, contribute to the diversity in curricula and explain why, as that graduate noted, programmes are 'all different'. Evidence of curricula diversity can be seen in Appendix A on page 257which identifies the modules of each of the ten undergraduate radiotherapy programmes in England.

In contrast, the General Medical Council (GMC) has created four guidance documents which supplement the 'Promoting excellence: standards for medical education and training' document (General Medical Council, 2015c). Supplements include 'Organising Placements', 'Assessing Students', 'Involving Patients and the Public' and 'Developing Teachers and Trainers' (General Medical Council, 2015c). Detailed within the 'Organising Placements' supplement is guidance on what learners can expect from their placements and the changes that occur during the levels of study. Placement exemplars from a range of hospitals are also provided showing how effective placement can occur in a variety of ways (General Medical Council, 2015b). The 'Assessing Students' supplement documents a variety of assessments and gives details on the reliability, validity and aspect of knowledge or skill that a particular assessment judges (General Medical Council, 2015a). Reasoned arguments are presented that explain the advantages and disadvantages of the type of assessment. Whilst professional education and competence-based assessment involve multi-faceted, complex processes (Khan and Ramachandran, 2012; Pijl-Zieber *et al.*, 2014; Poskitt, 2014), having supplementary guidance that learners and educators can access is one way towards overcoming the limitations afforded by outcome-based standards.

2.4.3. Curriculum delivery

Despite some variation to curricula content generated by outcomes-based standards and frameworks, it has been suggested that radiotherapy programmes follow a broadly equivalent academic and practice delivery split, with practice placements occurring at each level of study (Paterson, 2012; Flinton, 2015; Society of Radiographers, 2017b; McPake, 2018). However, a comparison of radiotherapy programme data taken from the Unistats (2017) website suggests there is substantial variance in the ratio of academic and placement learning as shown in Table 2.4 on the next page.

The wide variation of time spent in lectures, self-study and work-based placements was unanticipated as anecdotal evidence from discussion with fellow educators, previous theses such as that presented by Flinton (2015) as well as the radiography careers website (Society of Radiographers, 2017b) indicate that the split of academic to clinical practice is approximately equal. However Sutton (2013) notes that a small percentage of HEIs may offer less time in practice suggesting variations of 25%.

Unistats data is provided by institutions and final-year students and whilst this is the only empirical evidence available related to the proportion of academic and placement learning in therapeutic radiography, its validity should be interrogated. Discrepancies between data could be due to differences in internal quality processes associated with data management and/or data input procedures adopted by HEIs; variance could also be related to how clinical hours are assigned within individual programme modular structures. However, what is clear is that all programmes employ academic and placement learning which affords both advantages, such as integration into the healthcare setting, and disadvantages, not least of which includes adapting to different learning cultures (Paterson, 2012).

Table 2.4.: Unistats data (March 2017): proportion of time spent in academic (lectures and self-directed study) against time spent in work-based placements per year (%)

HEI	**Academic: Placement Ratio**			
	Year 1	**Year 2**	**Year 3**	**3 year Avg.**
Birmingham City University	18:82	37:63	46:54	34:66
City, University of London	100:00	95:5	62:38	86:14
Hertfordshire	57:43	51:49	63:37	57:43
Kingston & St George's	93:7	56:44	62:38	70:30
London South Bank	60:40	56:44	60:40	59:41
Liverpool	61:39	61:39	47:53	56:44
Portsmouth	76:24	69:31	72:28	72:28
Suffolk	65:35	64:36	63:37	64:36
Sheffield Hallam	63:37	63:37	52:48	59:41
University of West England, Bristol	67:33	61:39	82:18	70:30

2.5. Learning theories and influences in radiotherapy curricula delivery

Learning can be regarded as both an individual and a collaborative process, depending on the activity with which a learner is engaged (Hativa, 2000). There are many theories that seek to describe how learning occurs, each with different perspectives and terminology, but central to this study are those that relate to the individual learner, for example, adult learning theory and those that describe acquisition of professional knowledge, core skills and competencies, for example, experiential and professional learning theories most of which make reference to collaborative learning constructs and the influences of social contexts.

2.5.1. Individual learning theories

Pioneered by Knowles (1980), adult learning theory suggests that there are a number of aspects in which adults differ to children in their motivation to learn, as identified in Table 2.5 on the facing page. Whilst there is some contention as to whether these are unique to adult learners (Merriam, 2001), nevertheless, adult learning theory aids explanation of how and why learning occurs. Of particular note is that relevance of an activity appears to strengthen a desire to learn, therefore, aligning teaching to authentic situations may aid and encourage learning.

Similar to Knowles (1980), Chickering and Gamson's (1987) principles of good practice (Table 2.6 on page 34) highlight the importance of motivation in learning; however, whereas Knowles's (1980) theory reflects goal-oriented, 'expectancy-value' themes, the principles described by Chickering and Gamson (1987) champion social-cognitive aspects as influential on motivation and learning. Cook and Artino (2016) note that theories of motivation for learning are diverse and can be conflicting, how-

Table 2.5.: Aspects of adult learning based on Knowles' theory of andragogy (Taylor and Hamdy, 2013, p. 1563)

Aspects of Adult Learning Theory	**Example**
1. The need to know	Why do I need to know this?
2. The learners' self-concept	I am responsible for my own decisions.
3. The role of the learners' experiences	I have experiences which I value and you should respect.
4. Readiness to learn	I need to learn because my circumstances are changing.
5. Orientation to learning	Learning will help me deal with the situation in which I find myself.
6. Motivation: internal rather than external	I learn because I want to [not because I have to.

ever, there are themes that span the range of contemporary theorems.

One of these concepts relates to competence and the influences that belief and perception have on confidence and an ability to perform (Cook and Artino, 2016). This is an important consideration for professional programmes as competence is realised not only in formative and summative assessment and examination, but also on a day-to-day basis when learners attend placement. Arguably, placement practice is more overt in its perceived usefulness and thus may have a higher motivational task-value, that is, the extent to which a learner places importance, value and interest on an activity (Cook and Artino, 2016). Conversely, where classroom-based teaching does not explicitly link professional practice, its perceived value could appear low to learners. White *et al.* (2014) undertook a qualitative study exploring learning experiences of medical students in one institution to investigate why learners were poorly-engaged with or missing classes. Reasons cited by participants included: active learning was poorly designed and/or sessions typically involved passive learning

Table 2.6.: Seven principles of good practice in undergraduate education, adapted from Chickering and Gamson (1987)

Principles	Consequence and application
1. Encourages contact between students and Faculty	*Increases student motivation and encourages sense of belonging*
2. Develops reciprocity and cooperation among students	*Encourages collaboration and social aspects through a learning community*
3. Uses active learning techniques	*Engagement with tasks becomes part of student and is applied to past experiences*
4. Gives prompt feedback	*Focuses learning by revealing what student's know/have learnt and what is yet to be learnt*
5. Emphasises time on task	*Students manage time effectively and are aware of time needed for learning*
6. Communicates high expectations	*Gives ambition and target; extra effort made / support offered*
7. Respects diverse talents and ways of learning	*When variety of opportunities for learning are provided, students are able to show individual strengths and learn in ways that works for them*

causing issues with concentration and focus. Interestingly, a further suggestion for non-engagement was attributed to under-development of the skills and attributes required to facilitate active learning; a situation that could be of concern to educators of professional programmes where principles of adult learning theories are utilised to deliver curricula within practice-based as well as academic learning environments.

Influences on motivation to learn can be explained further by Achievement Goal theory, a concept in motivational research that refers to cognitive and behavioural entities in relation to task and goals (Kaplan and Maehr, 1999). Learners with performance-goal characteristics tend to be of the belief that intelligence and ability to perform are an inherent and unchangeable trait; thus, they presume excellence is and should always be attainable (Kaplan and Maehr, 1999; Finch *et al.*, 2015; Cook and Artino, 2016). Whilst this appears largely positive, there exists an additional, self-inflicted pressure to perform which can result in a variety of outcomes on the learner's motivation. In situations where achievement is relatively easy and the learner is successful, confidence in ability is conserved and the learner maintains motivation. However, where the activity or task pushes the learner to a point beyond natural ability or intelligence, the learner struggles, becomes disengaged, defensive, demotivated and eventually gives up (Kaplan and Maehr, 1999; Cook and Artino, 2016).

In contrast to learners with performance-goal traits, those who ascribe a mastery-goal orientation believe that intelligence and ability vary according to the task and situation; thus, they handle better more complex situations and actively seek opportunities in which learning occurs and development can ensue (Kaplan and Maehr, 1999; Finch *et al.*, 2015; Cook and Artino, 2016). Learners with a mastery-goal orientation will readily tackle tasks beyond capability and actively embrace failure, being driven by a desire for learning, and as such may not achieve the success of goal-orientated peers. However, in contrast to goal-oriented learners who gain confidence from successful achievement of an easy task, mastery-goal learners struggle in this context as it presents no challenge and no perceived learning; therefore, they too can experience issues with motivation (Cook and Artino, 2016). Achievement Goal theory offers explanation of disparate learner reactions to educational activities. It recognises variation afforded by the ease or complexity of the activity thereby highlighting that learning is not only affected by an individual's mindset, but also is situation and task-specific (Cook and Artino, 2016).

White *et al.*'s (2014) study of learner engagement considered the social aspects of learning, noting that efficiencies and emotions played a role in motivation and learner decision-making; for example, participants suggested that sitting with friends created a less challenging environment because they were less embarrassed if they did not understand a concept or had not prepared fully for a session. However, friendship groups can also be detrimental to learning as distractions and discussion occur readily (White *et al.*, 2014); thus group structure and social dynamics can affect motivation. Yet, in Chickering and Gamson's (1987) principles, reciprocal social interactions and learning communities are purported to encourage motivation and thus social aspects of learning are an important area of exploration. The next section reviews social constructivism theories, such as those purported by Vygotsky (1962), within the context of experiential and professional learning, both of which have relevance to undergraduate radiotherapy programmes.

2.5.2. Experiential and professional learning theories

Experiential learning covers a broad range of activities and may best be described as learning through 'experience' (Kolb, 1984). Assumptions include that learning is situated and embodies social constructivist elements as described by Vygotsky (1962), although, it should be noted that unlike Knowles (1980), much of Vygotsky's work was based on the study of children rather than adults. Social theories of learning contend that context and community are key parts to learning and it is social interaction processes that lead to co-creation of knowledge resulting in communities of practice such as those described by Lave and Wenger (1991).

In their early studies, Lave and Wenger (1991) purported that learning occurred as a consequence of social relationships in the workplace (termed situated learning) and used the phrase 'legitimate peripheral participation' to describe how members of a group become immersed within a new community. They noted that learning happens through the process of becoming an integral member of the community and not only includes developing knowledge and skills, but also incorporates a shared identity and culture, a theory also acknowledged by Eraut and Hirsh (2007). Learning in communities of practice assumes that learning is a joint enterprise and is a matter of mutual engagement within specific contexts where there is a common language utilised (shared repertoire) (Wenger, 1998). For sharing to occur, particularly within a specific environment such as a radiotherapy department, it could be argued that some grasp of basic principles and knowledge is necessary in order to engage in meaningful dialogue. Furthermore, in order to appreciate that learning is taking place, there needs to be recognition and reflection which may occur during or after experience (Eraut, 2000; 2004; 2007). Thus, reflection is an integral part of learning within practice.

2.5.2.1. Reflective Practice

Experiential learning models that conceptualise learning through the reflective practitioner model have widely been used in health care programmes and practitioner research (Menter, 2014). Dewey (1938, p.20) made significant contribution to experiential learning theory noting that there was 'an intimate and necessary relation between the processes of actual experience and education'. He contended that personal interaction within appropriate surroundings enriched education as it allowed learners to develop applied rather than abstract knowledge; this is a precept on which professional learning has been built. To enable learning to occur, Dewey (1938) suggested that experiences should be guided by a facilitator rather than taught explicitly. Furthermore for education to be effective, teaching should not only include content presented in ways with which learners could identify, but also encourage reflection on experiences as this would enhance learning (Dewey, 1938). Much of Dewey's (1938) early work appears in later theories of reflective practice such as those presented by Argyris and Schön (1978) which are discussed later in this section.

Kolb (1984) describes a learning cycle model (Figure 2.2 on the facing page) that tends to begin with a concrete learning experience, although Kolb postulates that the cycle can start at any point (Kolb, 1984). Kolb theorises that learning is extracted from reflecting on an experience and this then informs actions. Whilst this could be construed as a useful tool to extract learner experiences in this study, the model focusses on the individual perspective and fails to take account of the environments in which learning occurs, thereby paying little attention to social and cultural influences. Because Kolb's model personalises experience and therefore relates to explicit knowledge of the individual, it does not capture the complex education processes that experiential learning encapsulates (Yardley *et al.*, 2012).

Because reflective observation and abstract conceptualisation take place within the boundaries of that individual's knowledge and understanding of the experience, the situation becomes self-limiting. The concept of not knowing what could be known is a phenomena described by the Johari Window (Newstrom and Rubenfeld, 1983).

The Johari Window (Figure 2.3 on page 40) is a theory developed by two psychologists

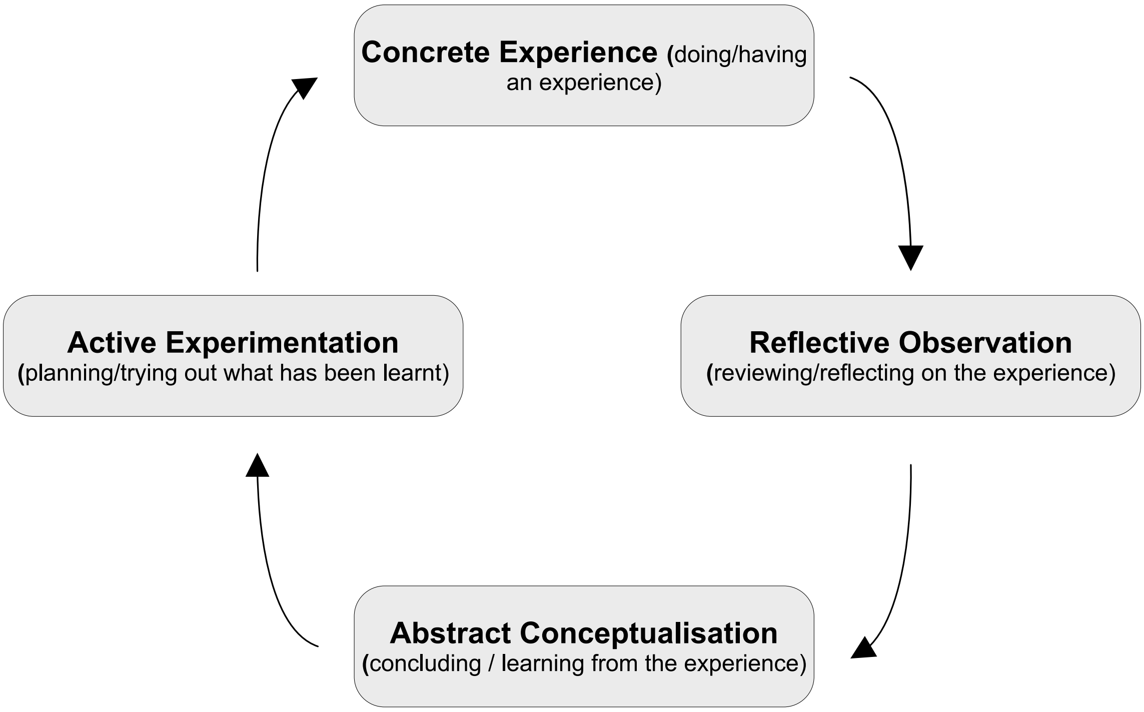


Figure 2.2.: Kolb's Experiential Learning Cycle (Kolb, 1984)

Joseph Luft and Harry Ingram which describes four 'windows' of knowledge (Luft and Ingham, 1955). The 'open' window relates to knowledge of which we and others are aware; 'hidden' is the knowledge of which we are aware but others are not, that is, knowledge private to us; 'blind' is the aspect that others know but it is unknown to us; 'unknown' remains a mystery to all parties (Luft and Ingham, 1955).

When a therapeutic radiography learner reflects in isolation, abstract conceptualisation can only be performed within the context of what is known to self; thus if the concrete experience is located around an area with which the learner has little knowledge, then analytic thinking and discovery will be affected. Discussion with peers may occur which may go some way to 'discovery'; however, this is subject to the knowledge of those to whom the learner converses and they too may have their own 'blind spots'. Newstrom and Rubenfeld (1983) purport that learners with large blindspots can often lack the skills with which to interact. Indeed, if a learner also has

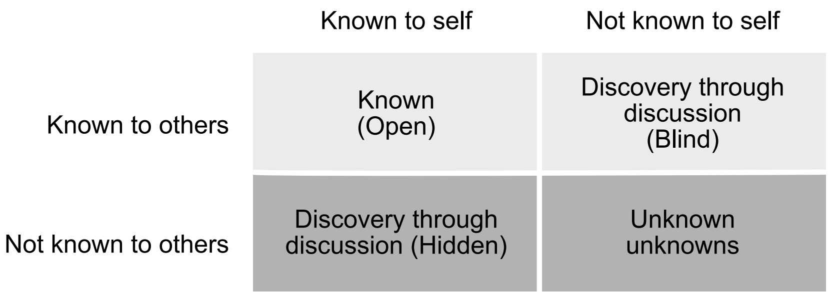


Figure 2.3.: The Johari Window (Luft and Ingham, 1955)

an expansive 'unknown / unknowns' and their self-awareness and conscious-thought capabilities are limited, inter-personal relationships can be difficult. This phenomena goes some way to not only explaining why some students struggle to display knowledge concepts, but also could be the reason why some students appear to lack criticality when employing Kolb's (1984) experiential learning cycle.

Argyris and Schön (1978) describe a model of double loop learning which recognises that some of what is learnt may be related to cultural and social dimensions of the organisation in which a practitioner works, for example, an HEI or Hospital Trust. Whilst Argyris and Schön's (1978) model of double loop learning appears a step forward from that of Kolb's model (1984), limitations remain in that reflection is undertaken within the confines of the organisation and no part of the double-loop process questions the fundamental assumptions and goals of the organisation. Furthermore, the role of emotions and values which, as Schutz and Lanehart (2002) argue, are an intrinsic part of learning, appear insufficiently represented in the model (Menter, 2014). Thus, the double loop learning model also has limitations.

Schön's (1983) exploration of how professionals think in action is relevant to professional learning, as this attempts to describe how a person reacts in response to unfamiliar or unexpected situations. Reflection-in-action brings together a person's previous experiences, ideas and actions in an attempt to make sense of the given situation (Schön, 1983); thus it is akin to professional intuition and the 'tacit' knowledge described by Eraut and Hirsh (2007). After the event, Schön (1983) purports that further critical reflection occurs (reflection-on-action), a purposeful rather than intuitive event, which facilitates feedback and learning (Nestel and Tierney, 2007). Whilst Schön's (1983) theory of how professionals think is useful in identifying reflective processes, nevertheless, it's application to the learner journey has some limitations as although a learner assumes some knowledge and skills, it is unlikely that they will have developed too much professional intuition or tacit knowledge as this is only acquired with experience and time (Eraut and Hirsh, 2007).

Reflection outcomes are a key part of learning on undergraduate radiotherapy programmes (Ng *et al.*, 2008; Chapman *et al.*, 2009) and a review of HEI programme specifications highlighted that all programmes reported reflection as a learning outcome as shown in Table 2.7 on the following page.

Whilst critical reflection is fundamental in professional learning, consideration must also be given to the distinct forms of knowledge constructs, as it is these aspects of learning that are thought to vary with time and experience (Ng *et al.*, 2008; Menter, 2014). Benner (1984) differentiates between two distinct forms of knowledge in professional learning: 'knowing-how' and 'knowing that'. 'Knowing how' relates to information acquired when something is practiced and so is performance related, for example, setting up a patient in a clinical setting (Khan and Ramachandran, 2012), and this is divorced from 'knowing that' which aligns to theoretical input and explanation. Winch (2010) concurs that forms of knowing assume two distinct parts: the theoretical underpinning of a specific field of enquiry and practical knowledge (Winch, 2010). Theories related to 'knowing how' are presented in Benner's Novice to Expert Theory (Benner, 1984).

Table 2.7.: Reflective practice outcomes featured in undergraduate radiotherapy programmes in England

HEI	Reflective Practice Outcomes
Birmingham City University	Produce a portfolio of evidence that demonstrates evidence of suitable competency and reflective practice appropriate to that of a newly qualified therapeutic radiography practitioner.
City, University of London	Demonstrate the ability of critical self-reflection.
Hertfordshire	Use a learner-centred approach that encourages self-reflection and development of inter-personal and professional skills thus affording graduates the opportunity to be adaptable and self-managing. Skills are enhanced by critical reflection of their performance in practice.
Kingston & St George's	Undertake skilled competent, safe, evaluative reflective therapeutic radiography practice. Reflect upon informed decisions about clinical practices consistent with accepted protocols and the individual patients' needs.
London South Bank	Critically reflect on practice, in particular research evidence, ensuring an evidence based approach to the professional role. Constructively reflect on clinical practice. Critically reflect on practice / subject area using research evidence ensuring an evidence based approach to the professional role.
Liverpool	Use critical and analytical skills gained through research, reflection and reflective practice to solve problems. Demonstrate independent critical reflection on their experiences, in order to identify areas for personal development.
Portsmouth	Respond as a critical and reflective practitioner to the rapidly changing role of the radiographer and therefore work more effectively within a health care team. Critically reflect on their learning and demonstrate how it can be transferred to other situations.
Suffolk	Yr 1 Care and nursing skills; basic therapeutic radiography skills; developing ability to reflect on practice. Yr 3 emphasis on analysis, synthesis and reflection; ability to handle cognitive complexity; to evaluate; to apply knowledge and new skills in new situations; to apply the particular to the general.
Sheffield Hallam	Engage with continual professional development and the process of action planning and reflection.
Uni of West England, Bristol	Demonstrate effective personal management skills, including IT skills, time management, prioritisation of workload and ability to self-evaluate/reflect. Demonstrate reflective practice.

Table 2.8.: Summary of novice to expert theory (Benner, 1984)

Level	**Description of Knowing**
Novice	Recognises facts relevant to a skill or specific situation. The behaviour is aligned to the particular situation and limited to those features, i.e. behaviour is governed by a set of rules that the novice applies to a situation.
Advanced Beginner	Prior experiences enable recognition of recurring, global components of a situation. There is knowledge and the know-how which guides actions but not enough in-depth experience to perform intuitively.
Competent	Although there is a confidence and an ability to cope with a wide range of situations, speed and flexibility is lacking when making a decision. Competent practitioners recognise patterns and through analytical thinking recognise the nature of clinical situations more quickly and accurately than advanced beginners.
Proficient	Here there is an analytic ability to recognise and modify plans beyond the normal situation. There is a holistic appreciation which improves decision-making.
Expert	Has an intuitive grasp of a situation which has been framed by experience and acquisition of deep knowledge. There is no reliance solely on 'rules' to guide actions; there is an unconscious response to a given situation.

2.5.2.2. Novice to Expert theory

Benner's (1984) theory was based on a model of skill acquisition first developed by Dreyfus and Dreyfus (1980) in the field of computing. Benner (1984) adapted the model to the field of nursing but the levels are described in generic terms and subsequently have been applied to other professions where a competence or skill is displayed. The broad definitions of the Novice to Expert Theory are presented in Table 2.8.

Benner's (1984) model suggests there is logical progression from one stage of knowing to another which results from practical experiences gained over time. The model propounds that stages of 'knowing how' are displayed in a number of ways, progressing from the application of rule-based knowledge in a specific context to intuitive decision-making in which knowledge guides actions and decisions implicitly rather than explicitly (Benner and Tanner, 1987). The explicit to implicit theory suggests that there is a learnt response and a subsequent behavioural reaction which later becomes embedded as an 'accepted' truth. However, Benner (1984) omits analytic thinking, critical reflection and objective judgement from the process which are known to contribute to expert fluidity (Gobet and Chassy, 2008).

The model as it is presented infers that the development of knowledge occurs linearly with distinct phases of learning development. However, radiotherapy practice exists within an environment where technologically-advanced equipment and updated radiotherapy techniques are continually being introduced and new roles are being developed to improve service delivery (Citrin, 2017). Any change in role or responsibility, for example, an 'expert' practitioner being asked to implement a new radiotherapy technique or an 'expert' lecturer being required to teach a subject with which they are unfamiliar, requires the alteration of existing knowledge and skill or acquisition of new skills and underpinning theory. Thus, with new and different experiences comes an altered state; consequently in today's fast-developing world a practitioner or lecturer may embody more than one level of the 'knowing-how' Novice to Expert continuum (Bowen and Prentice, 2016).

Another limitation of the theory is the suggestion that expertise relies fully on experience. For example, Benner (1984) defines the expert nurse as one who:

> No longer relies on an analytic principle (rule, guideline, maxim) to connect her or his understanding of the situation to an appropriate action. The expert nurse, with an enormous background of experience now has an intuitive grasp of each situation and zeroes in on the accurate region of the problem without wasteful consideration of a large range of unfruitful,

alternative diagnoses and solutions. (Benner, 1984, p. 31–32)

This definition is simplistic and fails to take account of other factors that affect expert intuition, such as cognitive and emotional responses situated in long-term and short-term memory and the integrated use of knowledge from different domains (Boshuizen *et al.*, 2003; Gobet and Chassy, 2008). It also ignores personality traits and mindsets which, as noted in Achievement Goal theory, will affect competence and success in specific activities (Cook and Artino, 2016). Indeed, Benner's (1984) definition of the expert nurse omits the multi-faceted aspects of learning: personal identity, cultural influences, situational contexts and the changing circumstances in which learning occurs which, as Ericsson (2015) notes, are some of the concepts by which an expert practitioner acquires and maintains their expertise.

2.5.2.3. Workplace influences on learning

The place where learning occurs has a significant impact on what, how and when learning occurs (Eraut, 2007; Eraut and Hirsh, 2007; Eraut, 2011). Within each learning arena, an inherent, yet, often indescribable culture exists with practices being embedded within accepted custom and practice (Eraut and Hirsh, 2007). Culture is a reflection of human thought and behaviours which are influenced by interactions, observation and what is learnt from others (Beals *et al.*, 1977). Specific professional and social groups have a different set of words and a common understanding with which they are associated (Eraut and Hirsh, 2007). Thus there is a period of time during which familiarisation and adaptation to the culture occurs and this is the period in which a student learns to behave and accept the values associated with the profession.

Developing an ability to cope with a workplace learning culture forms part of a 'hidden' curriculum, i.e. "processes, pressures and constraints which fall outside of, or are embedded within, the formal curriculum and which are often unarticulated or unexplored" (Cribb and Bignold, 1999, p.197). One leading researcher who has investigated the field of work-place learning is Eraut. His model of learning, based on empirical evidence, analyses the development of professional expertise and concludes that professional knowledge development is complex and consists of many parts, including:

- codified knowledge ready for use;
- knowledge acquired through enculturation;
- knowledge constructed from experience, social interaction and reflection;
- skills developed through practice with feedback;
- episodes, impressions and images that provide the foundations for formal knowledge;
- self-knowledge, attitudes, value and emotions (Eraut, 2014, p.48).

Eraut terms knowledge concepts as tacit knowledge and deliberative learning (Eraut, 2000; 2004; Eraut, 2014). Tacit knowledge relates to the subconscious aspects of learning which can include organisational and team cultural and discourse influences related to the place of learning (Eraut, 2007; Eraut and Hirsh, 2007; Eraut, 2011). Tacitness incorporates several aspects of knowledge including situational understanding that is advanced through the stages of development to increasingly intuitive problem-solving based on pattern recognition as expounded by Dreyfus and Dreyfus (1980) and Benner (1984). Such knowledge is uncodified and socially-constructed, yet, as displayed in Figure 2.4 on the facing page, it also considers an individual's influences (personal knowledge) within the social context (Eraut, 2010).

Personal knowledge embraces what a person brings to a situation and influences how they think, perform and interact (Eraut, 2007). Typically, radiotherapy students are drawn to the profession through a number of avenues, however, personal and familial

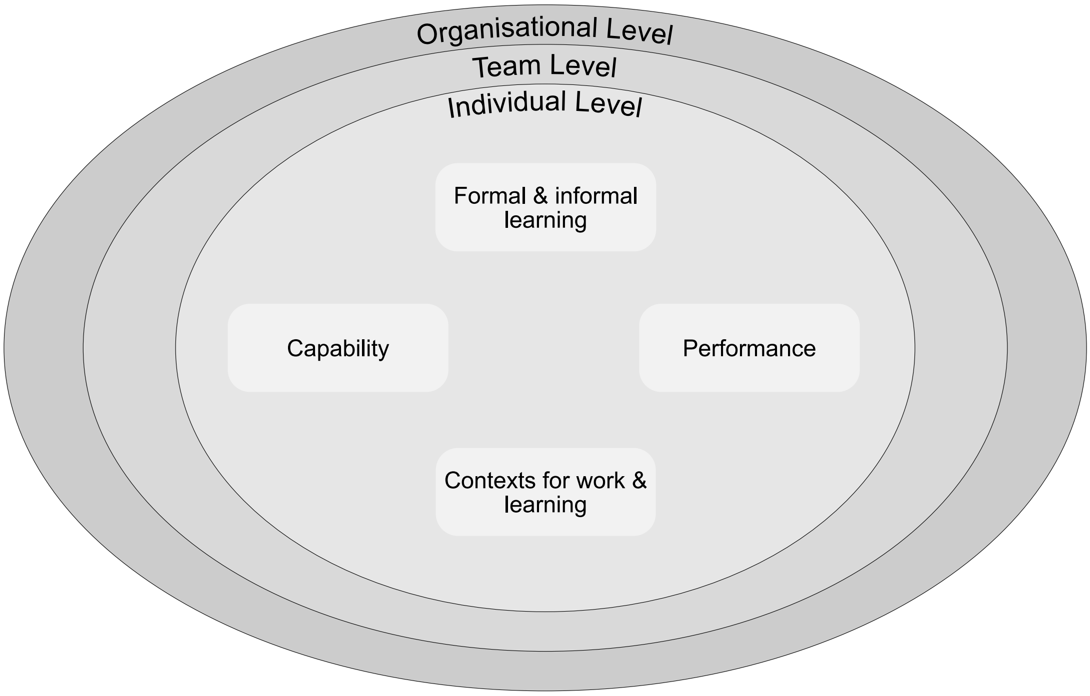


Figure 2.4.: Key Aspects of Workplace Learning (Eraut, 2011)

experiences of a diagnosis of cancer and radiotherapy treatment combined with a desire to want to help others, tend to be reasons cited for entry to the profession (Society of Radiographers, 2017a). Family and community contexts are known to influence inter-personal skills and are an example of implicit learning (Eraut, 2011). Yet, personal capability, including the inherent capacity of a student to learn, will also effect how and the extent to which learning takes place (Eraut and Hirsh, 2007). Thus, as shown in Figure 2.4, learning has many influences and is multi-faceted.

Conscious appreciation of tacit knowledge may only be realised when a learner achieves something that in past weeks could not have been achieved (Eraut, 2000; 2004; 2007). This suggests that in order to recognise the development of tacit knowledge, an active purposeful event such as a conscious reflection on activity should occur. This not only has implications for radiotherapy curricula content and delivery, but also for any programme embracing work-based learning as a means of key skills development.

In contrast to tacit knowledge, deliberative or codified knowledge is that which is learnt formally and is stored in semantic memory for later use in situations where memory recall is desirable (Menter, 2014). Eraut (2010) posits that traditional models of learning have focused on codified knowledge with less emphasis placed on the socially-constructed processes that relate to the development of tacit knowledge; despite the lack of evidence available, this certainly appears the case for therapeutic radiography. Eraut also suggests that knowledge can be accrued through a prescribed learning framework, however, emphasis needs to be placed on how academic and placement components are integrated and there should be consideration of the learning consequences that specific methods of teaching bring (Eraut, 2014).

Both tacit and codified knowledge within academic and placement environments play an important part in the development of professional learning. According to Eraut (2011), typologies of workplace learning exist which can be categorised according to:

- task performance;
- awareness and understanding;
- personal development;
- academic knowledge and skills;
- role performance;
- teamwork;
- decision making and problem solving;
- judgement.

Whilst the task and underlying knowledge and skill set vary according to the specific professional role, nevertheless the learning trajectory inherent within the category reflects a typology that is common to many professions, including therapeutic radiography education. Table 2.9 on the facing page, adapted from Eraut (2011), provides

Table 2.9.: An example of a typology of workplace learning trajectories (Eraut, 2011)

Category	**Pathway**
Task performance	Speed and fluency Complexity of tasks and problems Range of skills required Communication with a wide range of people Collaborative work
Academic knowledge and skills	Use of evidence and argument Accessing formal knowledge Research-based practice Theoretical thinking Knowing what you might need to know Using knowledge resources (human, paper-based, electronic) Learning how to use relevant theory in a range of practical situations

an example of a typology of workplace learning trajectories.

Within the typology there are key activities that can promote and develop learning (Eraut and Hirsh, 2007; Eraut, 2011). Based on the work and definitions of Dreyfus and Dreyfus (1980) and Benner (1984), it can be assumed that a student radiographer begins at the level of the novice and, in order to become proficient, must be exposed to activities that encourage the development of knowledge, understanding and practical skills of the qualified therapeutic radiographer. Within academic and work-based environments, learning opportunities are afforded by specific activities and whether an explicit or implicit objective, each activity may have a learning by-product associated with it (Eraut, 2011). Table 2.10 on the next page gives an outline of work-based processes and activities and examples of the learning with which they may be associated, the recognition of which is useful when suggesting specific activities for radiotherapy students.

Learning within a profession is situated within a community of practice and, as shown

Table 2.10.: Typology of learning processes and activities (Eraut, 2011)

Processes with learning as a by-product	**Learning processes at or near the workplace**
Participation in group processes	Being supervised
Working alongside others	Being coached
Consultation	Being mentored
Tackling challenging tasks and roles	Shadowing
Problem solving	Visiting other sites
Trying things out	Conferences
Consolidating, extending and refining skills	Short courses
Working with clients	Working for a qualification
	Independent study

in Table 2.10, may employ both active techniques, for example, tackling challenges and trying things out, as well as passive learner engagement, for example, observation (Eraut, 2011). Some practices, for example, tackling challenges, have an element of risk to them and new learners might be less inclined to engage with this sort of activity, whereas, a more experienced learner may derive confidence from this should they be successful (Eraut and Hirsh, 2007). However, most activities involve socio-cultural practices and procedures within which there exists a range of power influences that not only require the use of different learner skill sets, but also result in a variety of dynamic relationships between teachers and learners (Hativa, 2000; Bergstrom, 2010). Thus, work-place learning affords a range of complex, interactive or passive learning opportunities and presents a richness of relationships from which the learner can profit, provided the activity is appropriate to the level of learning; something usually described and measured by competence-based outcomes (Eraut and Hirsh, 2007).

2.5.3. Concepts of competence

Gauging the extent to which learning occurs in the workplace is often monitored through competence-driven assessment. Concepts of competence may have different meanings to different professions as the workplace defines a set of roles and responsibilities that are socially-specific and may therefore not only be unique to an individual profession, but also may be organisationally swayed (Eraut, 1998). In general, competence encompasses constructs which comprise the overriding characteristics of the profession and learner capability, defined by Eraut (1998, p.135) as "what a person can think or do that is relevant to the work of a particular profession".

Jackson (2007) in her study of assessment of clinical competence in therapeutic radiographer graduates, described fourteen constructs that she believed comprised the radiotherapy role and made the radiotherapy practitioner fit for practice (Table 2.11 on the next page). The position statement for the research acknowledged that competence could be defined as a continuum, with HEI's employing Benner's (1984) novice to expert theory to describe competence achievement; yet, this is an assumption and there is no evidence in literature to suggest that this was the educational model employed by HEIs.

Jackson's (2007) fourteen constructs were divided into two main groups: technical and patient management skills; professional and communication skills which were subdivided into broad categories (Table 2.11 on the following page). Many of these categories could equally apply to other professions because they describe skills common to healthcare professions and work-place learning trajectories (Eraut, 1998; 2011); indeed, it could be argued that perhaps there was scope to explore in more depth the tacit and codified knowledge that helps to define and shape the therapeutic radiographer role.

The method of data gathering was a survey, sent to all radiotherapy departments in

Table 2.11.: Constructs of graduate therapeutic radiographer competence (Jackson, 2007, pp.149-150)

Technical and patient management skills	**Professional and communication skills**
Knowledge and terminology	Team work
Ability to perform techniques	Professional conduct
Safe working practices	Confidence
Utilisation of treatment data	Communicating messages
Accepting responsibility	Giving information and instructions
Administrative procedures	Attending to patients and establishing rapport
Dose calculations	Listening and questioning skills

the UK and a senior member of practice staff was asked to complete the questionnaire (Jackson, 2007). As noted by Eraut (2011), there are organisational influences and contexts that exist in the work-place, therefore, a senior practitioner in department A may have had different expectations to some-one in department B. Furthermore, the socially-situated nature of competence means that individuals are likely to interpret competence in different ways (Eraut, 1998); radiographer one in department A may have had a differing opinion to radiographer two in department A. Whilst Jackson (2007) acknowledges some limitations of the study, for example, the reliability of the grading criteria (Table 2.12 on the next page), the lack of attention to: explicit definitions of competence; the nuances of individual and organisational influences on the study design; detailed participant responses and findings; casts some doubt as to the value of this study in defining and exploring graduate therapeutic radiographer competence and fitness to practice.

Epstein and Hundert (2002), in their study defining domains of professional practice in medicine, claim that there are seven dimensions of competence (Table 2.13 on the

Table 2.12.: Jackson's (2007) competence descriptors

Grade	Competence Descriptor
A	Exceptionally high standard. Evidence of ability to think and act independently.
B	Very good standard. Evidence of sound grasp of facts and concepts.
C	Generally a sound competent performance. Mainly error free.
D	Competent performance with some weaknesses. Additional support required.
E	Limited performance of competence. Weaknesses. Limited understanding of facts and concepts.
F	Major shortcomings in competence to practice. Performance containing serious errors and inaccuracies.

following page). Each domain is provided with descriptors which usefully give clarity and detail to the domain; indeed they present a broader and more multi-faceted professional role which takes account not only of individual characteristics, skills and behaviours, but also the socio-cultural nature of contexts impacting on the role.

Competence and capability are intrinsically linked and part of the learner journey involves developing new knowledge and capabilities over time (Eraut, 1998). However, several factors impact on stages of learning not least of which include the capacity to learn which can vary from one individual to another and can be partially explained by cognitive load theory (CLT).

CLT describes a relationship between learning tasks and the ability of a student to both process information and store it in long-term memory (Sweller *et al.*, 2019). A person's cognitive load consists of: the intrinsic load which is essential for performing the task; the extraneous load (not required for the task); and the germane load (learner's self-imposed deliberate cognitive strategies) (Young *et al.*, 2014). Improved learning occurs when the cognitive load is reduced, that is, when tasks are not too

Table 2.13.: Dimensions of professional competence in medicine (Epstein and Hundert, 2002, p. 227)

Dimension	**Description**
Cognitive	Core knowledge Basic communication skills Information management Applying knowledge to real-world situations Using tacit knowledge and personal experience Abstract problem-solving Self-directed acquisition of new knowledge Recognizing gaps in knowledge Generating questions Using resources (eg, published evidence, colleagues) Learning from experience
Technical	Physical examination skills Surgical/procedural skills
Integrative	Incorporating scientific, clinical, and humanistic judgment Using clinical reasoning strategies appropriately (hypothetico-deductive, pattern-recognition, elaborated knowledge) Linking basic and clinical knowledge across disciplines Managing uncertainty
Context	Clinical setting Use of time
Relationship	Communication skills Handling conflict Teamwork Teaching others (eg, patients, students, and colleagues)
Affective/Moral	Tolerance of ambiguity and anxiety Emotional intelligence Respect for patients Responsiveness to patients and society Caring
Habits of Mind	Observations of one's own thinking, emotions, and techniques Attentiveness Critical curiosity Recognition of and response to cognitive and emotional biases Willingness to acknowledge and correct errors

complex or have unnecessary distractions (Gooding *et al.*, 2017; Sweller *et al.*, 2019). Thus, learning becomes most effective when the task and activities required of a learner are clear and well-defined; this applies not only to the guidance and outcomes for developing clinical competence, but also to the assessment used to measure it.

2.5.4. Assessment and feedback

Assessment of work-based learning can be subject to issues with reproducibility, observer effects, measurement error and validity (Shepard, 2009). Yet, it is a core component of learning and can be used not only to inform and give feedback for future learning that can enable self-reflection on strengths and weaknesses, but also to measure the extent of learning in order to award a grade on performance of core skills (Epstein and Hundert, 2002; Khan and Ramachandran, 2012). One theory used in assessment processes that describes the development of clinical competence and is useful in defining skills at various study levels is Miller's Pyramid (Miller, 1990; Mehay, 2012).

Miller's Pyramid (Figure 2.5 on the next page) recognises the constructs of knowledge, skill and attitude and also takes account of the novice to expert theory thereby reflecting the stages through which a learner acquires professional competences. However, Khan and Ramachandran (2012) contend that there has been inappropriate application of Miller's Pyramid to assessment of practice learning, especially in relation to the contextual influences on an individual's performance which may be considerable. They note that expectations of performance should be tempered according to specific environments and that learners may achieve different performance results according to specific points in time (Khan and Ramachandran, 2012). This aligns to the workplace learning trajectories purported by Eraut (2011) and suggests that assessment, though useful in determining the skills that comprise performance, should be nuanced

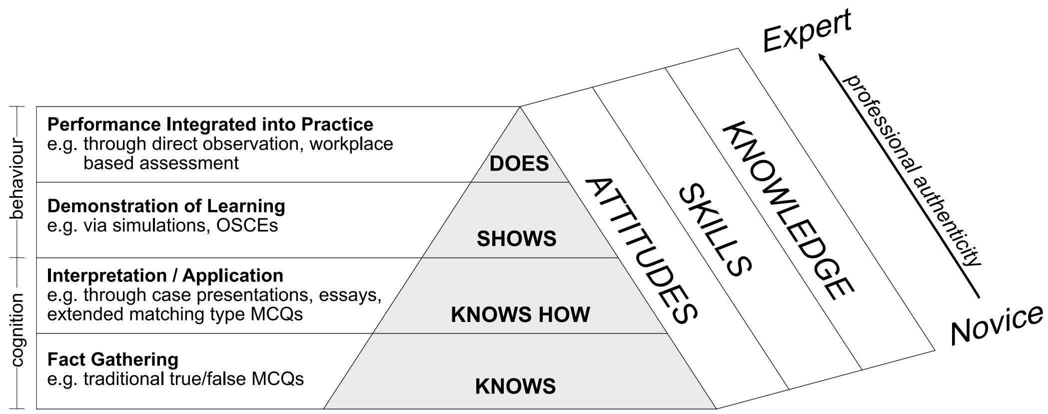


Figure 2.5.: Miller's Pyramid (Mehay, 2012; p.41)

according to experience. Thus objectives should be set which not only differentiate between the performance of a novice through to expert, but also align to explicit skills in specific environments; concepts which again throw doubt on the reliability of Jackson's (2007) research which attempted to measure the competence of graduate therapeutic radiographer generically.

Whilst assessment procedures can look to advance according to stages and places of learning, there still remains a requirement for robust teaching and mentoring systems as inadequate feedback by those with whom a learner interacts can be a cause of a failure to learn (Epstein and Hundert, 2002). Indeed, excellence in teaching is linked to learner excellence in clinical performance; thus relationships between a learner and teacher are key (Griffith *et al.*, 2000; Blakey *et al.*, 2019) and are worthy of mention as they may assume some relevance and importance to positive learning experiences in this study.

Feedback embraces a multiple of theoretical concepts, some of which encompass the reflective theorems espoused by Schön (1983) which purport that the learner is a self-analysing reflective practitioner who monitors and adjusts their performance accordingly. Other theories embrace the sociological aspects of learning, such as those described by Eraut and Hirsh (2007) and Lave and Wenger (1991), who note that an individual constructs their professional identity from persons with whom they are interacting in the work-place environment. Thus there is opportunity for role-modelling and mimicry through socio-cultural processes and, if a learner has not only an orientation for learning, but also explicit perception of the need to adapt, as Knowles' (1980) adult learning theory suggests, then learner self-regulation exists and with it comes a desire to acquire feedback (Nicol and Macfarlane-Dick, 2006).

Other aspects important to feedback include the learner's stage of training: a novice learner who is new to a particular radiotherapy process or technique will be utilising codified knowledge (Eraut, 2000; 2004) but as hypothesised by Dreyfus and Dreyfus (1980) and later Benner (1984), the novice practitioner will perform and think in a different way to an expert. Not only will a novice learner initially require a lot of feedback, but also there should be consideration of how the learner monitors and recognises performance which varies according to the stage of learning and the internal motivational processes the individual employs (Nicol and Macfarlane-Dick, 2006).

Nicol and MacFarlane-Dick (2006, p.205) describe seven principles of good feedback processes (Table 2.14 on the following page).

They suggest that students can only achieve specific goals if what is required is understood, that is, students' expectations align to those of their teachers and supervisors. Evidence suggests that this is not always achieved and there is a need to clarify learning outcomes utilising explicit criteria and clear objectives (Nicol and Macfarlane-Dick, 2006). Once the goal is known, then it is important to provide opportunity for learners to reflect, yet, as described by the Johari Window, sometimes learners are unable to recognise the learning required if it is a subject with which they are unfamiliar (Luft and Ingham, 1955; Newstrom and Rubenfeld, 1983) so reflection without explicit feedback can have limitations.

Explicit feedback should embody information that enables students to recognise im-

Table 2.14.: Seven principles of good feedback practice (Nicol and Macfarlane-Dick, 2006)

Number	**Principle**
1	Helps clarify what good performance is (goals, criteria, expected standards)
2	Facilitates the development of self-assessment (reflection) in learning
3	Delivers high quality information to students about their learning
4	Encourages teacher and peer dialogue around learning
5	Encourages positive motivational beliefs and self-esteem
6	Provides opportunities to close the gap between current and desired performance
7	Provides information to teachers that can be used to help shape teaching

provements required of their own performance and take appropriate actions (Nicol and Macfarlane-Dick, 2006). Furthermore, the information should be couched so as not to negatively impact on confidence and motivation for learning; rather, it should encourage and enable learning progression which as noted by Nicol and Macfarlane-Dick (2006) may only be realised if the opportunity to implement performance feedback is provided. Thus there needs to be careful consideration of the impact that feedback has on a learner and, associated with this, attention should be given to the power yielded by teachers and supervisors who are in the position of giving feedback.

2.5.5. Teachers and learners

Bergstrom (2010), in his study on student-teacher relationships in higher education, acknowledges the influences of independence, support and power on learning processes and the learner. In professional programmes, learning in the workplace is facilitated by practitioners: the duties and responsibilities for which are prescribed in professional codes and frameworks. Section 9.1.10 of the Education and Career Framework for the Radiography Workforce (2013, p.12) states that following a period of preceptorship the practitioner should "mentor and teach learners, support staff and other professionals." However, the role of teacher is a position for which the practitioner may neither be fully prepared nor comfortable with because formal teaching of learning theories on professional programmes tends to be lacking (Erlich and Shaughnessy, 2014; Irby, 2014). Review of module content that comprise the programmes for the ten HEIs offering therapeutic radiography education, appears to concur with this; there appears no explicit teaching of education theories apparent in the data (Appendix A on page 257). Yet, evidence shows that there appears a clear relationship between excellence in teaching and learner clinical performance (Griffith *et al.*, 2000; Blakey *et al.*, 2019); thus, an understanding of teaching is a desirable knowledge concept, if not an essential skill, of a graduating practitioner.

The results of a study into clinical teaching performance conducted in the Netherlands by van der Leeuw *et al.* (2016) demonstrated that 79% of clinical-based teachers (n = 385) were identified by learners as needing teaching skill improvement with 80% (n = 390) identified as requiring an improved attitude to teaching. The learners in the study were residents on medical programmes with whom clinical staff were interacting in a supervisory role. Learners used both a numerical scoring system and prose as methods of feedback to their clinical supervisors. Findings of the study also demonstrated that, as well as clinical supervisors lacking teaching skills, learner residents were unable to provide instructive and appropriate feedback to their supervisors. Van der Leeuw *et al.* (2016) concluded that although some potential bias may have been introduced via phrasing of the data collection tools, nevertheless results indicated that there was clear scope for improvement in the residents' feedback to clinical teachers which, together with a lack of underpinning knowledge of teaching theory, appear recurrent themes in practitioner teaching (Palmer and Cherryman, 2009; Irby, 2014).

Practitioners typically provide oral and written feedback in line with supervisory roles and mentoring (Perram *et al.*, 2016) which the Society and College of Radiographers (2009, p.2) define as:

> a dynamic process which needs to be able to change, and enable change, throughout the different career stages; mentorship and mentoring mean something slightly different to each individual dependent upon their particular circumstances. There are many different definitions but there are however common themes that run consistently throughout; the idea of someone who is there to help, support and guide another into a place of greater knowledge, understanding and usefulness and that of a working relationship which extends mutual trust and respect.

This definition acknowledges the individualism inherent within mentoring systems and gives emphasis to the facilitative nature of the process. A mentor thus assumes a different relationship with a learner compared to a teacher, yet, a practitioner typically assumes both roles in work-place learning, in addition to the role-specific tasks and responsibilities they must deliver (Eraut, 2007; Palmer and Cherryman, 2009; Piquette *et al.*, 2015). Consequently, there are competing demands placed on practitioners which may further be compounded by the complexity of clinical processes and organisational challenges, for example, staff shortages (Eraut and Hirsh, 2007; Perram *et al.*, 2016; Blakey *et al.*, 2019).

There are various interactions that occur between a practitioner and student, and actions and reactions of both impact on learning (Palmer and Cherryman, 2009; Irby, 2014). Less of an issue is the student who learns radiotherapy techniques and procedures effortlessly; those who quickly develop clinical competence, self-awareness and

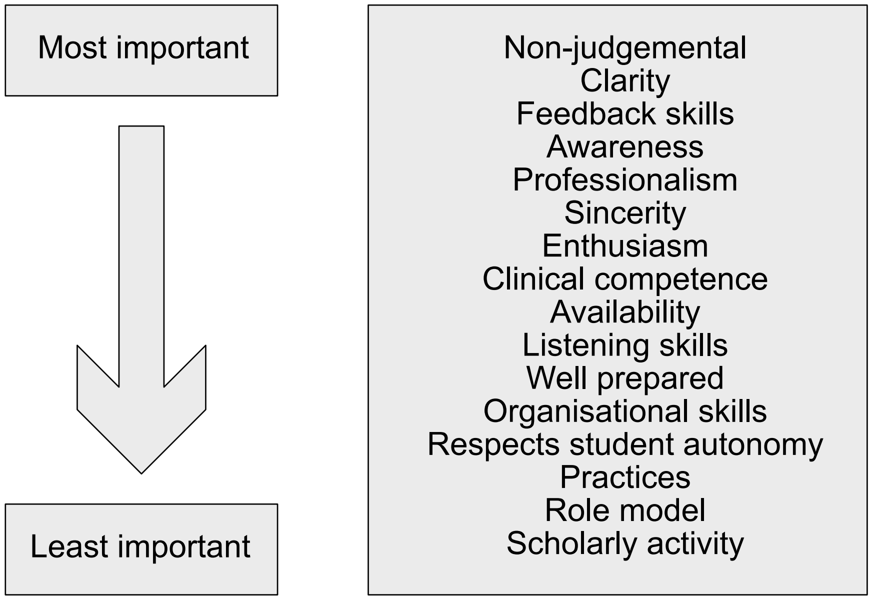


Figure 2.6.: Adapted from Perram *et al.* (2016, p.298) Practice Educator Skills ranked according to Importance

a patient focus are regarded as 'model' students and less educational and emotional investment is required from the practitioner (Palmer and Cherryman, 2009). However, students who struggle in the placement environment typically have an effect on practitioners who may respond in a variety of ways: they could ignore the issue, possibly to avoid an increase in workload or because they do not know how to deal with it; alternatively, they could be instrumental in devising an action plan or suggesting an intervention justified by well-constructed feedback (Palmer and Cherryman, 2009). The findings from a study by McPake (2018) demonstrated that radiotherapy students endure both positive and negative relationships in practice. Positive feelings were engendered when practitioners provided encouragement and support; those that were deemed friendly and approachable were seen to positively contribute to a student's learning. This correlates with the findings from a study by Perram *et al.* (2016) whose research defined sixteen characteristics that comprised the 'ideal' practice educator (PE) (Figure 2.6).

Interestingly, as students progressed through their level of study, some PE characteristics became more important whilst others less so. For example, two characteristics (feedback skills and being non-judgemental) were attributed greater importance with increasing student experience, whereas three characteristics (being well-prepared, having clinical competence and participating in scholarly activity) became less significant (Perram *et al.*, 2016). In addition to using Likert scale measurements, Perram *et al.* (2016) employed free-text open response questions in which students were asked to provide information on their three 'least-preferred' and three 'most-preferred' PE characteristics. Four 'most-preferred' characteristic themes emerged from the data: respectful; inspirational; supportive; good teacher; which correlates with the findings of the study by McPake (2018).

In McPake's (2018) study, negative experiences included feelings of frustration, fragility, vulnerability and reduced confidence, the cause of which students felt were directly related to specific behaviours and attitudes of practitioners. Examples of situations and behaviours cited included alienation from the team, unjustified criticism, being made to feel unwelcome, and a lack of power and control, for example, when asking for competencies to be signed off (McPake, 2018). Douglas *et al.* (2015) in a study that asked business students to describe both a positive and a negative teaching, learning and assessment experience noted that quality determinants included: physical resources such as access to learning environments and learning resources; yet, more emphasis was towards the socio-cultural dynamics of programme delivery such as attentiveness and helpfulness of staff, availability of staff and communication. Interestingly, communication related not only to accuracy and frequency of verbal and written communication, but also to whether students fully grasped the academic language being used, for example, in receiving feedback on performance or assignments. This is significant as, on professional programmes, students have to become familiar with the language used in academia as well as that within clinical practices and this can be a cause of tension between the two environments (Eraut, 2004; Menter, 2014) thereby affecting the relationships between the learner and teacher.

Control in student-teacher relationships can be influenced by the way in which the curricula is delivered and organised; if this is highly-structured with high levels of teacher input, students often have clear direction, yet, if explicit instruction is missing, then students are required to take more responsibility and decisions for their learning (Bergstrom, 2010). This may be more achievable if the knowledge or skill required is transparent to the learner, however, as Eraut and Hirsh (2007) note, both unconscious tacit and conscious codified knowledge exist. Eraut (2014) contends that codified knowledge has to be available in a form that allows it to be used in a particular situation, suggesting that a learning and teaching intervention needs to be authentic and presented in a way that is transferable. This aligns to simulation theory which attempts to re-enact skills training in particular circumstances (Kalaniti and Campbell, 2015) and is a learning activity that may be common to all undergraduate radiotherapy programmes in England as all have simulation facilities as shown in Table 2.15 on page 65.

2.5.6. Simulation in radiotherapy education

Programme data shows that all HEIs in England have simulation facilities for use in radiotherapy education (summarised in Table 2.15 on page 65). The Virtual Environment for Radiotherapy Treatment (VERT) is a two or three dimensional, computer-generated, virtual environment that mimics a radiotherapy treatment room. The movements of a treatment machine are operated by means of a handset to enable radiotherapy to be applied to a virtual patient who is positioned on the treatment couch relevant to the area of the body being 'treated' with radiotherapy (Bridge *et al.*, 2007). A number of VERT models exist, ranging from desktop variants which work on a computer to the fully immersive model where the user is able to walk around a virtual treatment room 'operating' the radiotherapy treatment machine, known as a linear accelerator (Linac), by means of the integrated radiotherapy handset. It is unsurprising that all HEIs in England possess VERT as its introduction into radiotherapy education arose from recommendations made by the UK National Radiotherapy Advisory Group (NRAG) following the launch of the UK Government's Cancer Reform Strategy (Department of Health, 2007). NRAG suggested that VERT would improve retention of students on radiotherapy programmes by creating better learning experiences and would increase training capacity without burdening already busy radiotherapy departments (Bridge *et al.*, 2007). The recommendation was accepted by the UK Government resulting in a five million pound fund subsequently used to install VERT systems in all HEIs and radiotherapy clinical departments in England (Flinton, 2015).

VERT is useful in the development of psychomotor skills relevant to the operation of a Linac (Bridge *et al.*, 2007). Furthermore, it permits students to identify the regions of the body receiving radiotherapy which informs how precision and accuracy are paramount in treatment delivery by drawing the student's attention to the effects of incorrect field placement, and also facilitates understanding of the side effects of radiotherapy as the beam of radiation can be visualised passing through normal tissue structures. Where VERT falls short, is in providing an appreciation of the complete radiotherapy patient pathway and the key decisions made relevant to an individual patient. It could also be argued that VERT encourages a misplaced focus, i.e. attention is purely on the equipment and takes away from the care and compassion afforded to patients which should be a routine part of treatment set up and delivery.

Table 2.15.: Summary of simulation facilities found in HEIs in England offering undergraduate radiotherapy education as defined on websites in 2017

HEI	**Virtual Environment for Radiotherapy (VERT)**	**Radiotherapy planning facilities**	**Other**
Birmingham City University	Yes - 3D version	Yes - manufacturer not specified	Ultrasound, Imaging suite, PACS
City, University of London	Yes - 3D version	Yes - Varian Eclipse	Clinical skills centre
Hertfordshire	Yes - 3D version	Yes - manufacturer not specified	Radiotherapy labs, imaging lab
Kingston & St George's	Yes - 3D version	Yes - manufacturer not specified	Not specified
London South Bank	Yes - 3D version	Yes - Xio	Not specified
Liverpool	Yes - 3D version	Yes - manufacturer not specified	Imaging suite digital equipment, clinical skills resource room, human anatomy resource room
Portsmouth	Yes - 3D version	Yes - manufacturer not specified	Diagnostic imaging suite, ultrasound imaging, centre for simulation & health care
Suffolk	Yes - 3D version	Yes - Varian Eclipse	Radiotherapy practical room
Sheffield Hallam	Yes - 3D version	Yes - Eclipse	Not specified
Uni of West England, Bristol	Yes - 3D version	Yes - Varian Eclipse	Not specified

However, it does allow students to experiment with the equipment in a safe environment and become familiar with the movements of the Linac in real time through the use of a genuine Linac handset (Bridge *et al.*, 2007; James and Dumbleton, 2013).

Other equipment owned by HEIs includes radiotherapy planning equipment (Table 2.15 on the previous page) which comprises specialist software applications that run on computers, some of which have interactive, high resolution screens. In most cases, planning systems purchased by HEIs are modified, non-clinical versions of systems found in radiotherapy clinical departments; thus they have the same functionality and capability of clinical planning systems. However, there are different manufacturers of planning system software and whilst all planning system software can be used to teach the underlying principles involved in planning a patient's individualised radiotherapy, the software and user interface are specific to each manufacturer. Thus a student can learn core knowledge underpinning planning principles and become familiar with the specific system that a University employs, however, in terms of mastery of skills related to operation of the planning system software, this may be rendered ineffectual should the clinical placement in which the student undertakes their practice learning have a different planning system. Consequently a student may be competent in producing a clinically-acceptable treatment plan at a University, yet, on placement they may not be able to perform the most basic function of planning such as selecting an appropriate radiation beam for treatment. This can be a source of frustration for the learner and is an example where simulation-based mastery learning is slightly mismatched to the goal of simulation. However, if the outcomes of simulation are determined in advance of integration into a programme's curriculum, then simulation can be an effective method of learning (Motola *et al.*, 2013).

Two HEIs identify that they have ultrasound suites which are employed in the delivery of radiotherapy education to students. Formerly, ultrasound was known for its non-ionising radiation properties utilised in the diagnosis of health and illness and confirmation of pregnancy. More recently, however, it is being used within a radiotherapy context in the measurement of bladder volumes prior to treating the pelvis with high energy radiation beams in order to increase the accuracy of radiotherapy delivery (Hilman *et al.*, 2017; Mason *et al.*, 2017). This form of treatment verification is still in development and empirical evidence related to training is limited. It is perhaps a consideration for the future of undergraduate radiotherapy curricula.

Simulation can be classified according to the technology and processes used (Alinier, 2007). Some authors such as Aggarwal *et al.* (2010) purport that simulation should employ some form of technology that mimics a real-life simulation. However, others argue that role play can be considered simulation because carefully-planned and well-constructed clinical scenarios can produce authentic situations that mimic practice (Pilcher and Bedford, 2011; Wright *et al.*, 2015). The benefits of role play include negation of the subjectivity that clinical experience brings, thereby giving some equity of experience across a cohort of students; thus it is a controlled environment and may be used both as a learning tool and for assessment purposes (Wright *et al.*, 2015).

Whilst simulation is seen in the literature as a worthy method of learning (Bridge *et al.*, 2007; James and Dumbleton, 2013; Motola *et al.*, 2013) and all HEIs offering undergraduate radiotherapy education have simulation facilities, it cannot be assumed that all HEIs use simulation to the same extent, neither that learners view simulation experiences as positive learning. Bridge *et al.* (2017) conducted an international audit of the use of VERT and noted that 90% of the respondents (n = 52) used simulation as a means of conveying information related to radiotherapy techniques and concepts. Yet, the study also noted that there was a discrepancy between how it was employed and its functionality as a teaching and learning tool, suggesting that the pedagogy had not been fully explored or exploited by radiotherapy communities.

Simulation experiences embrace a multitude of learning opportunities which can involve both formal and informal learning depending on the simulation context and scenario (Kelly and Hager, 2015). Inherent to simulation activities are a number of pedagogies including deliberate practice and problem-based learning (Loomis, 2016). Deliberate practice involves a purposeful simulation of a skill or set of skills which in general are practiced in preparation for the clinical setting. This lends itself to the development of new skills and is appropriate for novice learners (Aggarwal *et al.*, 2010). However, as noted by Issenberg *et al.* (2005), it is important to have explicit goals for simulation and all learners must be given appropriate time to achieve the predefined outcomes applied to the task. However, as previously noted, outcomes are open to various interpretations; thus, learner development requires feedback from a facilitator which, as Kirschner *et al.* (2006) contend, should be instructional and direct, especially for novice learners who may not have sufficient working knowledge to inform their performance.

Shanahan (2016), in their study of a radiography simulation package, noted that simulation addresses two main stressors associated with clinical practice: the fear of making mistakes and feelings of unpreparedness for practice. Shanahan (2016) also purports that simulation benefits are four-fold and include development of technical skills, image evaluation skills, self-evaluation skills and problem-solving skills. Yet, in order to develop these higher level cognitive skills, context and outcome of individual and collaborative learning simulation activities need careful consideration and control (Issenberg *et al.*, 2005; Kirschner *et al.*, 2006). Thus it is necessary to not only identify the learning strategies employed, but also the inter-relational peer dynamics impacting on simulation learning experiences.

2.5.7. Peer and problem-based learning

Peer learning can be defined as the teaching and learning that occurs between peers, who are neither experts in teaching nor experts in the knowledge being discussed (Boud *et al.*, 2001; Ross and Cameron, 2007; Bennett *et al.*, 2014). Common features include learning from others within a particular social grouping and sharing learning in either formal or informal settings (Boud *et al.*, 2001; Ross and Cameron, 2007; Bennett *et al.*, 2014). Ross and Cameron (2007) contend that peer learning may occur between different levels of students from one institution as there is familiarity with educational contexts, content and terminology employed. Furthermore, because there is congruence and proximity in terms of subject knowledge and cognitive ability, there is a reduced power-authority dynamic and learning within the peer group becomes less onerous and more mutually-supportive (Boud *et al.*, 2001; Ross and Cameron, 2007).

Boud *et al.* (2001) describe peer learning as an abstract entity noting that it can apply to different scenarios, for example, on a one-to-one basis or within a wider group. What distinguishes formal peer learning systems from collaborative or co-operative learning is the role that a non-peer tutor plays: in peer learning the peer is both the tutor and the student and the non-peer academic or clinical tutor is a helper, some-one who creates and facilitates the peer learning (Boud *et al.*, 2001; Ross and Cameron, 2007). Bennett *et al.* (2014), in their study investigating how peer assisted learning transferred to the clinical setting, noted that there were sometimes tensions between peers who competed for the attention of expert clinical practitioners. Theories of work-base learning and communities of practice learning contend that students are peripheral to the practice setting and learn from expert clinical practitioners in order to become accepted as members of the professional community (Lave and Wenger, 1991). Time spent with expert practitioners is therefore prized and peer learning in clinical settings may therefore not be viewed as useful as that within other learning contexts (Bennett *et al.*, 2014). However, Boud *et al.* (2001) contend that there are a plethora of skills which can be enhanced through peer learning including: listening skills, planning and negotiation, facilitation, tutoring, giving and receiving feedback, dealing with conflict and problem-solving skills, especially when problem-based learning is integrated into the peer learning activity.

Problem-based learning (PBL) not only embraces some elements of skills development, but also employs information processing and the social and psychological interactions associated with team working (Bate *et al.*, 2014; Loomis, 2016). The multi-dimensional processes involved with PBL mean that advanced situations can be explored and higher level cognitive skills such as clinical reasoning utilised (Loomis, 2016). Arguably, the processes used in PBL align to the skills required for professional practice, in particular, those that are developed at later stages of learning. Provided that a PBL scenario is authentic and corresponds to a student's level of study, students are able to draw together previous personal knowledge and experiences and apply them to the situation posed; however, as Kirschner *et al.* (2006) note, minimal guidance for PBL scenarios or those that are misaligned to a learner's knowledge, will result in ineffective learning. Khan and Ramachandran (2012) agree noting that a lack of knowledge limits the ability to perform; a composite entity that comprises psychomotor and cognitive skills and impacts on the attitudes of others. Yet, some exponents of PBL contend that gaps in knowledge are part of the PBL educational process: knowledge voids are identified and addressed through the process of discussion, typically within small groups, and it is that social interaction and interrogation that promotes deep learning and improved knowledge retention (Bate *et al.*, 2014).

PBL relies on all members sharing responsibility for the process and thus it is mutually-dependant (Bate *et al.*, 2014). When a learner fails to engage with their group, this can be a source of frustration, however, where a group works well, displaying support and empathy to members, individuals' confidence can be increased and learning enriched (Bate *et al.*, 2014). As such, PBL may be a useful tool for learning on professional programmes. Indeed any activity that encourages the core skills of the role which are defined as empathy, respect, sensitivity and compassion (Society of Radiographers, 2017b) are welcomed. However, as discussed earlier, learning experiences are related to an individual's personal capability which also influences the extent to which learning occurs.

2.6. Summary of the Literature Review

The aim of this study is to explore the teaching and learning experiences that learners find positive in developing the knowledge, understanding and skills required of a graduate therapeutic radiographer. To provide context and background to the research, this literature review has provided an overview of the role of the radiographer and therapeutic radiography education, not only identifying distinguishing factors that comprise the profession, but also the methods employed to deliver professional programme curricula. Where possible, therapeutic radiography research has been presented and evaluated, however, it has been necessary to draw on evidence from other professions to explain core concepts underpinning learning on professional programmes and highlight the wider debate on concepts of competence.

Literature related to the ten HEIs in England that offer undergraduate radiotherapy programmes in England has been presented and reviewed with notable differences and similarities highlighted. Discussion around resources, including simulation facilities and academic and placement delivery has also occurred.

Finally, I have presented a range of individual and experiential teaching and learning theories, identifying the multi-faceted contexts and influences that impact on and sit alongside the learning required to become a therapeutic radiographer. Professional knowledge and competence have been discussed and the situational and socio-cultural contexts that potentially impact on a learner have been evaluated.

3. Research Design and Methodology

3.1. Introduction

In this chapter, I explain how the study was designed and discuss the philosophical and theoretical assumptions that helped shape the methodology. I articulate why an appreciative inquiry approach was adopted and provide a critical discussion of data collection methods. Finally, I describe the processes involved with data analysis and interpretation and demonstrate how academic and ethical rigour was maintained.

As noted in chapter one, the aim of the study was to explore and evaluate learning experiences that prepare students for the role of a therapeutic radiographer. In order to realise the study aim, the research objectives were to:

- Identify activities that radiotherapy learners defined as positive learning experiences;
- Establish where and how learning takes place;
- Establish whether learning activities reflect teaching and learning theories;
- Create a framework of educational methods that are conducive to developing skills for a therapeutic radiographer.

3.2. Determining the research design and methodology

When considering which methodology to choose, it was necessary to acknowledge my ontological, epistemological and philosophical assumptions. By determining the viewpoint from which I wished to ask the research question, I would expose the influences guiding the study design and data interpretation processes. I also explored theoretical frameworks and research paradigms applicable to the study area.

The data being sought encompassed both implicit and explicit learning mechanisms and their effectiveness as perceived by learners. Therefore studies which explored learning related to professional programmes, learner experiences and student evaluations of programme curricula were reviewed to determine appropriate methodological research processes. Other factors influencing the research design were more practical: I ascertained from where an accessible sample best placed to provide relevant data could be gained; I acknowledged there was a constrained timeframe during which the study would take place and there were limited resources available. Finally, I considered the methods for collecting data that would align not only to the ethical imperatives of the research study, but also to my own epistemological and philosophical viewpoints.

3.2.1. Ontology, epistemology and philosophical assumptions

The object of research in this study related to learner experiences on undergraduate radiotherapy programmes in England, in particular, what were the positive learning experiences of radiotherapy learners that facilitated the development of knowledge, skills and understanding required of a qualified therapeutic radiographer. Whilst the subject under investigation appeared identifiable, although the term ‘knowledge’ is debated amongst authors of professional learning theories (Eraut and Hirsh, 2007), how I made sense of those experiences and the influences that shaped them had to be given consideration. Critical discussion and reflection during my doctoral journey had made me more aware of my beliefs and philosophical assumptions. I am of the opinion that teaching, learning and assessment of radiotherapy curricula should be purposeful, underpin the key skills of the therapeutic radiographer and be informed by an evidence base. I believe this approach has been influenced by my early career as a radiographer, during which time I engaged with the scientific method which embraces positivism (Cohen *et al.*, 2011). The traditional positivist paradigm, supported by philosophers such as Russell (1959), claims that phenomena are real and exist without the need for the human mind to give them meaning. At the beginning of my journey, I had a desire to draw 'logical' conclusions from evidence, namely, to discover an empirical, objective truth about effective learning of radiotherapy curricula. However, the more I researched professional learning theories and radiotherapy curricula and its delivery, the more I realised that not only was there a rich tapestry of teaching and learning approaches available, but also, due to personal knowledge and capability, different people constructed meaning in a variety of ways as expounded in Denzin's concept of multiple versions of reality (Denzin, 1989). Thus, with time and study, I came to appreciate that my interpretations of teaching and learning were skewed by my own personal, social and cultural influences and therefore my approach and explanations would not be the same as the next person's. As I began to acknowledge the subjective nature of the area being studied, my initial positivist stance was tempered and I eventually realised that the study would necessarily embrace elements of constructivism, an anti-positivist paradigm.

Constructivism opposes an objective reality, instead suggesting that truth is socially constructed through human interaction and consciousness (Bryman, 2012). As such, knowledge and understanding evolve through discussion and collaboration in a social environment, with individuals constructing meaning through their lived experiences. Because there is variation in the value that individuals place on their reality, people construe meaning in different ways (Cohen *et al.*, 2011; Flick, 2014). The constructivist paradigm fitted well with the aims of the research and unlike positivism which tends to be associated with quantitative research methods, constructivism is associated with qualitative research (Cohen *et al.*, 2011; Bryman, 2012; Flick, 2014). I therefore adopted a qualitative, rather than the originally-intended quantitative research design.

3.2.2. Qualitative research paradigm

There are various descriptions of qualitative research and although there is no commonly-agreed definition, most authors on the subject suggest that it provides a means of exploring experiences, perspectives and behaviours (Bryman, 2012; Flick, 2014; Ritchie *et al.*, 2014; Silverman, 2016). Qualitative research also facilitates understanding of how people learn, think and develop understanding (Bryman, 2012; Flick, 2014; Ritchie *et al.*, 2014; Silverman, 2016). This made qualitative research an ideal method to use in this study. Of particular relevance was that qualitative research not only permits data-gathering on what is actually happening, but also elicits information that describes the influences and context in which experiences take place (Bryman, 2012; Flick, 2014). This enables inherently-complex and dynamic processes, including unintended effects and external influences to be described. Although I had knowledge and understanding of what constitutes radiotherapy curricula, the processes and influences by which knowledge and skills are transformed into learner comprehension and skills were less appreciated and lacking in literature; this was an area I intended to consider in this study. The study aimed to investigate educational methods that prepare a graduate for their role as a therapeutic radiographer within the specific context of positive learning interventions. I intended to use and compare the realities and interpretations of multiple participants to explore learning experiences on undergraduate radiotherapy programmes so that a table of potential enabling learning interventions may be shared with the radiotherapy community. This method employed an inductive approach which typifies qualitative research (Bryman, 2012; Flick, 2014; Ritchie *et al.*, 2014). Choosing a qualitative research methodology thus enabled me to explore those learning experiences and access rich data from which to illicit interpretation of how learners experience learning and what learners believe to be enabling learning interventions on radiotherapy programmes.

3.3. Methodology: Appreciative Inquiry (AI)

In this section I discuss AI methodology, justifying why I decided to adopt this approach. I also detail the AI cycle and discuss how I aligned the phases associated with AI to meet the needs of my study. The discussion highlights the benefits and perceived shortcomings of AI and acknowledges the implications that an AI approach has on data collection methods.

3.3.1. Why AI?

One of the dilemmas I experienced early on related to a desire to avoid creating negativity and conflict in the radiotherapy community by collecting data that directly or indirectly criticised pedagogical methods employed by individual HEIs. I wanted to neither highlight poor practices, nor denigrate teaching methods to which HEIs may be affiliated without offering some suggestions of positive learning interventions supported by established teaching and professional learning theories. Rather than proclaiming judgement on teaching and learning strategies employed by HEIs, I saw this study as an opportunity to share with the radiotherapy community, findings of positive learning activities which participants considered to be useful in connecting the theory-practice gap and enhancing learning of undergraduate radiotherapy curricula.

Evaluations that expose areas of poor practice are important and should be used to inform where there are problems and issues. However, such methods induce negativity because the focus is on what is wrong, rather than what is right, and data collected serves only to recognise and emphasise the problem rather than promoting solutions (Cooperrider and Srivastva, 1987). Not seeking resolutions from persons integral and central to the phenomenon in question, ignores potentially empowering, co-creational opportunities. Studies involving learners in assessing radiotherapy teaching interventions are lacking, yet, learners are well-placed to provide information on learning and teaching activities. Involving key stake-holders in research has known benefits and enhances the validity of studies (Entwistle *et al.*, 1998; Hanley *et al.*, 2001). Crocker *et al.* (2016) describe six roles in their study on patient and public involvement in health research: the expert in lived experience; the creative outsider; the free challenger; the bridger; the motivator; the passive presence. Some of these roles had applications to this study. I wanted to give learners the opportunity to share their experiences because they, rather than I, were the 'experts by experience'. They would also bring a fresh perspective to the study (the creative outsider) by perhaps challenging (the free challenger) some of the existing practices. Furthermore, learners might highlight influences in learning which may be more nuanced than overt, and more unintended than intended.

All these considerations led to an adoption of an AI methodology, not only because it embraces positivity and reflects my philosophical perspectives, but also because, through generative processes, it seeks practical solutions from learners who I viewed as key stakeholders and the experts in relation to the knowledge being sought.

3.3.2. The principles of AI

AI was developed originally as a change management tool deployed in organisational restructure (Cooperrider *et al.*, 2008). Its origins are in the 1980s when Cooperrider and Srivastva (1987) noted the negative effects on an organisation's employees when a problem-focussed approach to change was utilised. Being interested in research that embraced positive imagery, Cooperrider proposed a shared inquiry that used positivity and positive imagery (Cooperrider *et al.*, 2008). Ludema and Fry (2008, p.281) describe the changes that were realised through adopting an AI approach: 'the results were immediate and dramatic. Relationships improved, cooperation increased, and visible commitments by the physicians to change initiatives ensued'.

The first set of principles described by Cooperrider and Srivastva (1987) expounded that:

1. the inquiry begins with appreciation;
2. the inquiry is applicable;
3. the inquiry is provocative;
4. the inquiry is collaborative.

Appreciation within the context of AI relates to the positive theme that underpins the exploration. AI assumes that there are affirming potentials in all phenomena and ignores a deficit-oriented approach (Cooperrider *et al.*, 2008). This principle not only coincided with my belief that positive teaching and learning practices in undergraduate radiotherapy curricula existed, but also with my desire to avoid criticism of current learning practices.

The second principle notes the authenticity of the inquiry; it has to be valid and appropriate not only to those seeking answers, but also to those involved in the inquiry (Reed, 2007). This aspect of AI was utilised in this study: I determined a research sample to whom the study would have meaning, i.e. radiotherapy students and graduates and had focussed the study on an interest that I harboured.

The third principle, that the inquiry is provocative, does not, I believe, refer to an intended, deliberately-controversial inquiry. Rather I interpreted it as a challenge to question established practice and explore whether the learning experiences mirrored principles and good practices expressed in teaching and learning theories. Thus, in this study, provocation took the form of thought-provoking questions that prompted critical discussion and reflection on how learning on undergraduate programmes facilitated development of therapeutic radiographer expertise.

The fourth principle describes collective action and recognises that there is value in sharing during a process of inquiry (Cooperrider *et al.*, 2008). Collaboration, which Cooperrider *et al.* (2008) later elaborate as the constructionist principle, highlights the subjective knowledge and understanding that may exist amongst people. Collaborative discussions can deepen reflection and encourage the development of new knowledge which is co-constructed (Whitney and Cooperrider, 2012). Thus, collaboration can lead to in-depth exploration of a subject which was another aim of this study.

During the 1990s, development of the AI theoretical framework continued and a further set of new and connected theories were described, which Whitney and Cooperrider (2012) summarised as:

1. the constructionist principle;
2. the principle of simultaneity;
3. the poetic principle;

4. the anticipatory principle;

5. the positive principle.

The first principle (constructionist) assumes that organisations are socially constructed through language and conversation (Cooperrider *et al.*, 2008). This implies that there is no absolute truth but a myriad of subjective possibilities that are shaped by experiences (Bushe and Kassam, 2005). It also expounds that what is known is closely related to how we know but, critical thought can often be clouded through assumption and habit that is embedded at institutional level (Cooperrider *et al.*, 2008). Such presumptions were a possibility in this study and a methodology that could untether constraints perpetuated by unconscious assumptions would be an advantage. This was another reason why AI was considered an appropriate methodology to use.

The principle of simultaneity realises inquiry as an intervention (Cooperrider *et al.*, 2008). It suggests that as soon as an inquiry into something is made, intervention occurs and, with it, change is created simultaneously. As a research methodology AI opposes the more systematic, spiral processes of action research (depicted in Figure 3.1 on the following page) which generally include repetition of: a plan of inquiry, action and observation of solutions; implementation and reflection (Kemmis and McTaggart, 2000; Bushe and Kassam, 2005). Because change is considered instantaneous in AI (Cooperrider *et al.*, 2008), careful thought must be given to what and how questions are posed. Initiation of dialogue must be relevant, meaningful and of significance to the inquiry; concepts not unique to AI, yet, stimulation of dialogue must employ AI language otherwise the positive theme underpinning the exploration is lost. The process used to determine the subject of the inquiry and how questions were posed utilising affirmative language is presented later in this chapter.

The poetic principle of AI is a metaphor comparing an organisation to an 'open book' (Cooperrider *et al.*, 2008). Viewed as a book, the organisation is being 'written' by

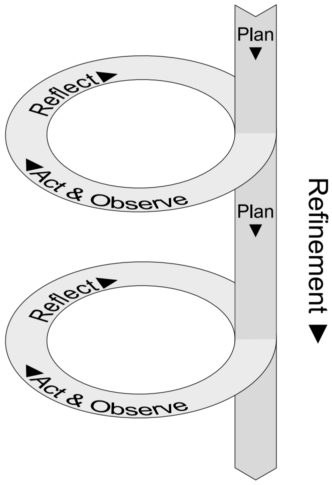


Figure 3.1.: Kemmis and McTaggart's Action Research Spiral (2000)

its members, of which there may be many, each bringing with them experiences that can be studied. In my study, the 'book' would be written by members not of an organisation, but of a radiotherapy community. Reflections on experiences of learning interventions narrated through story-telling by past and present learners, provided opportunity for rich description of experiences; the only limitations imposed were the inherent capability of participants' narrative powers and communication skills, a disadvantage afforded to research methods where data is collected orally (Flick, 2014; Ritchie *et al.*, 2014).

The anticipatory principle relates to the co-constructed image of the future (Cooperrider *et al.*, 2008) and thus may be perceived as providing a purpose and expectation on which to build the inquiry. In this study, the anticipatory principle embodied a future in which a framework of positive learning experiences would be developed which aligned to specific aspects of learning and the radiographer role in order to potentially enhance the delivery of radiotherapy curricula for undergraduates.

Finally, the positive principle reflects the affirmative systems and positive imagery used during the process of the inquiry (Cooperrider *et al.*, 2008). Reed (2007) purports that appreciative questions result in a more engaging and productive process for achieving change. Whilst there may be differences between individuals' realities, the positive environment means that each independent view is valued and therefore individuals have confidence to co-construct a changed future (Preskill and Coghlan, 2003). Thus, AI can be viewed as a participatory, collaborative and empowering process that seeks to explore what is 'good' in a system or phenomenon. For the purposes of my study, AI provided the enabling environment in which to collect data that not only incorporated past perceived positive experiences from a range of individual learners, but also provided them with an opportunity to dream of what the future could hold for undergraduate radiotherapy curricula delivery.

3.3.3. The AI cycle

AI comprises a cyclical process comprising four distinct stages: *discovery, dream, design* and *destiny* as shown in Figure 3.2 on the next page.

The setting in which AI occurs, is ideally within a generative space conducive to group discussion as this facilitates the co-constructive, collaborative aspects of the process. The *discovery* phase identifies the positive of a particular topic area or phenomenon. To discover such an aspect, it is imperative that the researcher and participants are familiar with the topic in question (Cooperrider *et al.*, 2008). This therefore implies that AI brokers an insider approach, that is, the researcher must be some-one familiar with the concepts and context related to the topic of inquiry. Although I was neither a practitioner who had undertaken a radiotherapy degree, nor a student learning on an undergraduate radiotherapy programme, I was very familiar with the topic being explored: teaching, learning and assessment processes associated with radiotherapy curricula and this would prove to be an advantage during the *discovery* and *dream* phases.

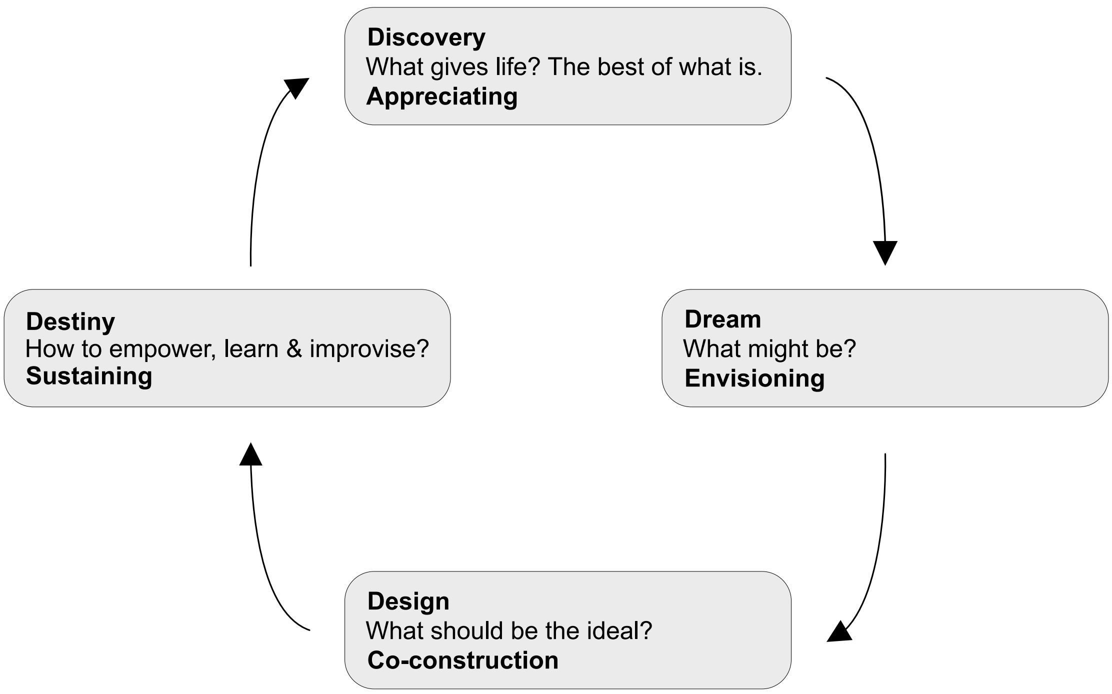


Figure 3.2.: Cooperrider's 4D Cycle of Appreciative Inquiry, taken from Cooperrider and Godwin (2012)

The *dream* phase explores what could or might be by expanding on past and present positives, incorporating them into a shared, ideal future (Cooperrider *et al.*, 2008). Data gained here extends beyond the established norm, relating more to an aspiration that has been grounded from past strengths (Cooperrider *et al.*, 2008). This phase has no limitations and seeks to explore the possibilities that may exist in the future. This was of particular use in this study as it provided unrestricted opportunities for participants to share their visions of radiotherapy education without overt focus on a particular learning strategy. Data collected in the *dream* phase encourages and empowers participants to contribute to a changed future; in my study, it provided useful data on what participants perceived to be of value in radiotherapy curricula delivery.

The *design* phase is where desires are translated into action planning and frameworks that enable change to be implemented. Because discourse is enabling and positive, it is not deficiencies that are made prominent (even though they may be mentioned) but examples of positive solutions (Reed, 2007). Solutions, however, must be organised and co-ordinated via a structured plan for them to be useful and coherent. In this study, learning interventions could not be considered in isolation; it was necessary to contextualise the data within significant features of learning and aspects of the role of the therapeutic radiographer. The *design* phase therefore included setting learning and knowledge within context in order to recognise a framework of educational activities relevant to radiotherapy education.

The implementation of the plan, where new ways of working are realised, comprises the *destiny* phase. *Destiny* is not an end-point but part of the ongoing cyclical transformative processes that AI philosophy embraces (Cooperrider *et al.*, 2008). In this study, activities and themes from the framework were reviewed within the context of learning theory and where there appeared clear evidence to support learning, some activities were embedded within one radiotherapy programme, undergoing programme review. Section 5.3 expands further on the *destiny* phase, but of note here is that immediate implementation of new ways of curriculum delivery into one programme was not an intention or objective of the study because the study had yet to explore and establish positive teaching and learning activities considered conducive to the development of key skills and knowledge associated with the role of the therapeutic radiographer. Figure 3.3 on the following page provides an overview of how each phase of the 4D cycle was utilised in this study.

3.3.4. Reflection in AI

Although AI encourages a systematic, positive approach to evaluation (Cooperrider *et al.*, 2008), embedded within the cycle is a flexible data collection tool that permits reflexivity and responsiveness to shared conversations, not dissimilar to the processes

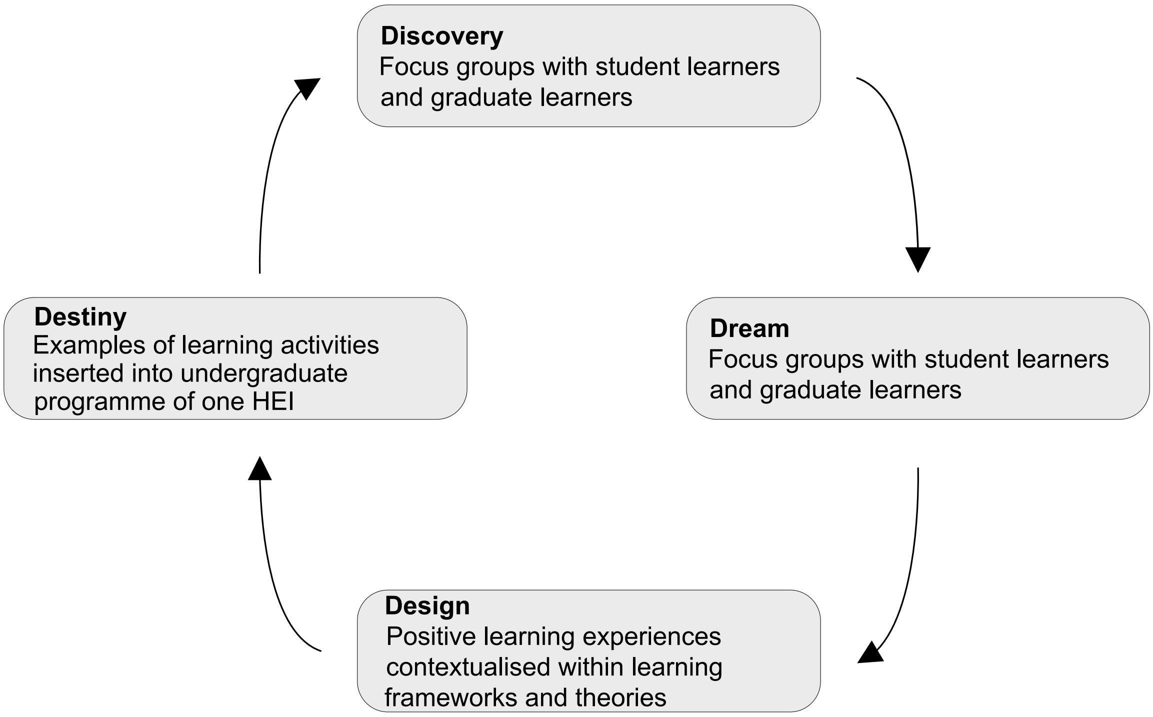


Figure 3.3.: Stages of the AI Cycle applied to the Study

that Ritchie *et al.* (2014) note are features of focus groups. AI relies on co-operative discussions that enable successful collaboration and generative ideas and shared aspirations to occur (Bushe and Paranjpey, 2015). Thus, AI not only enables reporting of what is good in a system or phenomenon, but also, through listening and reflective processes, enables participants to learn from each other thereby facilitating an environment in which novel ideas and thoughts are likely to emerge (Bushe and Paranjpey, 2015).

3.4. Ethical considerations

Prior to collecting data, ethical implications had to be considered. For my study, it was necessary to consider the best way to collect and report data that would answer the research question, whilst considering the potential impact on participants, and take account of possible benefits to the profession. I appreciated the situational and contextual ethical approaches and thus ethics was core to the study design. The following ethical concepts, adapted from Bryman (2012), were explored and addressed when designing the study:

- known harm should be minimised with participants fully informed of risks;
- the research should place no undue demands on participants;
- informed consent should be gained from participants prior to participation;
- participants should voluntarily participate: processes used for recruitment should be free from coercion;
- confidentiality of data and anonymity should be assured and respected;
- the research should have value and be worthwhile.

3.4.1. Ensuring no harm

Viable ethical practice includes considering what the research means for participants (Ritchie *et al.*, 2014). From the study's inception, I had no desire to ask participants to reflect on or highlight poor learning experiences which could induce negative feelings and potentially cause distress. Putting myself in others' shoes and considering the wider radiotherapy education community, I considered how I would want to report learning experiences. This had led to my choosing an AI methodology and, in my view, a collaborative, supportive method of inquiry.

Although I wanted to cover the topic in depth, nevertheless I recognised that the research method employed could potentially place a burden on participants and me as the researcher. I did not want to compromise the quality of the research but realised that asking intrusive or sensitive questions may give rise to harm or distress for participants and ethical dilemmas for me. I realised that by using a series of questions embracing AI language which were based on the role of the radiographer, I would provide a familiar context for participants, therefore affording some reassurances in that they would have knowledge of the topic areas and would not be put in the uncomfortable position of not knowing the topic in question.

3.4.2. Informed consent

A participant information sheet outlining the nature, purpose and methodology of the study was utilised for recruitment of students and graduates (Appendix B on page 293). The sheet also contained a written consent form, outlining the risks and benefits of participation. Potential participants were encouraged not to make a decision on the spot but to go away, read through the information and consider whether they wished to participate. With reference to the student sample, I also assured the cohort that participation (or not) in the study would not in any way affect their progress on a programme. Ritchie *et al.* (2014) note that it is good practice to use a staged approach when obtaining informed consent and employing verbal briefing supplemented by written information adds rigour to the process.

3.4.3. Right to participate and withdraw from the study

I strongly believed that learners should be given opportunities to express their opinions as that first conversation with a newly-qualified student at graduation had made me reflect on how teaching and assessment practices tended to be embedded within the culture of an organisation without undue consideration given to the impact on student learning experiences. These thoughts reiterated the need for me to adopt a non-critical stance during data collection. I therefore made a note to: not sway participants or intrude on their opinions; let conversations flow, avoiding putting words into participants' mouths; not limit participant contributions. I believed that all had the right to express their opinion and, fundamentally, it was their experiences, perceptions and thoughts that the study explored.

During the study, there needed to be a process by which participants could withdraw should they so desire. As participation in the study was voluntary, the process of withdrawal mainly applied to the period between giving full written consent and attending the focus group or interview. If a volunteer had a change of heart after giving full written consent, it was agreed that they should inform the gatekeeper (student learners) or placement facilitators (graduates). I preferred to avoid direct contact with participants because I wanted to be as certain as I could be that I did not exert any power or authority on participants. Participation withdrawal after giving consent occurred on two occasions; reasons for both were that the placement sites were short-staffed and graduates were unable to leave the treatment units.

3.4.4. Gaining ethical approval

I was cognisant of ethical codes both from an education and health profession perspective. Less well known were the machinations of individual hospital ethics committees and their accompanying local legislative procedures which varied from Trust to Trust. However, knowing that research principles should embrace a beneficence and cause no harm (Bryman, 2012), which I had built into the research design by utilising an AI approach, I was confident that reasonable steps had been taken to show that the research was ethical and complied with good research practice.

Prior to approaching NHS Trusts, ethical approval was sought and gained from the Research Ethics Committee at Buckinghamshire New University (Appendix E on page 319). Included in the application were copies of participant information sheets and consent forms. Verbal feedback from the ethics panel inferred that the proposal was well-structured and had addressed all ethical considerations appropriately.

Whilst this would permit access to undergraduate radiotherapy students, additional ethical procedures were necessary when approaching staff employed by the NHS as indicated in the NHS Health Research Authority (NHRA) matrices outlined in Appendix F on page 335.

Applications to the local Research and Development departments of NHS Trusts were made via a central ethics application system: Integrated Research Application System (IRAS). Informal discussions with my supervisors and placement practitioners intimated that some local research departments had a reputation for excessive and elaborate governance procedures and this proved to be the case.

NHS Research and Development departments were e-mailed to seek Trust guidance on local policies for researchers to approach NHS staff. This action was in line with the procedures outlined on the NHS Health Research Authority website. Although an ethical stance addressing principles of beneficence, respect for human dignity and justice, informed consent, confidentiality and data protection had been clearly articulated in the IRAS application (Appendix G on page 339), this did not immediately translate into achieving NHS approval. Part of the issue stemmed from the fact that I was an outsider, i.e. not employed by the NHS Trust which, according to some Trusts' procedures, potentially posed a risk to the organisation. After a period of seven months, approval to approach staff at four of six NHS sites was obtained. Reasons for not obtaining permission at two NHS sites differed. At one site, the manager could not free up staff due to staff shortages and workload issues and would therefore not endorse the request. At the second site, extraordinary demands were made by the Trust due to local governance procedures. In this case, the Trust insisted that the Lead Researcher must be a clinical Trust employee which was not and could not be the case. Furthermore, the Trust demanded that all paperwork associated with the study should contain the NHS Trust logo, intimating that the study was the property of the Trust. After pursuing this with the Trust for seven months, I decided to withdraw my application, a decision which staff in the radiotherapy department and I regretted as staff had already shown an eagerness to participate and believed the study to be worthy and advancing of undergraduate radiotherapy education.

3.5. Sampling and recruitment

The purposive sample was restricted to learners on and graduates from a full-time, three-year, honours degree programmes offered in England. This particular curriculum mode of delivery was the specific object of study because there are more institutions in England that offer this type of therapeutic radiography programme than any other models. Furthermore, by having programmes of the same length and a similar programme structure (alternating academic and clinical blocks of study), distractions caused by different curricula models were minimised. Choosing to use HEIs in England as the specific geographical area also allayed differences attributed to local distinct funding and educational requirements and gave further clarity to the research. The sample therefore included students studying on and radiographers recently graduated from a three-year, honours degree programme in England.

3.5.1. Students

Collection of data from students from a number of HEIs in England was considered but discounted. This was partly due to my being the sole researcher with no external funding support that could be used to cover my duties as a lecturer or professional lead. However, I reasoned that deriving the student sample from one HEI would not compromise the quality of the study because experiential learning, shaped by socialisation and communities of practice, would be specific to different Trusts and workplaces. Furthermore, each student was unique in terms of their individual situations, backgrounds, characteristics and strategies employed for learning (Eraut, 2000). Thus, a range of experiences would exist amongst one cohort in one HEI.

Using one HEI offered both advantages and disadvantages. Advantages included ease of access to the sample and a consistency in the University-based radiotherapy curriculum. Furthermore, both the participants and researcher would be familiar with the terminology used. Disadvantages related to the inherent issues associated with insider research, not least of which included the power-authority dynamic (Johnson-Bailey and Cevero, 1997). However, employing the use of a gate-keeper meant that no undue pressure was put on students to participate in the study, neither was there any unfair exclusions as a result of researcher bias. The decision to take part rested with the cohort that I deemed most appropriate to collect data from in order to achieve the study aims.

As a lecturer based at an HEI delivering undergraduate radiotherapy programme, I had ready access to three cohorts of students: first, second and final year students. All three years were initially considered as participants for the study, however, I realised that first and second year students would have less appreciation of the role of the radiographer. This was not only because they had experienced less experiential and academic learning, but also because junior students were on the lower rungs of the ’novice to expert’ ladder and, therefore, less likely to be familiar with the higher level skills and competencies associated with professional practice. As the study was exploring learning interventions within the context of the role of the radiographer, this was an important consideration; including first and second years in the sample would likely skew the discussions and therefore the data collected. Thus, the purposive sample of final year students at one HEI was derived.

To distance my ‘educator’ role from my ‘researcher’ role, I approached students via the independent gate-keeper, the year tutor. Gate-keepers are employed when there may be concern over the researcher's motives (Bryman, 2012). In this case, I used a gate-keeper to ensure recruitment proceedings were transparent. Having a third party present also gave me peace of mind as this provided external validation that I was not exploiting the power-authority dynamic and covertly coercing students onto my study. Consideration was also given to the timing of the approach and, after discussing this with the gate-keeper, it was decided that I should approach the cohort at the beginning of a lecture on a module with which I had no involvement. It was important to stress to students that progression with their studies would not in any way be affected should they not want to participate and emphasis was placed on voluntary participation.

Being conscious that I could be perceived by students as an authoritative figure, I used a 'scripted' narrative to explain the intentions of the study. The research was presented in a factual manner: I used little voice intonation, believing that a more monotone speech would mask my personal feelings which ranged from fear of no-one volunteering to excitement because I was finally attempting to recruit participants to the study. Such neutrality could have been perceived by students as negative, even discouraging, leading to no volunteers coming forward, something I reflected on and noted in my diary after the event. Fortunately, the topic area drew interest from the student cohort and a number of students openly expressed a keenness to participate in the study which had a snowball effect on the cohort.

A total of twelve final-year students were recruited to the study which I believed was an acceptable student sample for this qualitative research as I was employing an AI methodology which recognises that collaborative discussions can lead to co-creation of new knowledge and, thus, can lead to a greater in-depth exploration of the subject (Cooperrider and Avital, 2004). Furthermore, a larger sample in qualitative research tends to be preferred when the scope of the study is broad and when the intention is to draw comparisons between groups (Bryman, 2012). I considered that neither of these criteria applied to my study: the research had a narrow and explicit focus; and I was of the opinion that individuals construct meaning through their own lived experiences. Each participant would be viewed as an individual and I would not be utilising data analysis methods that drew comparisons between groups.

3.5.2. Graduates

Conversations with practice staff had raised awareness of the support necessary to guide a student's transition through their graduate year, the skills for which are influenced by their undergraduate radiotherapy curricula learning methods. Naylor *et al.* (2016) note that transition includes professional socialisation, that is, the further development of knowledge, attitudes, skills and values within the professional community. Such attributes build on aspects of previous learning and skill development and promote the development of professional autonomy and identity (Newton and McKenna, 2007; Deasy *et al.*, 2011; Hart and Bowen, 2016; Naylor *et al.*, 2016). Therefore an important aspect of undergraduate radiotherapy pedagogy is whether it prepares learners for the transition to practitioner. To gather data related to this area, it was necessary to recruit graduates: qualified therapeutic radiographers. A limit of twelve months post-qualification was applied as, although the graduate would be in a transformation period (Newton and McKenna, 2007), learning related to the role of the radiographer would still contain aspects of deliberative cognition (Eraut, 2011), thus, teaching methods that enhanced those aspects of learning would still be remembered.

I chose to use local hospital Trusts (n = 6) as I was familiar with them which presented several advantages:

- I did not have to undertake a number of visits to each site in order to acquaint myself with the placement, environment and culture;
- I was already ‘known’ within the Trust and had credibility as an educator;
- I had placement staff contacts who would act as links and through them I could gain access to Trust employees: qualified therapeutic radiographers.

Initially, I presented the aims of the study to placement educators at a joint University-Practice staff meeting. Having outlined the study intentions and data collection methods, I explained the strategies and practicalities of data collection, namely, that I intended to cause as little disruption as possible to placement sites and therefore data collection would occur at a mutually-convenient time on the Trust sites. At the meeting, I also asked if each placement site had recruited new graduates from HEIs in England to establish whether these sites could provide a purposive sample or if I would need to approach Trusts from a wider geographical area. Placement educators confirmed they had employed graduates who fulfilled the study’s recruitment criteria, so volunteers from these sites were feasible. At the meeting they also agreed to act as the link to graduates. Being the link would involve passing on details of the study (a letter of introduction and participant information sheet) to eligible staff, once local Research and Development approval had been gained from individual NHS Trusts.

Graduate volunteers were self-selecting and once they had given consent, their names were forwarded to me via the Trust placement educator. I then liaised with senior management and a mutually-agreeable date for data collection was identified which would cause the least disruption to the running of the department. The placement educator then organised the use of a private room within the Trust.

A total of ten graduates volunteered, a similar number to the student sample, which I believed gave balance to the study and was sufficient in light of the AI approach employed and narrow focus of the study.

3.6. Data collection methods

A variety of different data collection tools may be used to evaluate programmes and learner experiences, however, care must be taken when choosing a tool so that it permits collection of data relevant to the aims and focus of the inquiry (Aronson, 2013). To fulfil the objectives of the study, I needed to explore what and how positive learning experiences occurred and analyse why the experiences may be viewed as positive. In addition, I wanted to give voice to key stakeholders (learners and graduates) whilst minimising my own influences on the data. The following sections evaluate data collection methods that could have been adopted for this study and provide justification of the data collection method I eventually chose. I conclude this section with a discussion around how the questions were derived and the AI language adopted during formulation of the questions.

3.6.1. Methods used in evaluation of learning

Some methods employed in learner evaluations have origins based in a reductionist view, whereby the relative merits and success of a phenomena is constructed through the measurement of its component parts. The reductionist view assumes a cause-effect linearity model, suggesting that once something is known about the components that make up the whole, then the evaluation of the phenomena is predicted (Frye and Hemmer, 2012). Although the reductionist model helps with deconstructing complex phenomena, such as teaching experiences, reducing experiences to discrete parts loses the holistic nature of the experience (Frye and Hemmer, 2012). Furthermore, the focus tends towards whether specific outcomes have been achieved, not why or how this has been attained nor the place of pedagogy within a teaching framework (Cook, 2010).

Traditional programme evaluations that include assessment of teaching performance and commentary on learning experiences, employ elements of the reductionist view (Frye and Hemmer, 2012). The most common method used is objective-oriented, student-satisfaction surveys (Cook, 2010; Fletcher and Painter-Main, 2014). Surveys typically utilise quantitative methods, yet, the questions only superficially attempt to judge merit (Haji *et al.*, 2013). This could be because it is necessary to employ 'simplistic' questions which are easily intelligible, thus preventing misunderstanding of the question as well as attempting to reduce bias (Cook, 2010; Haji *et al.*, 2013). However, as Fletcher and Painter-Main (2014) note, questionnaire wording can limit responses and any attempts to reduce bias in questions can often draw attention to the bias, thereby compounding the issue. Whilst phrasing a question in simplistic language may provide clarity, it lends an inflexibility to the evaluation tool and prevents opportunity for collecting in-depth data or exploring unexpected responses. Moreover, standardised questions preclude situational and individual personal experiences, thereby preventing employment of metacognition, a critical skill that helps learners realise how they learn (Gooding *et al.*, 2017); a key aspect of this study. To meet the aim of the study, it was necessary to delve deeply into what learners perceived as positive learning activities alongside exploring teaching and learning theories that could offer explanation into how and why this may be the case. Thus, I selected methods based on verbal communication and story-telling to explore dimensions of learning.

Flick (2014) suggests that narratives have become an essential part of research that explores experiences, being used as both a data collection tool and as an object of research in itself. Narratives may be collected either in oral or written form, thus they provide a versatile data collection method that may be aligned to a range of qualitative methodologies and research aims (Flick, 2014). Douglas *et al.* (2015) used hand-written narratives of first year and final year students in Higher Education to explore the quality of teaching, assessment and support offered. A secondary intention of the study was to ensure that students' voices were heard. As this was an intention of my study, narrative story was a data collection method that merited further exploration. Narratives typically involve stages of stimulation: a question that generates a summary of an initial situation; a question that probes information relevant to the development of the situation; and finally a question that not only relates to an overview of what happened, but also gives some meaning to the situation (Flick, 2014). Whilst I felt that this was a valid technique for eliciting student experiences of learning, when viewed within the context of AI which employs a cyclical process comprising four specific phases and relies on co-operative and collaborative discussions (Bushe and Paranjpey, 2015), this method of data collection was not an exact fit and was therefore rejected. Instead, focus groups were chosen as they would not only mirror the generative space and group discussion facilitation that characterise AI methodology (Cooperrider *et al.*, 2008), but also enable co-constructive, collaborative processes to occur.

3.6.2. Focus groups

Focus groups differ to group interviews in that the researcher facilitates discussion around a topic rather than asking each participant a question in turn (Silverman, 2016). Focus groups initiate generative data and align to the constructivist approach (Flick, 2014). However, as Farnsworth and Boon (2010) note, they can be regarded as 'deceptively simple' (p.605). Although facilitation of conversation stems from the researcher, it is the subsequent process of interaction between participants and their response to each other's points that stimulates further insight and generates data (Ritchie *et al.*, 2014; Silverman, 2016). Where topics are of a sensitive nature, some participants who lack confidence may feel inhibited in a focus group situation, preferring a more personal discussion in an interview situation (Ritchie *et al.*, 2014). Conversely, some participants may be emboldened in situations with people who have had similar experiences and may therefore be given confidence by the group (Farnsworth and Boon, 2010). In this study, the focus was on positive and enabling learning experiences relevant to the role of the therapeutic radiographer and, after independent review of the questions by a peer lecturer and my project supervisors all of whom had experience in qualitative research, it was judged that the questions were not overtly sensitive and a focus group approach, embracing AI methodology, would be appropriate.

Focus groups require the researcher to manage the process and initiate the discussion (Ritchie *et al.*, 2014). Part of my role as facilitator was to create the safe environment in which the discussions took place. Creating a safe environment involved establishing trust and rapport with participants and between focus group participants. This not only enabled the participants to exercise autonomy, but also was more conducive to promoting discussion and thus eliciting rich data (Ritchie *et al.*, 2014). Bryman (2012) suggests that a session begins with introductions and setting of ground rules. In this study, the ground rules comprised a predetermined checklist, the intention of which was to provide reassurances to participants.

Whilst my objective in the introduction was to clarify the setting in which data was to be collected, such interference and quests to manage process can impose limitations on participant behaviour (Farnsworth and Boon, 2010). However, I thought it expedient to provide reassurances and encouragement to participants (explaining that diversity of opinion between group members was both acceptable and expected due to different individual experiences) and believed that the benefits of providing ground rules outweighed any risks. Diary entries describe a note to self that reminded me to deliver the ground rules in a positive stance reflective of AI methodology.

The intention was to use focus groups to collect data as this aligned to the AI approach. However, at one placement site, due to circumstances beyond my control and that of the placement educator, it was necessary to undertake two separate face-to-face interviews with graduates. In these episodes, I was required to adopt a more conversational approach as I was not only the facilitator, but also the collaborator and it was only through interaction with me that further stimulation and insight was generated. Interestingly, neither participant knew me and I think this allowed them to view me solely as a researcher, enabling frank and honest, in-depth conversations about their experiences to occur.

3.6.3. Questions used in the focus groups

To ensure that facilitative questions were appropriate to the role of the radiographer, I undertook documentary analysis of radiotherapy-specific and relevant NHS documentation which included review of:

- Standards of Proficiency (Health and Care Professions Council, 2013);
- National Occupational Standards (2017);
- College of Radiographers Education and Career Framework (College of Radiographers, 2013);
- NHS Key Skills Framework (Department of Health, 2004).

Silverman (2016) notes that documentary analysis can inform the contextual setting of a study and provide a means by which questions are elicited. Analysis of the documents included a mapping exercise using an Excel spreadsheet on to which statements from each document were transposed (Appendix C on page 305). This allowed cross-mapping of documents and enabled key characteristics common to all documents to emerge. Where there was high correlation between documents, this was deemed a key role of the therapeutic radiographer. Thus a list of core domains was generated that represented the role of the therapeutic radiographer. Key areas included: communication; radiotherapy planning and pre-treatment processes; treatment accuracy and verification; professional autonomy.

After a final review of each document to ensure no core descriptors had been excluded, a question on each area utilising appreciative inquiry language was developed (Appendix D on page 315). The language used to shape the questions was important, as the intention was to embrace an AI methodology and collect data related to positive aspects of teaching and learning. Examples of questions that employ an appreciative inquiry approach are given in the the Appreciative Inquiry Handbook (Cooperrider *et al.*, 2008) and these were used as a framework from which to develop questions used for this study. To ensure the aim of the project was met and the AI approach was embraced, two generic questions were included which would enable future envisioning. One generic question related to learning interventions that were viewed as useful in preparation for the therapeutic radiographer role; the other related to 'three wishes' for undergraduate radiotherapy curricula delivery (Appendix D on page 315).

Being conscious that the group comprised a set of individuals who may or may not be familiar with each other caused me to start the questioning with a topic about which I believed all participants would be able to proffer a view: communication. Thus my first question did not immediately seek to discover teaching and learning experiences related to communication which participants felt were positive, instead it prompted a general discussion around good communication skills. In addition to encouraging conversation, I used this question to introduce two other concepts: positivity and the professional role. Thus the initial icebreaker question was:

> The HCPC standards say that radiographers should possess 'good' communication skills – what does 'good' look like to you?

Having drawn participants into a conversation around the professional role and creating a positive context, I then moved on to ask them about positive activities that they felt enhanced their learning of communication skills.

Another aspect of the role which I thought might potentially cause some difficulty for participants revolved around the question of professional autonomy. A while ago, I had been in conversation with a Professional Officer from the College of Radiographers during which we had agreed that team-working was fabled as one of the most important parts of a therapeutic radiographer's role, often overshadowing the concept of autonomous practice. I therefore decided to add a separate conversational starter partway through the focus group which I hoped would lead to a general discussion about professional autonomy prior to asking for examples of positive teaching and learning experiences. The question was:

> The HCPC Standards of Proficiency (2013) say that as a radiographer you should be able to practice as an autonomous professional exercising your own professional judgment – what does autonomy/professional judgement look like to you?

On reflection, I was glad that I had adopted this approach as some participants struggled to put into words what autonomy meant to them and having a general conversation around this topic allowed insights and opinions to be shared across the group without too much intervention and direction provided by me. I noted in my diary that this strategy really "prevented me from slipping out of my 'researcher' hat into my 'lecturer' role!!!"

Because of the many and varied aspects of the role of the therapeutic radiographer and the requirement of embedding additional AI-based questions into the focus groups, data collection embodied a semi-structured approach. Using a framework of questions helped me to focus on teaching and learning activities relevant to the role of the radiographer and also:

- gave direction and flow to the discussions of the focus groups;
- minimised the potential for me to ask leading questions which could have introduced researcher bias;
- created a series of 'prompts' for me as the facilitator, which not only helped to keep me in the 'researcher' role, but also gave confidence and reassurance;
- ensured that the AI approach was maintained;
- provided consistency across each data collection event.

Cohen *et al.* (2011) notes that employing semi-structured data collection methods in qualitative research does not preclude the development of themes emerging from the data. Instead it can facilitate assumptions through cross-comparison of datasets thereby giving structure that helps in data analysis; indeed this is something I found useful when I began to analyse the data.

Draft questions were submitted for independent review to a radiotherapy lecturer colleague and to my research supervisors all of whom had expertise in qualitative research methodologies. My colleague in radiotherapy commented on the appropriateness of the questions specifically in relation to the role of the radiographer; also as they worked in education they also critiqued questions for readability, reliability and positivity. Some minor adjustments to the wording of some questions were made to ensure comprehension and provide story-telling opportunities which would have potential to gather in-depth responses. The questions were then forwarded to my two doctoral supervisors for scrutiny and they concurred that the questions: appeared appropriate to the research methodology employed; were not of an overtly-sensitive nature; and would allow the aim and objectives of the study to be met. Submitting questions for independent review adds to the rigour and credibility of a study (Cohen *et al.*, 2011).

3.6.4. Collecting and recording of data

For all events, data was recorded using two audio digital voice recorders which meant I did not have to take notes and was able to maintain an engaging body posture. Student focus groups were held on the University campus, whereas, the discussions with graduates took place at hospital Trust sites. The decision to conduct the focus groups at the participants' place of being was based on practicalities, cost and convenience for the participants. All activities took place in private rooms located away from busy areas which permitted uninterrupted discussions to occur. On all bar one occasion (discussed in the next section) focus group participants sat in chairs aligned in a half semi-circle with me, the facilitator, in the middle, a recommended format for focus groups (Holloway and Wheeler, 2013). This enabled each participant to see each other as well as be positioned at an approximate equal distant from me and the digital voice recorders.

3.6.5. Facilitating focus groups as the insider researcher

Facilitation of focus groups can be challenging and the skill of the researcher contributes to the success of the event (Ritchie *et al.*, 2014). Whilst I was a novice researcher, I had developed skills in group facilitation in my other roles so felt comfortable and able to meet any challenges that might occur. To enhance consistency of data collection, I facilitated all data collection events. The stance taken was non-judgmental and encouraging to best expedite sharing of experiences. It was not possible to predict my effect on the focus group nor the influence that group dynamics played, however, as noted earlier, it was important to acknowledge these aspects and these with other critical reflections were recorded in a diary.

Farnsworth and Boon (2010) note that the relational dynamic between the researcher and participants affects group interactions and therefore the data collected. Potential power and authority influences exist in the lecturer-learner dynamic with some authors noting that this can adversely affect data collection (Johnson-Bailey and Cevero, 1997; Alsobaie, 2015). I was very aware of this phenomenon with the student cohort, so when participants from one student group chose to ignore the half semi-circle of chairs set out in the room, opting instead to sit behind a table, I did not draw attention to my preferred seating arrangements. Ritchie *et al.* (2014) suggest that non open-plan seating affords some degree of psychological protection. In this case, the table was large enough to house all participants along one side. To enable me to see all participants it was necessary to sit on the opposite side. This had the effect of creating a divide: not only did I have to turn my head to each participant to maintain eye contact when they spoke, but also participants towards the ends of the row could not easily view and converse with peers. The interaction between the group members appeared to be affected as a consequence, with responses being delivered in a linear, sequential manner which was rather different to the spontaneous, cross-spoken, collaborative fashion of other groups. Although there was less cross-group discussion, the level of reflection appeared not to be affected and an advantage was that all participants gave examples and spoke of their experiences specific to an aspect of the therapeutic radiographer role. Diary entries related to the day speak of my indecision to move the group. Although the room layout from my perspective felt 'uncomfortable', I reflected that I did not want to impose something on the group which would perhaps create tensions and assert the power-authority dynamic that I was trying to avoid.

An advantage to the insider role is that the researcher already has an established rapport with participants which, as some authors argue, leads to participants being more willing to open up to the researcher (Merton, 1972; Mercer, 2007). Such responses, which are a result of a previous intimacy, may not occur when the researcher is a stranger (Mercer, 2007). An insider researcher is also capable of an intuitive responsiveness that enables empathic encouragement during the research process (Merton, 1972; Mercer, 2007). This was something I found myself doing, and believe that, as a result, the data collected was detailed and complete.

Deciding to be the research instrument might have been construed a risk, because I could have been considered too close to the situation with pre-concepts clouding the direction in which I facilitated discussion (Brannick and Coghlan, 2007; Corbin-Dwyer and Buckle, 2009; Humphrey, 2012). However, pre-understanding affords some advantages, such as being cognisant with terminology and organisational systems, which can allow the researcher to appear informed and credible (Brannick and Coghlan, 2007; Humphrey, 2012). I believed this to be the case in this study as participants openly sought clarification around radiotherapy-specific discussion points, something that may not have happened if I had not appeared credible to them. Conversely, being knowledgeable about the topic under discussion, may lead to a tendency to presume too much and subsequently may impose limits on responses which risks data collection (Brannick and Coghlan, 2007). Being cognisant of this, I deliberately held back on summarising participants' perceptions. Humphrey (2012, p.582) notes that when undertaking insider research it is necessary to be 'risk-aware rather than risk-averse'. I believed I went into the data collection phase with my eyes open: I was sensitive to the risks and the different 'hats' that I would be wearing when collecting data (researcher, educator and professional therapeutic radiographer).

Another area I had to consider was how I would manage stories of learning interventions that I considered dubious practice. This created some tensions for me, causing a dilemma between my 'researcher', 'educator' and 'professional' roles. As the researcher I could note the occurrence; however, as an educator and professional I was used to offering critical comment, feedback and support on assumptions and opinions given. Johnson (2004) notes that a desire to intervene is not uncommon in health research. Like him, I noted the struggle within myself and felt the need to accept responsibility as an educator for experiences participants shared during the research process. Eventually I determined that there were certain aspects of the study that I had control over and processes I could employ to minimise ethical dilemmas such as adopting an AI approach. However, I realised that any anxieties I felt were purely related to my experiences and inherent biases and until data was collected and analysed within the context of teaching and professional learning theories, which was a core intention of the study, I could not and should not impose on the study any preconceptions or educator-based beliefs I held on participants' experiences. By not exercising judgement on individual experiences, I felt I gave all participants parity of opportunity to provide examples of learning activities that they believed were positive and beneficial; data collection was neither the time nor place for me to enforce my educator tendencies which might have caused participants to question the value of their educational experiences.

One aspect of being a researcher surprised me: I had not appreciated the depth of emotional attachment I had to the study. Researchers who are external to the environment being researched may have less personal interest and emotional investment in a study when compared to an insider researcher and thus there may be a temptation to be less explicit about reasons as to why decisions are made (Brannick and Coghlan, 2007; Corbin-Dwyer and Buckle, 2009). As the researcher and focus group facilitator, I did not attempt to resolve issues or offer opinion on individual experiences (a stance contrary to my lecturer role which entails pastoral support). Initially I found this concept difficult to contemplate (as noted in my diary, the thought of not showing empathy and support caused 'worry and apprehension'); however, it transpired that my anxieties were misplaced as participants were supportive of each other, though the level at which this occurred fluctuated according to the group. Farnsworth and Boon (2010) identify that each focus group participant brings with them an individualised sociocultural background which contributes to the group dynamic. Where the group consisted of members with a tendency toward empathic and sensitive characteristics, the level of support across the group was high. I found these data collection experiences generally more enjoyable than where there was slightly less overt support offered by group members. However, I accepted that interaction and discourse from group to group would vary according to the group members and group dynamics.

Of the three 'hats' worn, the easiest to regulate was my professional role as a therapeutic radiographer. This was a real asset during data collection as I was cognisant of processes and opportunities for learning within University-based and workplace environments as well as specific, radiotherapy-based terminology. This was noted in my diary.

The use of a diary encouraged reflection and analysis. Instead of attempting to eliminate the effects of me as an insider researcher, I attempted to understand my decisions by adopting a critically reflective and reflexive stand, using the diary in which to record my thoughts and feelings during each stage of the research process. During the development of the study design, many of the diary entries recorded related to why and how the design could be justified in relation to achieving the aims of the study; they also noted my feelings on how the wider radiotherapy community would view the study. Diary entries made prior to and immediately after each data collection episode were explicitly descriptive and served to contextualise thoughts, feelings and events surrounding these periods.

3.7. Data management and analysis

Data management includes preparing and organising the data; a key part of the process that ensures ethical principles and confidentiality of participants are maintained (Flick, 2014). Having a clear system of retrieving data also provides a systematic manner in which data can be more easily sourced, ready to be used when reporting findings. The next section summarises how the data was managed and details the analyses that occurred, including a discussion on how the themes were derived.

3.7.1. Transcription and labelling

The audio voice recordings were transcribed verbatim using an external transcriber who adhered to the confidentiality agreement drawn up by the researcher as indicated on the HEI ethics application (E on page 319). I then checked the transcripts for accuracy by concurrently reading through the written transcripts whilst listening to the audio recordings. As the transcriber did not have a background in either radiotherapy or education, they struggled with some of the terminology used, for example VERT. Minor corrections to the scripts were therefore necessary. Once the accuracy of transcriptions had been confirmed, data was anonymised by removing names of individuals, education establishments and placement sites which could have compromised participants' identities. Following this, anonymised transcripts were posted to individual participants inviting them to comment on the accuracy of the scripts. Whilst this is a recognised research procedure, Silverman (2000) contends that such textual checking is a flawed process as this fails to appreciate that a person's beliefs and narratives are exposed within specific context and interactions; thus opinions are dependent not only on the audience to which the understanding is told, but also the point in time at which it is expressed. Nevertheless, participants were given the opportunity to verify the transcripts of the original data collection and were asked to respond to the researcher if they believed that there were inaccuracies resulting from the transcription process. No responses were received.

There were eight data collection events (six focus groups and two interviews). To aid source identification and give greater transparency when reporting the findings, I assigned a unique code to each participant. This comprised a randomly-selected letter and classification of learning status. Flick (2014) suggests that an alphabetical list is good for anonymising data as it removes any intended or unintended characterisation and reference to the individual. Thus the codes used were:

- Student A, Student B, Student C, etc. through to Student L (n = 12)
- Staff A, Staff B, Staff C, etc. through to Staff J (n = 10)

I kept the key to the unique codes separate from the rest of the data and only I had access to this. Raw data including the audio recordings were uploaded onto a secure, password-protected database, to which only I had access. Printed data, including the consent sheets, were placed in envelopes marked 'confidential' and locked away in a filing cabinet.

3.7.2. Data analysis

Data analysis was guided by the aims of the study, research question and theoretical propositions. Many studies employing AI omit detailed description of the processes used in data analysis. Examples of this include Johnson's (2014) study that explored on-line teaching practices and Sandars and Murdoch-Eaton's (2017) article describing AI in medical education. Whilst authors provide description of AI as a methodology, nowhere do they address nor evaluate data analysis methods. Clarke and Thornton (2014) similarly omit details of data analysis and they, like other AI authors, focus on description of the phases of AI utilised in the study. Although not always the case, McIntosh *et al.* (2013) present their data using quotations from participants. This is unsurprising as qualitative data analysis needs to be grounded in the data collected (Silverman, 2016). Indeed, I have utilised this approach, presenting raw anonymised data alongside my discussions and analyses which are based on and make reference to teaching and learning theories.

Analysis of focus groups extends from a simple noting of statements, e.g. in consumer analysis, to focussing attention on the interaction of the group (Flick, 2014). The latter stance takes account of the fact that statements made in focus groups are embedded within a group dynamic rather than being isolated statements of individuals. Focus group analysis may present challenges, not only because more than one participant may be speaking at the same time, or conversely, one or more participants may remain silent, but also, differences between focus groups may be attributed to the group dynamic and thus comparison between groups causes difficulties when attempting to interpret data (Flick, 2014). Thus, focus group analysis may be perceived as a limitation of the data collection method; however, as the AI process recognises the co-constructive influences of group discourse and therefore the co-creational opportunities afforded, analytic challenges presented by employing focus groups are outweighed by the benefits afforded by the methodology. As AI employs an inductive, constructivist theoretical paradigm, it was expedient to consider analytical methods aligned to this such as thematic analysis as described by Braun and Clarke (2006) and content analysis (Cohen *et al.*, 2011; Silverman, 2016; Nowell *et al.*, 2017).

Thematic analysis is a generic, flexible, analytic tool that is independent of epistemology and pre-existing theoretical frameworks and thus may be used across a broad spectrum of studies (Braun and Clarke, 2006; Nowell *et al.*, 2017). It does, however, have compatibility with constructivist paradigms which aligns to the stance taken for this study. Content analysis takes account of both the content and the context in which the data was collected (Ritchie *et al.*, 2014). Thus it not only considers what was said but how this was presented and with what frequency. Both systems involve systematic approaches to qualitative data analysis but there are subtle procedural differences, as shown in Table 3.1 on the next page.

Thematic analysis is particular useful when examining perspectives and experiences of participants as it enables similarities and differences to be explored (Nowell *et al.*, 2017). Furthermore, it is able to capture nuances and unanticipated insights which makes this a suitable inductive analytical method for this study. Working on the premise that this study intended to capture the subjective experiences of learners, and the need to measure frequencies is not necessary in order to meet the aim and objectives of the research, I chose to use thematic analysis.

It was important to align the analytical framework not only to the profession-specific interview questions, but also to the research objectives which were to:

- Identify activities that radiotherapy learners define as positive learning experiences;
- Establish where and how learning takes place;
- Establish whether learning activities reflect teaching and learning theories;
- Create a framework of educational methods that are conducive to developing skills for a therapeutic radiographer.

When analysing and interpreting the data, I used a systematic process which was compatible with the data collection method and AI methodology employed and involved a number of steps including:

- Familiarisation of data;
- Identification of individual participant contribution for later use when deploying participant quotations in the findings section;
- Noting of activities and comments from individual focus groups scripts that align to teaching and learning theories and will answer the research question.

Table 3.1.: Comparison of thematic analysis and content analysis, adapted from Cohen *et al.* (2011, pp.564-569); Silverman (2016, p.333); Nowell *et al.* (2017)

Thematic Analysis	**Content Analysis**
1. Familiarise yourself with the dataset (note initial comments and ideas; document theoretical and reflective thoughts; review transcript and reflexive journal)	1. Define the context of the generation of the document (who was involved)
2. Generate initial codes (with reference to prof learning theory evidence; note decision making in determining coding so audit trail is apparent; systematically code whole dataset; refer to reflexive journal)	2. Define the unit of analysis (search for words, phrases, sentences, paragraphs) and generate coding units and contextual units
3. Search for themes (collate similar codes into potential themes, gather all data for potential theme; keep notes of development of concepts and themes; create diagrams)	3. Confirm the codes to be used in the analysis (reacquaint yourself with the text) confirm open codes, analytic codes & axial codes
4. Review themes (check if themes work in relation to the original dataset/literature, check for examples that do not fit; generate a thematic map / diagram; supervisors to vet / discuss themes)	4. Construct the categories for analysis (key features of the text showing links between units)
5. Refine themes (consensus on themes; document decisions made and rationale; refine specifics of each theme and linkages between them, generate propositions, look for complexity, associations)	5. Conduct coding and categorisation of the data
6. Produce the report (describing process of coding / theme & justification; thick description of context; description of audit trail; highlight theme choices in relation to methodology, research questions, context)	6. Conduct the data analysis (note frequencies of codes and categories; note the nuances and inferences from the text)
	7. Summarising (main features of the data)
	8. Making speculative inferences from the data

Both a list of theories and the study aim and outcomes were printed out on sheets for ease of access and cross-referencing;

- Cross-checking activities and comments across the data sets;
- Generating codes related to the activities by observing patterns within the data;
- Searching for similar codes throughout all data sets both visually and by listening to recordings again;
- Collating codes onto spreadsheets (thematic maps) to enhance visual recognition of patterns and themes within data;
- Reviewing thematic maps and labels and going back to the original recordings to ensure data has not been taken out of context.

The steps above infer a sequential analysis strategy, yet, this was not the case as activities, for example, listening to the recordings, occurred throughout the whole period of data analysis. However, some description of the processes employed are useful, giving transparency and clarity to how the themes were derived (Flick, 2014). Familiarisation of data included constant re-reading of all transcripts and repeatedly listening to the recordings. Alongside this I consulted my diary entries which detailed the contexts in which data was collected. Listening to the audio files was of particular value as it gave dynamics and emotion to the text; something that was not immediately obvious through the written word. As I became immersed within the data I developed a better understanding and appreciation which enabled insights, concepts and themes to emerge.

In the early stages of coding, I systematically went through each focus group and made notes in pencil on the documents highlighting what I felt was important and interesting based on what I knew of teaching and learning theories. I then began systematically coding the data, not restricting the codes I used as I did not want to apply limitations to the data. Post-it notes and coloured stickers were useful as they could be moved around very easily and provided easy visualisation of similarities and differences in the data. The process was repeated several times until I was happy that I had not omitted anything during the process of analysis. To be sure, I listened to the audio recordings whilst referring to themes.

For each question/topic area explored, I grouped together similar codes in a 'findings matrix', an example of this can be found in Appendix H on page 371. Data recorded included:

- the learning activity, for example, mentoring;
- significant features and learning consequences, e.g. associated emotions, the possible learning theories and concepts to which these may belong;
- recording the context and situation in which the activity occurred, for example, in VERT, in placement, etc.;
- quotations to support the theme;
- source and location of the text.

During the process of coding I made notes in my diary on why and how decisions were made. This approach provides insights and potentially offers explanation of the thought processes utilised. Thus it gives transparency to the processes employed, providing rigour to the data analysis process and trustworthiness to the findings (Silverman, 2016).

3.7.3. Defining and presenting the themes

In the next chapter (Findings), I present the themes derived from the data elicited during the *discovery* and *dream* phases of AI. All participants willingly discussed and described learning activities related to aspects of therapeutic radiography education, enabling detailed examination and analysis of participants' experiences. By exploring what, when, where and how learning occurred, I reveal activities and learner journeys that participants believe are positive experiences; the social and emotional concepts that have influenced that learning on undergraduate radiotherapy programmes are also analysed. I also present activities that participants deemed empowering, which is defined by Houser and Frymier (2009, p.35) as "a student's feeling of competence to perform a task that is meaningful and has an impact on the situation." Activities are reflected on within the context of teaching and learning theories to afford some explanation as to why participants found them empowering.

Figure 3.4 on the next page illustrates the main themes which emerged after analysing the data sets:

- teaching and learning;
- relationships in learning;
- and the learner journey.

It also indicates the categories and codes which were combined to form the themes. Spanning the main themes and integral to all of them is 'emotions in learning', a recognised facet of the learning process (Schutz and Lanehart, 2002; McConnell and Eva, 2012). A discussion of the impact and importance that emotions play in learning is integrated into each theme.

Although emphasis was towards the positive because an AI methodology was employed, the use of open-ended questions exposed some negatives. This was in line with other studies utilising AI. Negatives and challenges are discussed within each theme.

The themes are derived from my interpretations and conclusions drawn from the data which have emerged after careful analysis with reference to the study aim and objectives. However, key aspects of this study were related to valuing learner perspectives and enabling learner voices to be heard; therefore my analysis is presented

Emotions in Learning

Positive:
confidence; motivation; desire; sense of achievement; feeling valued / sense of responsibility; altruism; approachable; listening; trust; respect; feeling of doing well in assessment; being 'good' at something; job well done; doing the right thing, e.g. taking time to listen to a patient

Negative:
fear; struggle; worry; scared; nervous; pressure; unprepared; difficult; embarrassment; in the way; uncertainty; gaps; adversity; stress; attitudes; uncomfortable; challenges

Teaching and Learning	Relationships in Learning	The Learner Journey
Sub-themes	**Sub-themes**	**Sub-themes**
Academia and placement learning	Interaction with:	Learning trajectories: Individual skills, knowledge, understanding; codified knowledge
Activities: role play; technological simulation; questioning; feedback; tutorials; one-to-one; peer learning; buddying / teaching learners; Workbooks, guided learning; Applying theory to practice; Assessment	Peers Practitioners: teachers; supervisors; mentors; experts; practice educators Academics Link lecturers Patients	Capabilities; Self-awareness; performance; knowledge of limitations; being professional Being new (novice) - developing new knowledge through observation, role-modelling, repetition & reflection;
Collaboration and team-work; PBL		Progress / consolidation: tacit knowledge; learning from mistakes; problem-solving; decision-making; judgement Electives
Interpersonal skills; Communication		About to qualify: competence
Cultural knowledge: uncodified knowledge and socialisation		
Challenges: academia / placement / lack or variation of opportunities;		

Figure 3.4.: The Overarching Themes and their Relationship with Emotions in Learning

alongside participants' quotations. Care has been taken to not take quotations out of context so the original meaning is lost. However, in some cases, quotations have been shortened with omitted words clearly indicated using [...], and, where appropriate, descriptive words have been inserted into brackets to improve understanding of the context in which a response is given, for example, it [the sky] is blue.

3.8. Conclusions

This chapter has presented and justified the methodology and methods used, highlighting how my epistemological and philosophical stances influenced the study design and presentation of the findings. It has discussed how the sample was derived and explained the data collection methods employed, noting how AI-type questions aligning to the role of the therapeutic radiographer were developed. It has also evaluated how I embedded ethical principles within the study, analysing how I managed the three different 'hats' of researcher, educator and professional. Finally, I have presented how anonymity of participants has been preserved and how academic rigour was maintained through the data collection and analysis processes.

The next part of the thesis turns towards the findings, the data for which was gathered during the *discovery* and *dream* phases of the AI cycle. Data from these two phases has been combined as many sub-themes and topics appeared in both phases and there was a desire to minimise repetition.

4. Findings

This chapter draws together the findings from the the *discovery* and *dream* phases of the AI cycle and presents participants' examples of positive teaching and learning experiences that enables therapeutic radiography knowledge, understanding and skills acquisition, thereby meeting study objective one: *identify activities that radiotherapy learners define as positive learning experiences*. It discusses the circumstances under which positive learning occurred, noting the role emotions play in learning. Evidence from a range of theories is used to support my suggestions as to how and why learning took place.

Where appropriate, an activity has been discussed with reference to the site of learning: academic and / or placement. This enables me to meet study objective two: *establish where and how learning takes place*. However, neither environment is viewed in isolation as learning that takes place in one arena will impact on and contribute to learning in the other arena. By taking this approach, it is possible to highlight the links between academia and placement and to discuss learning within the context of relevant theories, thus enabling study objective three to be met: *establish whether learning activities reflect teaching and professional learning theories*.

Finally, I present a framework of activities which participants suggested were empowering according to specific aspects of the therapeutic radiographer role and highlight intrinsic factors that were found to be enablers of learning. These factors and activities summarise teaching and learning conducive to developing skills for a therapeutic radiographer and, thus, the final objective of the thesis*: create a framework of educational activities that are conducive to developing the skills required a therapeutic radiographer*, is met.

4.1. Perspectives on teaching and learning activities

4.1.1. Empowering learner experiences

As discussed in chapter two, teaching and learning of undergraduate radiotherapy curricula embraces the duality of academic and clinical environments within which a range of opportunities and specific and non-specific teaching activities facilitate learning. Findings from this study indicated that empowering learner experiences occurred in both settings with many positive learning experiences cited by participants were acquired experientially in the clinical environment and comprised authentic clinical situations which, as purported by Eraut and Hirsh (2007), can lead to development of know-how in the form of skills, knowledge and practice. Notwithstanding, University-based academia also provided empowering learning opportunities and those cited by participants related to participative action learning and practical knowledge acquisition, such as role play, simulation and peer learning. Murre and Dros (2015) suggest that most of what is learned is forgotten if it is not routinely used in prescribed participative activities. Thus, unless learning of codified knowledge in lectures is integrated into meaningful study activities which go beyond common strategies such as re-reading and highlighting material (Dunlosky *et al.*, 2013), then it is unsurprising that participants did not cite examples of positive learning from lecture-type situations. As an educator at a University, I found this an enlightening, yet, sobering discovery; however, armed with this evidence, I sought to explore why role play and simulation appeared empowering learning experiences.

4.1.2. Role play

Findings demonstrated that learning experiences in academia were most effective when teaching resembled the scenario in which it was to be used, for example, role play mimicking patient interaction situations as evidenced below:

> "In my first year we did a role-play….. that was positive, cos you were able to see gaps in knowledge or just anything in your communication, if you needed to build something, build up on that." (Student H)

> "[Role play] was actually really good because that was before we went out [into placement] and it prepared you a bit for going out and it wasn't so daunting when you were first told to [...] get the patient from the waiting area." (Student A)

The above quotations demonstrate that participants valued role play, not only because it created opportunity to simulate and practise particular skill sets prior to placement, but also because it enabled identification of where further knowledge and skills should be developed. Thus, in addition to linking academic activity to practice, participants' views inferred that role play engendered a means by which self-assessment and reflection occurred.

The learning theories apparent here are twofold. The first is Knowles's (1980) adult learning theory, in particular, the principle of meaningful learning in which students are prepared to invest time and energy if relevance of the activity to their role is apparent and is something that they want to learn (Merriam, 2001). The second theory relates to the reflective processes described by Schön (1983): reflection-in-action, which draws on previous experiences that a professional utilises in response to an unfamiliar, unknown or unexpected situation; followed by reflection-on-action which entails retrospective reflection and analysis to determine solutions and mitigate feedback (Schön, 1983). My examination of undergraduate radiotherapy curricula in England had shown that all programmes cited reflective practice outcomes (Table 2.7 on page 42) and one activity that appeared to facilitate reflection was well-constructed, academic-based role play.

Role play requires students to place themselves within particular situations in order to model a particular skill or role, otherwise it can appear artificial (Lane and Rollnick, 2007). Comments from participants appear to indicate that role play was used for authentic radiotherapy role scenarios:

> "I remember at the university, we had a day where we practiced first day chats, and I remember that being really useful, because I can still remember it, to this day, doing those chats and remembering how, although it was, because you were with your friends you can sort of, like, it's a bit easier, but then you sort of take the experiences you get from that, you can take it into, like, practice, and you can actually apply it, as well." (Staff I)

> "She [the lecturer] was doing an acting part and she was giving us sort of scenarios and she was playing this upset patient and she had tears rolling down her face and we were all like, okay. And that really helped because it kind of, it showed you how different people reacted to the same situation, she'd get some of us up to the front of the classroom and she'd act out this scenario and we'd have to sort of respond as best you could there and then with all these eyes on you so I thought that was really useful." (Staff F)

The above quotations highlight the hypothetical nature of the activity, yet, disclose some powerful interactions as well as professional application. Participants' quotations suggest that knowledge is gained and practical skills are developed through interaction. Chickering and Gamson (1987) posit that one of the seven principles of good teaching practice is to employ active learning techniques; this appears to be the case here: active learning has enabled an empowering learning activity. Indeed, more interaction was a wish expressed by Student F:

> "I'd say one [wish] would be more interactive lessons. Because although, like, some lessons are, like, really good and you're always involved, there are some that are, unfortunately, because of what they're been taught, sometimes they can just be a bit tedious, in a way. So it's sometimes a struggle to keep the full concentration, especially if you've got, like, a 9 till 5 day, you're on your last lecture and you're, just two hours looking at a PowerPoint may not be the most interesting thing. So it's just making sure you've got little, like even games or something like that, just to break it up." (Student F)

For interaction to occur, learning through role play necessarily embodies social dimensions (Nestel and Tierney, 2007). This is apparent in the data, for example, the use of the word 'games' by Student F hints at social interaction. Staff I also notes the social aspects inherent within role play; in this example not only drawing attention to the learning engendered by studying with peers, but also the emotions with which it can be associated: "because you were with your friends you can sort of, like, it's a bit easier". This concurs with White *et al.*'s (2014) study of learner engagement which found that when a learner sits with friends they feel more comfortable, being less likely to feel embarrassment should they be unable to confidently and appropriately respond in a teaching situation. Peer learning theory posits that there is a reduced power-authority concept that leads to feeling comfortable when peers learn together (Boud *et al.*, 2001; Ross and Cameron, 2007); this could explain the situation here. Although White *et al.* (2014) concede there is a risk of distraction, this was not noted in the findings of this study; rather, having support from friends during role play appeared one way of creating a positive learning environment, aligning to the principles purported by Chickering and Gamson (1987): that social-cognitive features can have a positive influence on motivation and are an important part of learning; and activities that include reciprocity and co-operation among students are to be embraced.

Positive interaction between students enhances learning (Boud *et al.*, 2001; Nestel and Tierney, 2007; White *et al.*, 2014), however, passive observation of peers' responses and behaviours also appeared conducive to learning as evidenced by the phrase "that really helped because it kind of, it showed you how different people reacted to the same situation" (Staff F). Thus, learning is exemplified not only through direct participation of the task, but also via observation, concepts which are features of peer learning (Boud *et al.*, 2001) and reflect the theoretical constructs defined in the typologies of work-place learning (Eraut, 2011) (Table 2.9 on page 49). Indeed, the learning consequences of role play not only include furthering of deliberative, codified therapeutic radiography knowledge and skills, but also development of tacit knowledge and co-operative capability using socially-constructed processes that will be required and used in radiotherapy practice environments.

Staff F's comments "we'd have to sort of respond as best you could there and then with all these eyes on you ....." infer another aspect of role play, namely, pressure to perform in front of peers. Woodhouse (2017), in his paper reviewing theories of emotion in learning, suggests that although there may be contrasting conjecture with regard to the role that emotions play in learning, emotions allow us to make judgements on experiences and facilitate self-development; thus they are key in the learning process, as seems to be evidenced by this statement. The participant's comments seem to intimate that pressure appears to be an empowering and motivating factor, findings which were similar to those reported by Kember (2000) who noted that learners can be encouraged by pressure to develop a greater understanding of the topic and undergo deeper learning. Another concept here may be explained by peer learning theory which concedes that the social environment in which the learner finds themselves can potentially influence personal transformation and create critical thinking opportunity as there is a desire to increase self-esteem and confidence (Boud *et al.*, 2001). Thus, the pressure of performing under the gaze of others can have positive influences on an individual's learning development and should the learner also display an orientation and readiness to learn, as suggested by Knowles's (1980) adult learning theory, then learning for students may be additionally enhanced.

Another characteristic of role play, namely, the safe environment of academic-based simulation was noted by Student B:

> "In 1st year we did something where one person pretended to be a radiographer and the other person pretended to be a patient and that was quite good because it was quite nice being able to like give your ideas across in a controlled environment where you're not potentially saying the wrong thing to a patient and freaking them out, so it's quite nice to get any mistakes out in a classroom [. . . ..] as long as you took it seriously in the classroom it was quite easy to then translate that into practice." (Student B)

The above quotation notes a specific context and setting for the role-play: preparing for the first practice placement utilising simulation of a 'radiographer' and a 'patient'. A novice radiotherapy student may struggle to make sense of a new situation or environment as learning is not only about acquiring knowledge of the situation, but also includes appreciation of the circumstances under which it occurs as intimated by work-place learning theory (Eraut and Hirsh, 2007) and situated learning theory (Lave and Wenger, 1991). Whilst a community of radiotherapy practice cannot be replicated exactly in an academic setting because of the complex variables that exist in practice, nevertheless, there is value in creating opportunities that encourage communities of learning (Menter, 2014). In the example above, it appears that students were assigned clearly-defined roles and were required to 'act' the different parts, the benefits of which appear to include an increased generation of ideas through shared learning; another feature of peer learning (Boud *et al.*, 2001). Student B uses the phrase "it's quite nice to get any mistakes out in a classroom" which suggests a positive emotion and a sense of coping with the activity and the environment within which it is occurring. The phrase Student B uses "as long as you took it seriously . . . " indicates that the activity required appropriate application and emotional investment by learners for it to be successful. Houser and Frymier (2009) contend that empowered students are likely to feel more motivated when undertaking teaching tasks as they are more confident and have higher self-esteem. They also purport that motivation is linked not only to the personality of the learner, but also the skills and behaviours of the teacher, in particular, the clarity with which instruction is communicated as well as the relevancy of the task (Houser and Frymier, 2009). In the example cited above, it appears that the teacher has provided a meaningful, authentic task; should the relevance of the activity be obscured, however, it is likely that students would be less inclined to take it 'seriously' because of a lack of motivation. Concepts of willingness to learn (personality traits) and relevancy of task concur with adult learning theory: learning needs to be meaningful and there needs to exist in the student a readiness to learn (Knowles, 1980).

Participants' responses suggest that role play can be built on and expanded in the placement setting:

> "I don't know if other departments had this but at our department [..] the radiographer would take us aside and we would do like a pretend first day chat with the radiographer so then that was quite nice in that because they're qualified and they do it all the time every single day, they could pick-up on little things like say if your mannerism was wrong or if you're not really sitting in an open engaging way then it was quite nice to have someone who's not a lecturer being like, "no, don't do that,. do this instead." (Student B)

> "First day chats with the radiographers. I was in like my first and second year, they'd like do role-play with me so they'd pretend to be like a patient and their relative and then that was quite good because then you can make sure that you said everything right . . . " (Staff I)

> "If there's any down time then you would just go in with the radiographers and they would pretend to be a patient . . . . it was quite fun." (Student B)

The above citations contain language that reflects positive emotions from which it can be deduced that these were enabling and empowering experiences. The phrase "that was quite nice" in the first quotation as well as "that was quite good" and "it was quite fun" in the second and third quotations respectively, all convey positivity. The first quotation appears to indicate that because the radiographers were 'qualified' and appeared to the participant as well-versed in the skill, they were seen as being credible teachers and experts in the field. This echoes the findings of the study by Bennett *et al.* (2014) who, when investigating the transfer of peer assisted learning into practice, noted that students preferentially sought teaching from experts as opposed to interacting with staff who appeared less well qualified.

There are various interactions that occur between practice staff and students and the participants' comments above show that staff, wittingly or unwittingly, are motivating students to learn. The two most obvious concepts at play here are role modelling and sharing of expertise both of which Eraut describes as key activities in his theories of work-place learning (Eraut, 2000; 2004; 2007) and Lave and Wenger (1991) posit are fundamental learning concepts in communities of practice. Instruction also seems to be active and personalised to the learner which, as Hativa (2000) notes, is an effective teaching strategy. Furthermore, the phrase "you can make sure that you said everything right" not only reflects a desire to achieve accuracy in the skill so could be described as goal-oriented (a concept described in Achievement Goal theory), but also implies that the participant found the task meaningful and therefore motivating and empowering.

As noted in chapter two, Achievement Goal theory is described as the link between goal-setting, emotions and achievement, of which there are two main forms (Kaplan and Maehr, 1999). Mastery-goal orientation is where a student maintains an optimistic viewpoint and deliberately seeks out challenges, passing through phases of negative emotions and deeply critical reflection in order to acquire mastery of the skill; here the focus is on the task and evidence suggests that these students perform at a higher level (Kaplan and Maehr, 1999; Finch *et al.*, 2015; Cook and Artino, 2016). The second form is performance-goal orientation (termed ego goals) (Kaplan and Maehr, 1999) which focuses on the self-perceived performance of the student, usually within the context of peers. Students with inherent ego goal characteristics seek a 'quick-fix' solution rather than take a challenging route to achieve skill mastery because they have a desire to appear competent within a social context (Kaplan and Maehr, 1999; Finch *et al.*, 2015; Cook and Artino, 2016). However, when tasked with more challenging situations, they are more likely to disengage from the learning process (Finch *et al.*, 2015; Cook and Artino, 2016). Findings from this study, highlight the competitive nature and satisfaction inherent within achievement as evidenced by the following:

> "I like competition kind of thing, so I personally say it will be... I just find it quite nice to try and produce the best I can." (Student K)

> "It is quite cool to, like the doctor comes in and you're like, "yeah, I've done the plan on my own", and at first when you look at him like, "please let it be okay", and then they like scroll through it and go, "yeah, that's fine", "phew! great!" (Student C)

> "Sometimes I just felt like I was being really pushy, but you have to be, in terms of being able to get in there, make sure you do that certain patient, and being able to do that patient successfully was a good feeling." (Staff J)

Of note in the above quotations, is the use of the word 'I' which reflects the learner-oriented drive related to achievement in learning (Finch *et al.*, 2015; Cook and Artino, 2016). Chickering and Gamson (1987) posit that communication of expectations gives ambition to individuals and a target on which to focus effort; the above comments suggest that participants had clear expectations and applied various means by which they could achieve their goals which, when obtained, resulted in positive feelings of success.

Student B describes an additional enhancement to role play: being required to orally explain and justify their actions as evidenced below:

> "You would just go in with the radiographers and they would pretend to be a patient so you would say how you would set them up, where you would put the markers and then it's just being able to justify on the spot why you're doing it, because that's what, I don't know if your CTs are the same but like we have to justify it on the spot so when you've got

> the patient in the room you'd be like, "I'm going to put the markers here because blah, blah, blah", [. . . .] so this is why I should be doing it." (Student B)

This combines role play with active learning processes that force students to make reasoned decisions based on previously-acquired knowledge and understanding. The scenario is authentic and therefore has relevance and meaning to the participant, yet, it also encompasses a staged learning approach where knowledge-gathering would have preceded role play and role play (with oral explanation) preceded interaction with patients.

The staged process of learning can be explained by two inter-related concepts: the Novice to Expert theory (Dreyfus and Dreyfus, 1980; Benner, 1984) and Miller's Pyramid of Clinical Competence (1990) (Figure 2.5 on page 56). The Novice to Expert theory posits development of a skill through stages of explicit knowing towards an intuitive grasp and behavioural response in specific situations (Benner, 1984; Benner and Tanner, 1987). In the above scenario the learner is verbalising the knowledge and understanding that underpins the 'know-how'. This indicates that they have gained theoretical knowledge related to the patient radiotherapy set-up (knows); the knowledge has been interpreted and applied to the real-time situation in which the participant found themselves (knows how); subsequently, the role play simulation with verbalisation of decision-making undertaken with qualified staff has enabled demonstration of learning (shows). Although not evident in the quotation, the next logical step would be to integrate performance into practice (does), which if Benner (1984) and Miller's Pyramid of Competence (1990) were applied, would be the concluding stage of learning. However, as noted in chapter two, limitations of the theories include the omission of analytical thinking which are an important part of competence and being expert (Eraut, 1998; Gobet and Chassy, 2008), so employing activities that involve critical reflection may enhance this positive learning activity even further.

In summary, role play in both University and placement settings, appears to encourage deeper learning by providing structured collaborative learning opportunities within a safe and supportive environment. The value of role play lay within conscious processes which, not only provide novice students in particular with the building blocks on which to build core skills, but also enable them to link learning in academia and practice settings, thus diminishing the theory-practice gap. Role play appears to stimulate a largely positive emotional and behavioural response in the student, provided there is motivation to engage with the active learning task and for this to happen there needs to be clear relevance to the professional role. When considering sequencing of teaching to aid the learner journey, role play in academia was seen by participants to enhance understanding and comprehension of practical aspects of the role of the radiographer and appeared especially useful within preparatory contexts. Some of this was seen also in the placement arena, however, role play in placement encompassed a broader context, for example, consolidation of skills related to specific techniques used to deliver patient treatment and this was performed with encouragement from experts, namely, therapeutic radiographers.

4.1.3. Technical simulation

In addition to role play, participants' comments indicated that a variety of simulation exercises were useful preparation for practice, for example, a hand washing simulation session undertaken in academia and the use of the Virtual Environment for Radiotherapy Training (VERT), as evidenced by comments below:

> "I think radiotherapy practice [simulation] was really good and I think we did something with our hands once, we were washing our hands but we

> used some sort of thing so we could see how not clean they were when, after you wash it, so then you know like the importance of hygiene so that was really good 'cos we were always dealing with hygiene here [at the placement site]." (Staff E)

> "VERT, [. . .] both at the uni and on placement is really helpful." (Student G)

> "I think the VERT [. . .] was pretty useful, because you don't want to be going there [to placement] on your first day and sort of fumbling around with the hand pendant." (Student E)

> "So in University we'd have these VERT sessions so they were very useful." (Staff J)

The VERT examples relate to manipulation of treatment equipment, specifically, the Linear Accelerator (Linac) which, as noted previously, is the technology predominantly used to deliver radiotherapy. To position a patient ready to receive radiotherapy, it is necessary to use controls on a couch on which a patient is laid and controls on a hand pendant that moves the gantry of a Linac; both sets of controls require expert hand-eye co-ordination and manual dexterity so that the radiation beam is delivered with sub-millimetre accuracy to the target found within the patient. As indicated by the comments of Student E, for the novice student, manipulation of the Linac is a challenge, yet, it is an essential practice-based skill that requires mastery. Being a life-sized Linac within a virtual treatment room projected onto a screen and operated using an authentic Linac hand pendant, VERT offers the opportunity for students to develop core psychomotor skills prior to practice placements so they have improved dexterity when operating the Linac in a department (James and Dumbleton, 2013; Bridge *et al.*, 2017). Student G's comments concur with this theory, stating that VERT in that respect was "pretty useful". However, the interactive functions of

VERT are limited to equipment manipulation: there is no interaction opportunities with a patient. Thus, with repeated use, a student may become proficient in moving the Linac but fail to appreciate the actual patient during treatment set-up. The lack of patient set-up interaction and clinical application was noted by participants:

> "I know we have VERT at uni, but I wish we had something else, like a bit more clinical, as in like a bed and like the machine because when we first started we had no idea what was going on, the pendant was so like bizarre to us, like I know we had the VERT pendant and stuff but we didn't want to touch, like I didn't want to touch the patient [who] was on the bed, I didn't want to freak them out and stuff but if we had something at the beginning I think that would have helped with the confidence 'cos radiographers don't have that much time either so you're sort of learning but it takes ages to learn it 'cos you don't get that time in the room as a first year, you're just observing coming in and out of the room, you have no idea what's going on." (Staff E)

Indeed, participants in one focus group noted that, although manipulation of a Linac was important, nevertheless, there were other equally important clinical scenarios involving Linac equipment that would be useful to simulate:

> "Probably the scariest bit is when you're ready to like leave the room and you need to move the gantry to check and you move the bed instead and you have to do the whole thing again." (Student C)

> "That's my biggest fear, that and pressing the big red [emergency off] button, I think I would just leave the department." (Student B)

> "Or the patient sits up and puts their arm on it, you're like, "no, no, no, no, leave that [your arm] there! . . . I think [for] some people, [it] takes a long time to like learn like how to move a patient and what ways would

> like hurt them and what ways would be good for me, bad for me . . . ” (Student C)

> “Yeah, that could be quite nice to maybe try to practice. . . ” (Student B)

> “It might also help like, because I’ve like pretended to be a patient before for like students to learn and stuff, and it might kind of help in your understanding of what patients are going through as well because it’s not very comfortable, it wasn’t very fun having someone like lean over you. . . ” (Student C)

Although VERT’s lack of authenticity is highlighted as a limitation in the findings of this study, Bridge *et al.* (2017) contend that by developing technical skills through VERT, students are able to focus more on patient interactions when in practice. However, to enable all students to gain sufficient ‘hands-on’ simulation experience at University, learning in small groups or pairs is required and because of the newness of the situation, interventions and feedback by a supervisor are key (Issenberg *et al.*, 2005); thus it is time intensive for academic staff. Time limitations and access to VERT in academia appeared to be an issue as reported by some participants:

> “VERT in general is very useful, but it’s quite hard in, like, uni when there’s, in Year 1 there’s so many of us.” (Student D)

> “[VERT sessions] were very useful. The only thing is we didn’t have them as frequently, we literally had one in the first year, which was at the beginning of the first year and our placement was at the end of the year, so literally we’d forgotten about it.” (Staff J)

Simulation theory contends that for simulation activity to be useful there should be clear educational objectives and a standard against which a student’s performance is measured (Motola *et al.*, 2013). If the purpose of the VERT session was to facilitate skill development for placement which, as Ziv *et al.* (2005) note, can be enhanced through feedback given during or at the end of simulation activity, Staff J's recollection of experiences suggest this was not always achieved.

VERT use in placement was seen to take a different form to its use in academia: rather than being used to simulate new experiences, it was utilised to enhance learning of clinical experiences as shown by participants' comments below:

> "[We had] VERT at placement and one of the uni lecturers came over, and they did [...] how to set up an electrons, but on the actual [VERT] machine upstairs, so we all had a go at how to set up the electrons, and it made it a lot, lot easier when you came back downstairs [to the treatment unit]." (Student D)

> "Being able to have a VERT room here like where we are trained and being able to have access to it when we needed it even though, you know, we only came here kind of for our sessions but just knowing that we could come here and play around with stuff in our own space, you know, practise electron setups in here and that kind of thing, stuff that you don't really get time to just do on the machine, I think that was a real positive point to have throughout our training." (Staff A)

> "After that [VERT] session it was a lot more smooth . . . whereas [before] I'd be asking questions quite hesitantly, like, "Do I do this, when do I do that? How do I do this?" but after that session I felt a lot more confident in how I, just the steps that I needed to go through to achieve skin app. So, and like, remembered it, like, from what he said, how I then moved the bed and raised the bed, type thing. So yes, just the VERT in general is very useful." (Student D)

The first quotation refers to electron beam set-up, a Linac-based radiotherapy delivery method used more infrequently than photon beams in a radiotherapy department as electron treatment is used for tumours close to the surface of the skin, however, many tumours are more deep-seated within the body and are therefore more suited to the dosimetry of photon beams (Metcalfe *et al.*, 2007). Because of the relative scarcity of electron beam delivery, students will have limited opportunity to observe and obtain hands-on experience; therefore skills and understanding of electron set-ups may be underdeveloped leaving students in a state of liminality, that is, not quite achieving competence. The phrase “made it a lot, lot easier” suggests that formal sessions in placement using VERT simulation contributed to student learning in a positive way, enhancing skills development which resulted in feelings of achievement. Indeed, Student D’s quotation above notes how, following a session on VERT in placement, they appeared “more confident”.

Confidence and competence are closely linked (Eraut, 1998) and simulation theory suggests that simulation lends itself to the development and improvement of competence in specific scenarios where the learner is inexperienced (Aggarwal *et al.*, 2010), as appears to be the case in the above example. Finch *et al.* (2015) note that positive emotions, in this case engendered by learning perceived as “very useful” (Student D) and “a real positive point” (Staff A), can further enhance the development of professional competence and promote personal growth in the learner. Within practice, VERT appears to be used when honing the skills of an individual learner with a perceived deficit, evidenced by the phrase “being able to have access to it when we needed it” (Staff A). Adult learning theory posits that, as self-regulated learners, students are able to discern not only what they want to learn, but also what they need to learn (Knowles, 1980). In the example above, recognition of the need to know may have triggered the activity which, once completed, has resulted in more effective clinical performance. This again reflects the learner-centred orientation which is a feature of adult learning theory and allows achievement to be made. Findings from this study have found that participants valued VERT in the practice setting, particularly when struggling with specific techniques and set-ups in the clinical environment. Thus VERT in placement may be used as an adjunct to patient set-ups, particularly where the technique or process is uncommon and a learner feels they are lacking in competence. In this situation, learning is tailored to the needs of the individual so is personalised rather than being used as a group peer learning activity.

To conclude, simulation in academia and practice can provide effective learning if appropriate educational principles are deployed. Consideration should be given to determining: if simulation-based activities will enhance elements of the curriculum; when this would be most appropriately employed; whether the activity is delivered in a group or is meeting an individual's learning shortcoming; and the extent to which a teacher is needed in order to deliver feedback, a recommended activity (Ziv *et al.*, 2005; Alinier, 2007; Motola *et al.*, 2013). Some participants in this study have suggested that VERT simulation in academia was useful in the following deliberate practices: familiarising novice students with Linac operation; and introducing novice students to the psychomotor skills required of a therapeutic radiographer within the context of accurate and effective treatment delivery. Yet, some participants have noted that there are resource implications and a lack of patient-related realism. VERT in practice has been used to refine practical skills for individuals and give competence and confidence in radiotherapeutic procedures, especially in processes and techniques that may not be prominent in the practice environment. Furthermore, having VERT in placement environments means that learner situations can be responded to on-demand and can complement patient experiences.

4.1.4. Peer learning

Some aspects of the role of the radiographer, such as radiotherapy treatment planning skills are taught in academia using computer workstations on which simulation planning equipment is housed (Table 2.15 on page 65). In this study, participants acknowledged the empowering relationships with peers when undertaking group planning sessions:

> "it was quite nice to all be in the room and because we're all in the same boat, none of us really know what's going on, so being able to help each other get through it because it's a bit easier than just having someone stand there and tell you, "this is how we do it, this is how we do it." (Student B)

> "[Working together] was definitely good,... and just trying to write different things that we did and even after those chats I think one time we produced completely different plans, even though we were talking it through with each other." (Student K)

> "Everyone worked together and sort of questioned each other and, you know, everyone's plan was different even though the outcome was exactly the same as well so it was quite interesting seeing how people were [working]." (Student L)

Learning from and with other learners are characteristics common to peer learning (Boud *et al.*, 2001; Ross and Cameron, 2007). Not only do learners take an active role in their learning as intimated by the comment "questioned each other" (Student L), but also they act as collaborators in the learning process as evidenced by "everyone worked together" (Student L). This and the quote "because we're all in the same boat" (Student B) intimates a togetherness as does "being able to help each other". Peer learning theory suggests that learner closeness stems from the proximity and congruence of cognitive ability and subject knowledge of the social grouping (Ross and Cameron, 2007). In this case, the social grouping would be one cohort of radiotherapy students to whom lectures may have been delivered so some knowledge of the underpinning principles of planning would have been gained; I have personal experience of five of the ten HEIs offering undergraduate radiotherapy programmes in England and this academic lecture-practical model has been the system employed by all. Manipulation of the planning treatment software requires specialist skills and knowledge of the operating system and it appears from the comments above that students were unfamiliar with these. Participants' comments infer that this has led to a shared problem, as noted by the phrase "none of us really know what's going on" and it is this common feature which appears to tie the group together. Boud *et al.* (2001) purport that peer learning helps with developing problem-solving skills and this is enabled through the comfortable, shared relationships which peer learning creates. Furthermore, peer learning enables students to recognise and share the burdens of challenges which can engender positive feelings of empathy, support and respect (Boud *et al.*, 2001). Thus comfort may be derived in perceived difficult or new situations, as was intimated in the opinions of some participants in this study, and, as noted by Chickering and Gamson (1987), activities that enable reciprocal social interactions and learning communities are an important and effective method of learning.

The skills inherent in working with others include principles of team-working, yet, as shown by the comments of Student K and Student L, learning is also developed through critical enquiry and reflection, for example, participants showed some curiosity as to why, although the outcomes were "the same" (Student L), different plans were created. In this example, peer learning can be seen to encourage reflection and formulation of questions, something that may not readily occur in situations where an academic is present because a power-authority dynamic can exist in learner-lecturer situation (Johnson-Bailey and Cevero, 1997; Alsobaie, 2015). As identified by Schön (1983), there can be reflection both in and on action; as seems to be the processes intimated by Students K and L. Another aspect of this situation is described in workplace learning theory, in particular, the two distinct forms of knowledge constructs described by Eraut and Hirsh (2007): the learners know *that* which must be achieved, that is, they know what the outcome should be, yet, the knowing *how*, which relates to the skill and performance and is distinct from knowing that, appears occluded. In this example, academic learning and practice have yet to merge.

Participants' opinions in this study have demonstrated the advantages afforded by peer learning and the key skills that this can help develop. Participants have noted that sharing of learning in the context of specific learning outcomes has promoted critical reflection resulting in not only deeper learning for individuals, but also tolerance of diversity and appreciation of alternative means by which outcomes can be achieved. Sharing problems has also invoked feelings of camaraderie, empathy and support, skills and feelings which are desirable in practitioners and this topic is explored further in the next section which reviews the learning theories associated with problem-based learning, another positive learning experience reported by participants.

4.1.5. Perceptions on problem-based learning (PBL)

Immordino-Yang (2011) contends that emotions, social processing and learning are intertwined. This concept was demonstrated in participants' comments about problem-based learning in academia which appeared not only to embrace social processing, but also to provoke a range of emotions:

> "I loved PBL!" (Student A)

> "I think in terms of learning I learnt most when we were in the... those sessions for PBL. Like I learnt the most when I was in them sessions because you went away, you did your research, you came back, you know, talked about it with other people so it was really useful even though it was so stressful at the time, you know... " (Staff C)

> "I thought that [PBL] was brilliant." (Student B)

> "... it [PBL] was the best thing because you come back here and they ask you a question and you don't even realise how much you've learnt because they're asking you and you can say it whereas before that you wouldn't have a clue where to begin." (Staff C)

> "I didn't like the PBL sessions but then when I look back on it now, thinking about it, well I actually enjoyed having the discussion then we'd get asked questions on what we've researched and then we'd realise, oh I missed this, I missed that, oh I didn't look at it from this point of view, oh there's this as well to consider." (Staff B)

There appears a dichotomy of feelings with regard to PBL; both positive and negative emotions in participants have been engendered, yet, learning appears to have been largely positive. Some of the processes involved with PBL appeared to cause feelings of stress and dislike for one participant in particular; yet, reflecting on them in the focus group, Staff B acknowledged that the research and collaborative discussion were beneficial and appeared to induce deeper appreciation of the topic and therefore more expansive learning. This awareness appears to reflect the higher level reasoning skills that comes with being a competent practitioner (Benner, 1984; Eraut, 2007) and it is interesting to note that this observation was made by a graduate; perhaps time and experience has led to this recognition; or perhaps being a participant in this study was the purposeful trigger that is necessary to highlight when learning has occurred

(Eraut, 2000; 2004; 2007).

PBL employs social and cognitive aspects of learning and exploits the view that students should be active rather than passive partners in their learning (Bate *et al.*, 2014). Indeed sentiments of partnership and relationships were echoed by Staff A:

> "It will be good if you have PBL groups [in year one] because you kind of get to know your peers a little bit more." (Staff A)

Staff C's comments "[PBL] was the best thing because you come back here and they ask you a question and you don't even realise how much you've learnt" confirms applicability of the scenario to practice, underlining that PBL is perceived to have value if it relates to authentic scenarios and if the learning induced builds on previous knowledge and situations (Taylor and Miffin, 2008); this reflects aspects of adult learning theory purported by Knowles (1980).

Although PBL in academia is a forced community engagement, nevertheless benefits are afforded, not least of which include facilitation of conversation in a safe, non-clinical environment using strategies found within community of practices (Bate *et al.*, 2014; Loomis, 2016). These concepts appear reflected in the findings of this study as evidenced by Staff B's comment "I actually enjoyed having the discussion". Other advantages include that specific knowledge constructs may be targeted in authentic case scenarios and the researched-knowledge presented can be regulated by a facilitator who is also able to act as a role model (Bate *et al.*, 2014). Adult learning theory suggests that students in higher education become self-directed learners (Taylor and Hamdy, 2013), however, team-working built on mutual respect and trust is a key aspect of the therapeutic radiographer's role and therefore performing in a group-scenario, taking responsibility for own learning and imparting knowledge to others, are useful skills to foster, as evidenced by the following discussion in one focus group comprising students:

> "It was nice to kind of like go away and have your little thing to study." (Student C)

> "You'd just discuss it and like the cases were always so interesting." (Student A)

> "The hard bit was everyone trying to like fight over each other to get their, what they've learnt out, "no, I've learnt this, this is more fun!" (Student C)

PBL appears to have value not only as a means by which holistic learning about a clinical scenario is acquired, but also as a team-learning activity in undergraduate radiotherapy programmes, thereby enabling development of the generic core competencies and skills required of healthcare students and practitioners. Furthermore, PBL requires students to actively search for and critique information, evidenced by the phrase "you went away, you did your research" which indicates another important learning strategy, namely, that of being aware of limitations in knowledge and understanding and knowing how and where to access information to fill that gap. Aspects of this align to reflective learning theories such as that purported by Schön (1983) and dimensions of professional competence such as those espoused by Epstein and Hundert (2002) (summarised in Table 2.13 on page 54). It also appears that, by gaining discrete bodies of knowledge, a learner's confidence within the group setting is enhanced; this concept is further evidenced below by Staff A:

> "I remember once at uni we had to make like a poster for something, we worked in groups and we had to make a poster on like when you check images, like when you do them for the first few days and then repeat them once a week, we had to do it for different sites and I think like for palliative and radical it helps you to understand the reasoning behind why we do it ... It [group work] forces you to get involved in events where

> even you don't feel like you want to work in a group, you work in a group, you work together and then you kind of put stuff down as well so you see it and then you present it so you're understanding it because you have to talk about it so you have to know what you're talking about, so in that sense it kind of sticks in your head, like if you just do a session, sometimes you can do the session and you walk out and you get it while you're there but when you leave you might have forgotten but by doing the poster you kind of have that imagery as well in your head where you remember it and you know, like today, I remember doing the poster or the session." (Staff A)

Although not PBL, this group activity demonstrates the empathy required for successful team-working, the research and decision-making necessary in retrieving appropriate data and the peer learning that came through discussion of material and justification for inclusion in the poster. The exercise appears to have engaged multiple aspects of learning: cognition and motivation, intimated by the phrase "then you present it so you're understanding it because you have to talk about it so you have to know what you're talking about"; another aspect relates to the affective domain of emotions evidenced by "you don't feel like you want to work in a group". Whilst this appears a negative emotion, it seems to have been an activating process enabling a positive outcome of deeper learning to occur. Chickering and Gamson (1987) cite active learning techniques as a means of empowering learning and this appears to be the case here. Although negative feelings were induced, it seems from the participant's comments that these were not disabling, rather, emotions coupled with active learning techniques served to enable long-term learning. This can be explained by the theories that describe emotions in learning. McConnell and Eva (2012) note that emotions comprise two parts: valency which is the term used to express the spectrum of positivity and negativity of the emotion; and arousal which refers to the strength of the emotion. They also posit that negative emotions cause an individual to analyse the details associated with the learning situation, whereas, positive emotions encourage a more global appreciation thus enabling links to be made between learning situations (McConnell and Eva, 2012). In the above example there is some negativity, yet, as noted by Reisberg and Hertel (2003) it is the strength of the emotion that causes information to be remembered and therefore learnt. Indeed, without the negativity, the strength of the emotion may have been less and potentially the incident may have been forgotten rather than committed to long-term memory.

Emotional states can impact on the processing that occurs in an individual, for example, positive emotions generally allow an individual to think flexibly and creatively as well as have a developed sense of curiosity (McConnell and Eva, 2012). Although emotions related to learning processes and task demands appear complex (Pekrun *et al.*, 2002), comments from participants suggest that negative and positive emotions play an important part in teaching and learning processes. As explained by adult learning theory, where there is relevance of learning to the professional role, motivation is likely to be enhanced and learning appears useful and positive. Whilst intrinsic personalities and characteristics of learners cannot be influenced by teachers, nevertheless creating valued opportunities in teaching that encourage positive emotions affects not only how students perceive and interpret information, but also their flexibility of response and creativity (McConnell and Eva, 2012). Whilst I would consider it anathema and ethically wrong to create teaching where negative emotions such as embarrassment are invoked because of the potential to inflict anxiety on a student which could impact on their self-esteem and well-being, nevertheless, it appears that both negative and positive emotive states contribute to the learning process.

Both peer and problem-based learning evoke a spectrum emotions that appear to empower learning. Discussion of the complexity of emotions has revealed that simplistic conceptions of positive and negative emotions should be avoided as all emotions appear important to the learning process. Context and goals of learning are important drivers, therefore care is required when designing learning tasks and opportunities; of note is that those which have clear relevance to the role of the therapeutic radiographer tend to be valued more. When employing teaching strategies that encompass peer learning and PBL, students should be told of the relevance to their education not only in terms of the knowledge constructs they will cover, but also the emotional investment, competencies, interpersonal and social skills the activities will develop. PBL was seen as a particularly empowering activity in the development of attitudes and attributes required of a therapeutic radiographer and also of reflective skills required by any professional practitioner.

4.1.6. Placement learning

Eraut (2007) contends that there are a wide range of learning processes evident in the work-place, which are often not acknowledged or justified. This could be because tacit knowledge is inherent within professions and is therefore not readily available to a novice learner; however, this may also be attributed to a lack of appreciation of complex professional practices (Eraut, 2007). Both individual and social learning theories abound in professional practice: individual learning relates to the way in which an individual may learn and interpret a learning experience, whereas, the social aspects draw together the social construction of learning processes including those related to the environment and culture within which the learner is placed.

Placement learning was clearly valued by participants, not only as a means by which skills were developed, but also in terms of preparation for the role of the therapeutic radiographer as evidenced in the quotations below:

> "There was a lot of placement, placement-uni, placement-uni and you do get a bit tired but it makes a big difference because you're actually doing and it gets you into a habit, you know what to do, you see it and it's a routine that you learn, so I think looking back at it now, without placement, without as much placement as we had, I don't think I would be in the same position [qualified radiographer] I'm in now." (Staff B)

> "Positive is the fact that we got a chance to go in there and do it for ourselves." (Staff J)

> "As much as the theory is [good] you need to see it practically to see how busy it can get, how it gets when patients get angry, even little little things like that." (Staff C)

Staff C's comment recognises the value of contextualisation which spans professional programmes and is inherent within work-based learning theory (Eraut and Hirsh, 2007). This also aligns to situated learning theory as purported by Lave and Wenger (1991) who proposed that learning of knowledge cannot be separated from the context in which it is used. Situated learning enables application of theory to practice by bringing together the spectrum of technical skills, ethical practices, factual knowledge and interpersonal skills (Yardley *et al.*, 2012). It can also promote further learning by revealing problems and issues not necessarily apparent in other learning environments (Yardley *et al.*, 2012); this was suggested by some participants in the study as noted below:

> "If you can see what that [image] match, how it actually, if you could move your PTV to how it actually affects it, then you can actually see what your, the effects of what you do and it will make you actually think about it and like should actually set up again or like what should I, what

> do I need to do?" (Staff I)

> "It's really good that we had such hard core placement .. so you know how to deal with tricky situations and apply your knowledge and what to say and when to say it and when it's appropriate to step back." (Staff C)

The above quotations demonstrate that when encountering a new environment or situation, it is necessary to understand the context and unwritten rules that exist within the culture. The phrase knowing "when it's appropriate to step back" (Staff C) reflects those boundaries which, as purported by Eraut and Hirsh (2007), can only be learnt through socialisation processes of being with others in the work-place. Social and cultural processes were reflected in other participants' comments:

> "Our department's quite good in that they'll really encourage you to try to get on with things . . . they're like, if you feel confident just go and do it." (Student B)

> "You do it and then [the radiographers say] I'll tell you if you're wrong, like you set them [patients] up, you do what you think is right, and then if it's right I'll tell you it's right and we'll leave, and if it's not then I'll do it, so it was more like being allowed to do it on your own and not having someone lean over and tell you you're doing it wrong when you're just getting to like working it out, so when you've a bit more time of the machine it was like . . . you do it on your own and then I'll tell you if it's right." (Student C)

The use of the words "really encourage you to try" (Student B) suggests an expansive rather than restrictive learning environment which appears to stimulate and empower students to learn. Allowing students to develop their skills within authentic work-place experiences requires controlling the context to minimise error and maximise learning as appears to be the case in the second example above. Encouraging students to commit to an action forces a decision to be made (Ramani and Leinster, 2008) which, as noted by Epstein and Hundert (2002), are key aspects of professional practice. Yet, as is evidenced in participants' comments, students do this in a 'safe' environment because they are supervised by qualified practitioners so risks to patients as a result of a student's action are very low. However this does not mean to say that errors or omissions are never made, as intimated below:

> "There was one chap who we were treating sort of like the thigh area and the doctor had gone through the consent form with him but hadn't discussed side-effects, maybe to his private area 'cos we were so high where we were treating and the doctor had completely glossed over that and this chap wanted children, and we kind of spoke to him and kind of got a feel for how well he understood the treatment and how it may affect those chances of having children in the future and he didn't understand so we weren't happy to treat and that was kind of a decision we kind of took together." (Staff F)

> "When you're stressed, it's very easy to make a mistake, it is surprising how easy it is to make a mistake, considering how many times you check something." (Staff J)

Staff J's comment suggests a relationship between errors and working in a stressful environment and whilst therapeutic radiographers strive to achieve perfection in treatment delivery and set-up, working to sub-millimetre precision in a busy environment is challenging and errors are made (Dunscombe, 2012). However, if errors are properly managed at an organisational level there is opportunity for learning to occur as evidenced below:

> "I feel I've learnt more from like, kind of like mistakes that I've made in terms of communication, in terms, not finding out exactly what I needed

> to, so I think that helped, like, me develop more." (Student J)

Findings from the study found that to learn from mistakes, a no-blame culture was key as indicated in the quotation below:

> "it's really open here in terms of [mistakes], and then if you've made [a mistake] you go straight to (NAME REMOVED) and you confess your sins and it's an open sort of, open policy really, open door policy so you're not blamed for it, it's kind of, okay why has this happened, and it's encouraged to sort of report... I think it's really good." (Staff F)

This quotation highlights the attitudes and support needed to feel comfortable and confident to speak up. "Open door policy" suggests approachability and a non-hostile environment and "you're not blamed for it" infers discretion and support from managers within the department. Eraut and Hirsh (2007) contend that managers play a key role in enabling work-place learning to be effective, not least of which includes developing good working relationships and thus a climate in which learning is enhanced.

In summary, this section has highlighted the value of and conditions under which empowered learning in the practice environment can occur and has drawn on theories related to professional dimensions and workplace learning to determine the links between contextualisation, authenticity, empowerment and learning processes. It has noted that a safe, no-blame culture supports student learning and progression, enabling immersion into the community of practice from which a shared professional identify emerges. The next section reviews guided learning activities specific to the workplace that participants cited as empowering and conducive to learning.

4.1.7. Guided learning: workbooks, portfolios

In this study, guided learning in the form of workbooks and portfolios was seen to aid learning as participants' comments show:

> "The university has given us a workbook which I find really helpful." (Student C)

> "I think having [...] the planning workbook to work through, that is really helpful" (Student I)

> "they [portfolios] have like a set of objectives for you to complete, like for each year. So when I was in first year they get you to just like look up phantoms and just get your head around that. In second year they actually give you plans kind of like conformal plans, like you have to work through them organs so you actually learnt all the different plans and techniques and how you achieve the best plan and so I found that quite helpful." (Staff C)

An advantage of guided learning is that it can take knowledge from the academic environment and situate the learning within the practice setting (Tartwijk and Driessen, 2009), thereby not only forging links between academia and practice, but also, as inferred by Staff C's comments, highlighting relevancy of content through context. Furthermore, the quotations suggest that learning is not static; students are taken on a learning journey (discussed further in section 4.3). Although workbooks afford each student the same learning objectives and give direction, which align to Chickering and Gamson's (1987) principles of communicating expectations and giving ambition, workbooks are learner-driven and thus students achieve outcomes in a timeframe customised to their knowledge and skills, thereby providing a means of personalised learning (Scott, 2015). As students learn in a variety of ways and undertake multiple learning trajectories to skills acquisition, guided learning can assist with enhancing each individual's journey and provide learner autonomy (Scott, 2015). However to be effective and motivate students to learn, guided learning needs to be relevant and have clear learning objectives that provide focus (Tartwijk and Driessen, 2009). Participants' comments below on a radiotherapy imaging and planning workbook suggest that these intentions were achieved:

> "Because we have the booklet that we have to fill out for the uni, and they always have bits and bobs at the placement site, as well, but the time they [planning radiographers] can spend with us just going through the anatomy, and how it relates to the planning process, as well, is definitely, I've improved in my anatomy knowledge the most there." (Student D)
>
> "I think the CT portfolio was good." (Staff E)
>
> "That [CT portfolio] was brilliant. Really liked the questions that we had to answer." (Staff F)
>
> "And the different techniques that we were told, so you'd write a whole paragraph about the techniques and I think that did help." (Staff E)
>
> "I'm well occupied [with a workbook]. I think you need to be in planning, because it can be quite boring. If you're just sat in, like, a room, with a computer screen and there's no one else about, you'd quickly go insane. Yes, boredom sets in, so it's important that someone's about if you need to ask a question, because if you're stuck and there's no one to ask the question then you're on your own and it just gets very boring." (Student D)
>
> "It [the portfolio] gave you focus as well so it split it all into different anatomical sites and you had to sort of go through it quite meticulously in terms of like how you did a scan, how you did a plan, why you did what you did so... It gave us that incentive to crack on, really crack on

> with it." (Staff F)

The quotations above demonstrate that workbooks and portfolios afforded focus to learning with some comments highlighting that they enabled construction of interconnected knowledge. Participants indicate that questions were employed to direct learners towards relevant radiotherapeutic procedures and underpinning knowledge; although questioning is a way of assessing knowledge, it can also enable active learning which Chickering and Gamson (1987) profess to be one of the seven good practice principles in education. Facilitating reflection on learning through the use of written documents enables self-analysis both during and after an activity (Schön, 1983). This in turn promotes students' awareness of their own knowledge and can facilitate self-monitoring and self-direction of learning; key concepts associated with professional competence (Eraut, 1998; Epstein and Hundert, 2002).

Student D notes that a specific learning construct, that is, anatomy was further developed in the placement rotation where anatomy is heavily used: the planning stage of a patient's treatment where radiation beam application is planned and calculated according to the position of the tumour and surrounding anatomical organs at risk. Because the questions are relevant to the context, the learner sees a clear link between the portfolio and the placement. This is key when designing guided learning and workbooks (Tartwijk and Driessen, 2009).

The quotation "I'm well occupied [with a workbook]. I think you need to be in planning, because it can be quite boring" by student D evidences that workbooks can provide learning stimulus in an environment in which opportunities may be considered passive and / or limited. This was also suggested by another participant:

> "[In the portfolio] you've got objectives, you've got like goals to work towards and when you achieve it you think, oh you know what, I can do this and that makes you feel a bit like you can do it." (Staff A)

Participants' comments show that workbooks provide external motivation and orientation to encourage learning. Discussions have eluded to examples where there is relevancy to the context; which may be explained by Vygotsky's situativity theory (1978). This notes that learning cannot be divorced from the context and community in which it occurs; it makes sense, therefore, that a participant cited anatomy use in the planning and CT rotation, the knowledge and understanding of which is paramount to accurate radiotherapy treatment planning and beam delivery. Furthermore this example reflects the Zone of Proximal Development associated with social constructivism that states a learner can only develop new knowledge if they have existing knowledge on which to build (Vygotsky, 1978). This has implications for the scheduling of theory and practice, a concept highlighted by participants:

> "We got the theory before we went in as well to do the practical work here and I found that really helped because ... When you're doing it ... it reinforces it, it's just like suddenly a lightbulb, like oh I get it you know, I understand it whereas before I didn't understand it" (Student A)

> "... 'cos we did that [anatomy] at the uni and a week later we got grilled on like a pelvis, had like a pelvis image and we got grilled on it and it was a case of we knew all the answers to it because we'd literally just studied it, so when it marries up like that it's really good, but definitely the anatomy [should come] in the first year 'cos you hear a lot of acronyms when you come out on placement for the first time and some of the time you're thinking what does that stand for 'cos it's slightly different to how the uni does it, but it's really good to have that sort of base knowledge before you go out, definitely." (Staff F)

> "I definitely want an anatomy thing first and maybe a structure with that, you focus on like, I don't know, head and, I don't know if head and neck

is a bit too difficult maybe at first, probably start with like prostate and then before that, and breast and then do head and neck, but the anatomy I think needs to be there." (Staff I)

Guided learning in the form of workbooks and portfolios appears to add value to placement experiences and provides opportunities not only to link theory and practice via learner-centred activities that employ principles of situativity learning theory, but also to induce motivation, self-direction and autonomous learning. Guided learning also appears to give focus and meaning to learning as well as providing orientation and impetus to the learning process which may be necessary when other stimulants are absent. Finally, guided learning may be accompanied by other interactive techniques such as questioning which, as purported by Epstein and Hundert (2002), are cognitive dimensions of professional competence and appear to direct and encourage active learner engagement.

4.1.8. Questioning and feedback

Challenging peers through questioning is one way a learner can express and measure their own level of understanding of a concept (Boud *et al.*, 2001). Furthermore, being questioned and questioning others are active learning strategies necessary for participation, reflection and effective learning (Chickering and Gamson, 1987; Eraut and Hirsh, 2007) and these were apparent in the comments of participants:

> "We were just asked a lot of questions, like in pre-treatment you'd be asked, you'd be grilled basically, and the senior radiographers said you have to hit the ground running, so first day there I was being asked loads and loads of questions, so the, I'll take that in a positive way, because it only fills gaps in my knowledge." (Staff J)

> "There's a difference in being asked a question by the radiographer when

> they're trying to sort of grill you and, you know, someone, a first or a second year is merely asking you because they don't know and they want to know, they're not trying to test your knowledge." (Student L)

Staff J and Student L infer that questioning techniques can be used in various ways, for example, by qualified staff to discover a student's level of study and establish base-line knowledge at the beginning of a placement; in this scenario staff could be attempting to diagnose the learning needs of the individual student to determine objectives for the placement. This could be construed as individualised learning, yet, the comments "you'd be grilled", "they're trying to sort of grill you" and "hit the ground running" could also imply that perhaps this was a specific teaching tactic used by staff on placement to motivate students to learn. Asking good questions is a fundamental skill that facilitators of learning should employ and is recognised as one aspect of professional competence (Epstein and Hundert, 2002) (see Table 2.13 on page 54). Clear questioning, if asked in a facilitative way, enables links and connections to be made between related topic areas and fosters learning by encouraging active reflection; deeper learning will ensue if it is accompanied by appropriate feedback (Nicol and Macfarlane-Dick, 2006; Azer *et al.*, 2013). These theories were echoed by participants:

> "[Questions] helped you kind of think more a bit more deeply about the plan that you were actually doing and then we went through it with like our mentors and stuff and they kind of asked the same questions but got us to explain our plans a bit more and I think that was quite helpful." (Student D)

> "I think the trick is to ask why things are being done, I think it's quite easy to turn up to departments and just follow people in and out, you're not going to gain much." (Student K)

> "You can just ask questions and make sure you know and are aware and that's how you kind of build, because then you get that knowledge." (Student L)

Questioning provides one means by which feedback is relayed and participants cite oral and written feedback as effective and important means of learning:

> "We also did a first day chat tutorial type thing, as well, at my placement, so that was really useful, as well, to be able to get feedback. So any kind of opportunity to get feedback was really useful." (Student D)

> "Feedback I think was the most important." (Staff E)

> "It's when you get like, good feedback from the patients, it does make you feel like you did something good... because then you know if you're going wrong, or doing something right. Because if you don't get feedback then you're kind of just left thinking..." (Student H)

Comments from participants highlight the empowering nature of feedback: if positive feedback is received this is motivating and can improve self-esteem as evidenced by "it does make you feel you did something good" (Student H). As purported by Nicol and Macfarlane-Dick (2006) good feedback practice enables clarification on performance and expected standards (Table 2.14 on page 58), yet, as highlighted below, feedback was not always given in what participants viewed as an appropriate time-frame:

> "It would be nice if they just filled it [competency form] out while you were working, so then they can give you some advice on what you could do [to improve]..." (Staff E)

This comment by Staff E reflects the self-regulation that is described by Knowles' (1980) adult learning theory: there is motivation and orientation to learn, yet, some external explicit description of performance is necessary to inform the student of their development within the practice environment. The comment also suggests a lack of certainty on performance which Eraut and Hirsh (2007) contend can often occur in the workplace. The participant suggests that written feedback through completion of forms is a way forward, yet, a mutually-convenient conversation between the learner and practitioner may be equally, if not more, useful as this could be achieved in a quicker time frame as detailed written feedback is time-consuming (Westwood, 2013). Indeed, oral feedback, given in real-time, may produce immediate results as changes may be agreed and implemented instantly (Nicol and Macfarlane-Dick, 2006); thus it could be viewed as a more efficient and effective strategy.

Participants' comments have highlighted how questioning and feedback enhance the learning process. Learning has been discussed with reference to the principles posited by Chickering and Gamson (1987), Knowles' (1980) adult learning theory and feedback principles purported by Nicol and Macfarlane-Dick (2006). The relationships between feedback and reflective practice have also been noted, whilst acknowledging conditions under which it becomes more or less effective. Nicol and MacFarlane-Dick's (2006) seven principles of feedback describe desirable and effective feedback; however, comments from participants highlighted that, in reality, there are constraints and limitations, particularly in a placement setting. Challenges that effect and impact on learning are evaluated in the next section.

4.1.9. Perceived challenges in therapeutic radiography teaching and learning activities

This section would not be complete without acknowledging the challenges and barriers to teaching and learning activities which participants expressed during the study. One particular issue related to insufficient preparation for practice:

> "You can tell even the first years that come here, they're like "what is going on", and even I don't know, silly little things like where the tattoo

is and stuff like this, things like that and like really small things would just help them understand." (Staff G)

"I think maybe that [more patient set-ups on VERT] would be quite nice to do at uni as a whole because then you would go out a little bit more prepared and sort of, I think it's just literally the fear in 1st year of not knowing what is going to happen, and it's just quite nice to be able to be like, oh okay, like I've done this, I know how it works on a fake patient so now I can apply it to a real patient." (Student B)

"I think using CBCTs [images in lectures] instead of like just the text books that you use for anatomy, I think that would be more helpful ... because yeah, like the text book, obviously it looks wrong when you've drawn it and then when you actually look on the screen [in placement] and it's ... and you've never seen anything like it so if you have like a session where you see it, like a really bad CBCT, a really good one and you're able to kind of crossmatch and then you kind of know... " (Staff D)

"Getting [1st years] to do basic research, like even about anatomy, you know, what does this look like on a CT slide, so what do you think ... even like basic things, it will get you to think because before coming here, you don't really, I don't know, like when I came, I don't know what I was expecting like my first placement ... I was very taken aback." (Staff C)

Another challenge reported related to when lecture material appeared too detailed and complex, with neither its relevance nor significance to learning addressed. Adult learning theory stresses that there must be clear indication of why learning is necessary and relevant (Knowles, 1980), yet, in the development of practical planning skills it appears that these principles were not always achieved as evidenced below:

> "Like the lectures for the planning, we were given a ridiculous amount of information and just told to, we had like a massive exam, everyone did appallingly in the exam, like I think there was one person that got a 2:1 and the rest were literally all lower than that. It was a ridiculous amount, all the slides were like completely full of information and like there wasn't the key points and also it wasn't the key points that were specific to us, like to make it relevant to what we were learning. So like, do you know what I mean? Like to make it useful, like why do we need to know this? Like what's significant about that, do you know what I mean, like how to make it relevant?" (Staff I)

The objections appear to be with the type of teaching delivery used to impart knowledge, the amount of information conveyed and a lack of clarity of purpose. The word 'ridiculous' is used which has negative connotations; the series of questions posed, one after the other, at the end of the paragraph, also emphasises feelings of frustration. In this example, lectures to support the development of a practical skill appear ineffective and the participant's negative opinion appears vindicated by their comment on assessment scores. Whilst it must be appreciated that not all students learn in the same way, there should be some consideration of the teaching method and whether it is learner-focussed and enabling of the skills and understanding it is developing. It is easy for a tutor to underestimate a learner's feelings of being overwhelmed, especially if the learner is unsure of the topic, rules or context (Meyer, 2010).

Radiotherapy treatment planning could be considered a discrete and specialist area of therapeutic radiography practice as it tends to be manned by planning experts possessing either a medical physics or therapeutic radiography background (McPake, 2018). However, this area embraces core concepts on which radiotherapy is based and therefore affords understanding that underpins safe, appropriate and effective treatment. The phrase "the slides were like completely full of information and like there wasn't the key points and also it wasn't the key points that were specific to us" suggests the participant felt overwhelmed with the material; unable to process and understand key concepts. These emotions can be explained by cognitive load theory (CLT) which describes a relationship between learning tasks and the ability of a student to both process information and store it in long-term memory (Sweller *et al.*, 2019). This concept was highlighted by students A and C who were discussing strategies for learning significant amounts of information:

> "[Having] an exam [formative test] every week so just forced you to do so much, I did love that actually . . . that was really good learning." (Student A)

> "It was, sometimes you find like you learn things and you learn more and more and you have an exam and you've forgotten what you learnt in the first place, whereas this was [weekly testing] like you've learnt it, do a test on it, and it was very, it helped kind of make it stick a bit more I think." (Student C)

> "Because it's [weekly tests are] spaced out whereas you know, for your exam you like cram for a few days and the it kind of does get easier, whereas this is like you're gradually doing it over time so like then, yeah, when you're cramming for the exams of this, but it [weekly testing] is just reinforcing it."(Student A)

Because working memory is limited, only a finite amount of information can be processed at any one time; therefore if the cognitive load demands are too high, processing of material, and therefore learning, is hampered (Sweller *et al.*, 2019). Comments expressed by Student D also appear to reflect this concept:

> "I think sometimes you get caught up in what you must know, and then

> what's nice to know. So sometimes it's difficult to, like, memorise tolerance doses or something, if you've got an essay on some other thing, you're not going to necessarily memorise your tolerance doses, because you're writing an essay about something else." (Student D)

Although human cognitive architecture continues to evolve, there is general acceptance that cognitive load consists of: the intrinsic load which is essential for performing the task; the extraneous load (not required for the task); and the germane load (a learner's self-imposed deliberate cognitive strategies) (Young *et al.*, 2014). To aid learning, the cognitive load should be reduced, which could include minimising extraneous load, reducing distractions and using methods of instruction complimentary to germane load, that is, employing tasks that are not overtly complex and are appropriate to the level of study (Gooding *et al.*, 2017; Sweller *et al.*, 2019). Staff I's comment in relation to radiotherapy planning knowledge and skills "we were given a ridiculous amount of information [...] and also it wasn't the key points that were specific to us, like to make it relevant to what we were learning" seems to suggest that the lecturer's chosen teaching method placed high cognitive load demands on the student. Interestingly, other participants commented that they found acquiring skills, knowledge and understanding of radiotherapy planning difficult:

> "In our second year I really struggled with the planning module because we were only given I think a week, two hours a week, I think, like teaching sessions and you only had a little bit of time in the actual planning thing and you were given an assessment which I really struggled with ... when I actually learnt what planning was about and I actually really enjoyed it, ... But when I was in uni I really really struggled with it" (Staff C)

Staff C's comment highlights the struggles and discomfort felt with developing planning skills, yet, it also suggests an action or series of events which have led to the modification of some inner knowledge and understanding, thereby allowing the student to pass through the dissonance phase, as evidenced by the comment "when I actually learnt what planning was about [...] I actually enjoyed it". This seems to suggest that further development has occurred post-University education and the participant now feels comfortable with the subject material and their planning skills. It could be that the time attributed to the development of planning skills during an undergraduate programme is insufficient so a student fails to achieve competence. This may be because planning skills require greater clinical decision-making skills as noted below:

> "I sat with a planning radiographer who's, they do a 50/50 role so they have a really good knowledge of radiotherapy but then they go into planning half their time so six months since, and we sat through, um, and we had dummy patients on that and she just said, and she was quite confident in my skills already, so I think she was a bit freer with me, but she was like, "Okay, we need to plan this". She left me on my own for like ten minutes, kept coming in to check up every now and then and it was nice to see her, and she just get me to produce like clinically acceptable plans and she would like critique it and she would go over everything and then she would give me another [treatment to plan] where I'm trying to miss all the bits [surrounding normal tissue] but it's [the tumour] right next to it and you can hit with it and you're like "Oh jeez, I don't even know where to start", but actually when you start thinking about it and trying and having that little free time to play around, you do start to learn." (Student K)

> "[In planning] you'd definitely have to think for yourself, like if you're stuck on, like if you can't get the coverage [or] you can't achieve the dose

> to the PTV, it's very easy to call the radiographer or the planner to say oh sorry, can you help me again, you have to really think and take your time with it, so I think that was a positive learning experience because I said okay, let me just think for a minute what I can do, have I tried this, have I tried that, but I think overall the actual placement was good. Just the length of the placement wasn't good, we only spent two weeks there, in the second and third year, so that wasn't a lot of time to cover everything." (Staff J)

As noted above, time was a perceived issue; indeed time limitations due to staff availability, time limitations as a result of placement rotations and time limitations due to academic modular structure were all noted as challenges by participants:

> "I feel that the planning module was so short compared to some other modules which were un... I know it sounds harsh but like unnecessary at the time, like even I don't know why I even spent so much time on this whereas that could have been in one session, so more time on things like, you know, the harder bits, the bits that people do struggle with and getting your head around that." (Staff C)

> "Just the length of the [planning] placement wasn't good, we only spent two weeks there, in the second and third year, so that wasn't a lot of time to cover everything, you know." (Staff J)

> "I've improved in my anatomy knowledge the most there than I have being on treatment, because there's not much time to think, you know, even though you are thinking about on treatment, there's not much time to ask questions, and if you do ask a question, you're not going to get a very detailed response, because everyone's running around trying to treat the patient." (Student D)

Table 4.1.: An example of a student placement rotation comprising twelve clinical weeks and six students

Student	Week 1	Week2	Week3	Week4	Week5	Week6
A	LA1	LA1	LA2	LA2	LA3	LA3
B	LA2	LA2	LA3	LA3	PL	PL
C	LA3	LA3	PL	PL	LA4	LA4
D	PL	PL	LA4	LA4	CT sim	CT sim
E	LA4	LA4	CT sim	CT sim	LA1	LA1
F	CT sim	CT sim	LA1	LA1	LA2	LA2
Student	**Week12**	**Week13**	**Week14**	**Week15**	**Week16**	**Week17**
A	PL	PL	LA4	LA4	CT sim	CT sim
B	LA4	LA4	CT sim	CT sim	LA1	LA1
C	CT sim	CT sim	LA1	LA1	LA2	LA2
D	LA1	LA1	LA2	LA2	LA3	LA3
E	LA2	LA2	LA3	LA3	PL	PL
F	LA3	LA3	PL	PL	LA4	LA4

> “I think it just depends, at the time we were quite lucky. I don’t think they do it anymore because they’re really busy now. . . ” (Student B)

> “And it was quite busy there, so even though my mentor, she did come over and look through the plans that we did, but again that was one of the issues that we weren’t given enough [attention]. . . ” (Student K)

> “It’s not something that they can help, cos they’ve got their own work.” (Student L)

Students typically have less number of weeks within treatment planning rotations as, although a radiotherapy department houses multiple Linacs to deliver treatment (the number is dependant on how big the department is), there is usually just one area in which the treatment planning equipment is housed. This means that a student’s time spent in treatment planning over a year of study is reduced compared to time spent on a treatment unit as shown by Table 4.1, indicating a typical distribution on Linacs (LA) (eight weeks), in radiotherapy planning (PL) (two weeks) and in pre-treatment (CT sim) (two weeks).

Meyer (2010) describe the idea of a threshold concept as analogous to stepping through a portal after which previously unknown perspectives and knowledge are revealed. As the threshold concept precedes the 'light-bulb' moment, it tends to be associated with negative feelings such as confusion, unfamiliarity and uncertainty (Meyer, 2010), as appears to be the case in this study. It could be that learning activities in undergraduate education may lead some students to the point of the threshold concept, with some appreciation of planning knowledge and skills, but, lack of time dedicated to radiotherapy planning may inhibit full comprehension and thus affect learning in this area.

Another aspect to consider is Eraut's theories of workplace learning (Eraut, 2000; 2004; 2007): perhaps knowledge and application of planning skills is tacit rather than codified as planning tends to be taught and manned by planning experts. Referencing the Novice to Expert theories of Dreyfus and Dreyfus (1980) and Benner (1984), a novice learner may find it difficult to understand concepts of planning as their experience and in-depth knowledge is limited and rule-bound, whereas, experts from whom a student is learning, make intuitive decisions based on experience and in-depth knowledge (Table 2.8 on page 43). This is explored further in section 4.2.3.

The fifth concept of Chickering and Gamson's (1987) principles of teaching acknowledges that the time spent on the task and topic should be related to the learning required. This study has shown that some participants have inferred that University-based education of planning knowledge and skills has left them in a state of liminality, that is, in a confused and under-confident state where knowledge and understanding are yet to occur. Student A reports on how other distractions, in this instance a lack of staff, can also detract from time required for learning, however, they also note how there may be some unexpected benefits to undesirable circumstances:

"Yeah, they just don't have, I don't think they have the staffing really at

> the moment, and I mean there was only two people on the one machine and I was on with them for the whole day, so like it was really nice I guess because they were like "you were a proper member of the team", and they gave me loads of responsibility and like that, I really built up my confidence, but yeah, I guess but kind of then obviously the other side of it where you don't get taught as much, you just have to learn as you go because there's not someone around to do these extra activities with you, but no, it does sound really cool ... because that's one of the things I'm really nervous about for the exam is imaging, I feel like I don't have, I'm not competent in that area, like I know when to do imaging and why we do it but I just don't know how to do it." (Student A)

Student A's quotation depicts the double-edged sword of being part of a small team as a result of staff shortages: on the one hand, the sense of belonging and team-working is enhanced; on the other hand, opportunity for instructional teaching seems reduced. Principle one of Chickering and Gamson's (1987) theory relates to encouraging contact between students and those with responsibility for curricula delivery, the consequence of which impacts on a student's sense of belonging. The above example has afforded a positive learning opportunity for further socialisation into the radiotherapy team. The learning here can be attributed to the process of becoming an integral member of the community, a theory purported by Lave and Wenger (1991), and adopting a shared identity and culture, as noted in the theories of workplace learning (Eraut, 2000; 2004; 2007). Yet, the student reports concerns that knowledge and skills related to imaging have not been developed and it appears that they were due to have an assessment in this area. As noted in chapter two, assessment is a driver for learning; it can influence "the way a student learns, the motivation a student has for learning and the content of what is learnt" (Brown and Doshi, 2006, p.

81). This concept, described in assessment theory, appears appropriate to this example, as, although the student recognises the advantages of their situation, reflected by the use of positive language "really nice", "proper member of the team"and "built up my confidence", nevertheless, the feelings of benefit are tempered with concerns for assessment and a lost opportunity of learning from a knowledgeable practitioner, evidenced by "there's not someone around to do these extra activities with you". Indeed, as noted by another participant:

> "The more time people spend with you, the better, you know, you're going to become." (Student D)

This concept infers another theme that was revealed by this study: relationships in learning.

4.2. Relationships in learning

This section presents and discusses participants' comments in relation to the relationships that learners form with other people and the effects they have on an individual's empowered learning. It seeks to explain why interactions impact on the learning experience and uses individual and social learning theories to reveal how this occurs. Where evident, emotions associated with different types of interactions are presented.

In this study there were four key groups with whom a student developed relationships:

- peers;
- patients;
- placement-based staff within the radiotherapy department;
- academic staff.

Though there are some features of relationships which are common to all interactions, particularly around the concepts of motivation and enhanced learning, nevertheless, each relationship is nuanced, bringing with it some slight variation in the learning afforded. Hence, this section has been structured according to the different groups with which a learner interacts.

4.2.1. Peers

As discussed previously, there is opportunity for cohorts of radiotherapy students to learn from peers because of smaller cohort sizes, simulation facilities utilised in academia and the overlap of placement rotations in practice placements. This can not only facilitate peer learning, but also encourage role-modelling as indicated by a participant's comments below:

> "At the last placement I was sharing a machine with a student who was, like, really good at communication, so I was, like, watching how he spoke, and how he spoke to patients, and that helped, and my communication's got better... and, so, because they were on the machine for two weeks and I was on it for three, so in my last week, I sort of, started doing what they were doing, and yes, got better." (Student G)

McPake (2019) suggests that in the radiotherapy setting, pairs of students collaborate but not necessarily with individual patients because of the complexities and supervision requirements employed with ionising radiation. However, Student G's comments suggests there are benefits to peer learning with individual patients, including learning from peers what is needed to be known. The use of human resources as an aid to learning are concepts expressed by Eraut (2011) in his typology of workplace learning trajectories (Table 2.9 on page 49). Learning processes that utilise human resources include shadowing and working alongside others which facilitate learning activities such as observing and listening (Eraut, 2011). Observing examples of communication and behavioural interactions is useful not only in terms of what should be achieved, but also how this can be attained; thus there is visual, in addition to verbal or written, description of objectives, embodied through social interactions which appear to empower learning of interpersonal skills.

Student G also appears to have used elements of reflective practice (both in action and on action) as described by Schön (1983) which includes self-assessment and analysis of needs: Student G recognises that their communication needs improvement; they have targeted a resource which can help them develop; they have observed how this can be altered; they have implemented change and noted improvement. These actions also reflect elements of adult learning theory (Knowles, 1980): self-regulation, internal motivation, willingness and orientation to learn.

Student G's scenario takes place in the practice environment, thus social and situated theories of learning are in play, including the communities of practice as described by Lave and Wenger (1991) and the social constructivism ideas of Vygotsky (1962), both theories noting that learning is a social process and contextually situated. Student G is observing and participating in radiotherapy procedures and is able to observe and listen to a peer in the workplace setting. Thus, not only are they learning from the cognition and decision-making skills of the peer within a profession-specific situation, but also they are experiencing this within the particular culture and physical environment of that radiotherapy placement. Unique social and cultural influences exist within each workplace (Eraut and Hirsh, 2007); observing and interacting with others more embedded within the culture, gives the student an idea of how to perform within the specific setting. It is not possible to simulate this within the academic environment where, although there may be skill development and knowledge transfer occurring between a lecturer and student or between peers, the environment is divorced from the socially and culturally-constructed placement setting (Durning and Artino, 2011).

Fergy *et al.* (2011) purport that peer support encourages integration within a cohort and influences progression on a programme; thus peer learning may provide wider benefits such as improved student retention. Participants' responses echo some of the wider learning benefits:

> "We had, like, a buddy system in our placement... so when I first went into first year, there was, I think there was three third years and three second years, so we actually, like, there was two first years to a third year and second year, and like, when you work your way up, you sort of realise that you've got a bit more responsibility as you go through the years, and it sort of, like, eases you into, like, going towards mentoring, as well, because you're going to have to do that when you're qualified, anyway, so I think that's quite handy." (Student F)

> "I used to be told by a mentor like, "right, we've got 1st year on the unit, you're in charge of the 1st year", so they'd like allow us both to go in the room together and then, well it's like a busy department so no one really has time to sit down with the 1st year and explain things, it was nice to like explain them as a student, and I think it might have made them understand a bit more because you know, you were on the same kind of level, yeah, and it was really good for like solidifying your knowledge, getting to teach them." (Student C)

> "I took the 1st years and [...] it was reinforcing your own knowledge." (Student A)

> "It [buddying others] enhances your own knowledge as well because if you don't fully understand something and you teach somebody else (they ask you random questions) it so it really helps and it kind of like highlights gaps in your own knowledge when you're thinking oh I can't teach this

> [all laugh]... yeah, how do I not know this [laughs].. Yeah, it's really useful, yeah, it works both ways having the students." (Staff F)
>
> "And it [teaching others] was good fun too!" (Student B)
>
> "You have to really understand it don't you, so you kind of realise then if there's gaps in your knowledge when you're actually trying to simplify something." (Student A)
>
> "Or they ask questions and you're like, "ohhh, I don't know, I'll come back to that!" (Student B)
>
> "It's kind of like they'll ask questions that you haven't thought of yourself as radiographers might asked of you and then [...], it makes you more critical of your own work [...] I do think teaching makes a difference." (Student A)

There appears to be real satisfaction in working with and teaching others as evidenced by the phrases "it was nice to explain" and "I do think teaching makes a difference" and "it was good fun". This can be explained by the reciprocal aspects of peer-assisted learning theory which notes that students taking on the dual role of teacher and learner are required to be able to describe and explain in clear language a concept at a level appropriate to their peer; this can only be achieved satisfactorily when a student has a good understanding of the concept (Donohoe *et al.*, 2015). In a study by Benware and Deci (1984), students, who had been randomly selected to teach a topic to peers, subsequently demonstrated better conceptual understanding in test results. It was believed that better performance was achieved because of the necessity to have a greater appreciation and deeper knowledge and understanding of the topic area (Benware and Deci, 1984). By extension, the disadvantage of peer learning may be that those students less cognisant with key concepts may be unable to provide effective teaching for fellow students, potentially leading to imbalance, issues and dissatisfaction in buddying partnerships.

Peer teaching is an established form of learning in medical education (Lockspeiser *et al.*, 2006; Ramani and Leinster, 2008) and it not only induces improvement in cognitive skills of the 'teacher', but also can enhance self-efficacy. This was intimated by participants in this study:

> "Getting involved with the first years at placement. That, sort of, helps you realise what you know. I mean, teaching somebody else. It's weird. You feel like you don't know much, and then you have to actually relay all the information that's, yes, it's fun… it helps them and us, as well." (Student E)

> "You can be like "This is how we match a breast, so this is what you click here and this what you click here" and again it goes back to that confidence thing of "Actually I do know this" and so yeah, not necessarily teaching but just again, yeah, showcasing that you do actually know it and I do like those moments where you're able to kind of go "You need to pick that up"." (Student K)

Student E's and Student K's comments suggest that peer teaching deploys self-assessed feedback systems; indeed, teaching can be that active purposeful event which, as noted by Eraut (2000; 2004; 2007), can lead to recognition and appreciation of learning within self. As highlighted by Student K, once it is realised that concepts are known and understood, confidence is boosted and positive feelings are engendered; these are known benefits that arise from peer teaching and learning (Boud *et al.*, 2001; Lockspeiser *et al.*, 2006).

Although there may be concerns about 'gaps' in knowledge and understanding, as noted by Student A and Staff F, because peers share a similar knowledge-base, social roles and cognitive congruence (Lockspeiser *et al.*, 2006), effective learning may be achieved more easily with peers, rather than during interactions with experienced practitioners. This may be because peers are in a similar position on the novice to expert continuum (Benner, 1984); thus, not only may they be able to explain a range of concepts in a way which is more easily understandable and appropriate to their level of study, but also knowledge may be more easily recognised within self, engendering positive feelings of achievement and confidence. Such attributes appear to denote a powerful learning tool; indeed, this was commented on by one participant who, although they were not offered a buddy when starting placement, recognised the benefits it gave and decided to take matters into their own hands:

> "I mean I didn't have that [buddying] when I started and I really would have liked that and I made sure that the next years had that and I was around and could show people where the accommodation was and where the department is and just basically finding your way around the first time, just showing there's someone there if you need to speak to somebody or just go and... even simple stuff like, you know, what else do I need in my uniform, maybe extra pens or stuff like that, and just like dumb questions you think of the night before and you're thinking have I prepared, so definitely having a buddying system with some of the other year groups definitely." (Staff F)

This comment elucidates the emotions that can occur with new undertakings and situations: confusion; feeling insecure; and being daunted by entering an environment with which you are unfamiliar (Helmich *et al.*, 2012). Entering placement or participating in a radiotherapy procedure for the first time can result in feeling vulnerable and anxious (Tamachi *et al.*, 2018); this is mirrored in participants' comments below:

> "When I first started the [NAME REMOVED] it was just like I don't

> know how to talk to these patients, what do you say to them because when you say to them, how are you, most of them say I'm not well, well you can't say, oh don't worry, so at first I was even afraid to speak to them." (Staff D)
>
> "When I first qualified I wasn't [...] as authoritative, only because I wasn't quite familiar with how it worked." (Staff J)
>
> "We didn't do any image matching at all, and which is quite scary when you go, when you start and they expect you, I don't know what they actually expect which is also a bit of a thing as well. But yeah, so you're like matching but you're not actually quite sure what you're matching to." (Staff I)
>
> "It's when they look at you and you're thinking, "oh, is this right?", and they go, "what do you think?", and you're like... I hope so, oh God I hope so! You're trying to read their face thinking what answer are you looking for?" (Student C)
>
> "I feel like, I don't think there's a blame culture but I feel like there is like a thing that like you'll be in big trouble sort of thing if you don't check." (Staff I)
>
> "When you've to do it on a patient for the first time and you're like, "I'm trying to do this as quickly as I can but you know ...." (Student B)

It is not until learners have gone through the event, that they can make meaning of the experience and then be able to assist and support others (Helmich *et al.*, 2012; Tamachi *et al.*, 2018). Staff F's comments "I made sure that the next years [...] I was around" portrays a camaraderie engendering support, as do Student K's and Student L's comments below inferring approachability and how social identity is reinforced by wearing uniforms:

> "It's very easy for them to come up to you though isn't it? When they see oh third year, green uniform, let's ask them because I don't want to sound silly in front of. . . " (Student L)

> "Oh definitely, being [in] the same colour as them makes us more approachable." (Student K)

Findings show that participants particularly valued peer relationships in the clinical setting, not only because they assist in the development of professional identity, but also they afford support in situations being experienced for the first time where feelings of anxiety and vulnerability exist. A number of factors influence peer to peer relationships, yet, the overriding message appears to be that opportunities which facilitate connections between peers are to be recommended and should be implemented in curricula delivery to supplement traditional methods of teaching and learning.

4.2.2. Patients

Learner relationships with patients occur within the clinical environment, thus much of the explanation as to how learning occurs is derived from theories of situated learning (Lave and Wenger, 1991), social constructivism (Vygotsky, 1978) and constructivist theory which Yardley *et al.* (2012) contend comprise the basis on which experiential learning occurs. Experiential learning was evidenced in the comments by Staff G and Student J:

> "I think, having to be with patients every day it makes you, your communication is just being practised." (Staff G)

> "I think [. . .] communicating [with patients] is really important, and how building that relationship between you and the patient is something that you need to focus on." (Student J)

Communication skills are a key part of professional practice, yet, there is sometimes a mismatch between competence and performance (Heaven *et al.*, 2006). The comments above intimate the applied education and understanding that comes from experience, a concept purported by Dewey (1938), presented in chapter two. Nevertheless, aspects of adult learning theory are also present as the learning is individual to the learner and partly driven by their self-regulation and orientation for learning (Knowles, 1980). Examples of individual situations were cited by participants:

> "I spent about an hour with a patient in a side room and again it wasn't really radiotherapy, she was just upset because her son had gone abroad and she's not heard from him yet and she broke down into tears and it's one of these things that the small, little things all get on top of you but to have that time was lovely and to be able to do something like that, you know, you do feel, you got home and you think "That was a good day almost ... it's the reason you're there really isn't it?" (Student K)

> "I had a patient that only communicated to me that he was having problems with diarrhoea, and I just gave him feedback on what medicine he should take, what lifestyle changes he could make, or what medication he could take, so I felt that was like, a good communication experience." (Student I)

> "I've had a few really good experiences like when I was a student, you know, a lot of patients, I was surprised on how much, you know, chocolates and cards you get as a radiographer, you know . . . and the fact that, you know, you can see patients so kind of appreciate your help, it really makes that difference, ... [you] get to know a patient and talk to a patient apart from the cancer, so like, you know, what do you do apart from when you're, you know, coming here, you know, what are your hobbies, all that kind of stuff, just getting to know a patient, it just means so much to

> them, and you can really see it on their face. I think that really makes my job, like it's really worth it, really rewarding, no matter how hard and stressful it can be, it's really rewarding at the end of the day, so I think that experience itself…" (Staff J)

The quotations above reflect appreciation and subsequent increased feelings of self-worth and reward that come with being able to spend time with patients. In these scenarios patients are external motivating factors triggering the altruistic and caring tendencies within students which, as noted by Epstein and Hundert (2002), are dimensions of professional competence. They also appear to give satisfaction and purpose to learning, evidenced by "it's the reason you're there" (Student K) and "it's really rewarding" (Staff J). Thus, participants' comments suggest that active participation and authentic interaction with patients provide meaning and motivation which give impetus for learning.

Unusual scenarios are likely to embody elements of reflective practice, as highlighted by "you got home and you think" (Student K), which Kolb (1984) contends leads to adaptive learning enabled only through experience. Because the learning is situated within the individual and therefore is influenced by their cognition, capabilities and skills, learning engendered in one student may be different to another (Eraut and Hirsh, 2007). Internalisation aspects of Kolb's (1984) theory can be regarded as a limitation: a student communicating with patients, may not recognise learning or shortcomings in performance without support from a more experienced, competent peer or practitioner (Yardley *et al.*, 2012; McPake, 2019).

Having an understanding of patient experiences in a radiotherapy department was something recognised by participants as important and an aid to learning. Students K and C gave examples of activities undertaken in the radiotherapy department that had facilitated learning more about treatment set up from a patient's point of view:

"… just being on the bed, if somebody gets on the bed and that's okay and then they raise you up and you can bear with that, then they leave the room... and that again makes you realise what it's like to be a patient and it's those little things that actually, they spark interest… " (Student K)

"I've like pretended to be a patient before for like students to learn and stuff, and it might kind of help in your understanding of what patients are going through as well because it's not very comfortable, it wasn't very fun having someone like lean over you" (Student C)

This activity seems to have engendered empathy and brought a realism to learning that can only be gained by participation in an experience (Yardley *et al.*, 2012). Although this only relates to the physical set-up procedure of radiotherapy, omitting the substantial emotional burden that comes with a diagnosis of cancer, nevertheless it appears enlightening for students and gives them insight into the experience.

It is unlikely that each learner will experience exactly the same scenario because, as noted by participant Student B, "not every patient's going to respond the same way." There is therefore a need to adopt a flexible approach as noted by participants:

"Being able to adapt yourself to each patient, so for example, if a patient, either their English isn't that great and you [need to] know what appropriate words to use." (Staff B)

"Having that adaptability to be able to assess, […] the situation you're in, and changing your communication to be able to communicate most effectively as you can with that person." (Student F)

"It's just catering to each individual patient so it's not one way fits all." (Staff A)

"I met a lady who had dementia, […] and even if you asked her how's

> your treatment going she was like, what treatment? [. . .] The people that are the best at it you know, they're more adaptive." (Staff C)

> "Adapting to, like, change, like, you've got different patients, age, if they're older you might need to talk to them a bit different to if they're young, like, some might be hard of hearing, and [have] learning disabilities, [. . .] you've just got to talk to everyone, communicate with everyone differently." (Student G)

Participants indicated that personalising care for individual patients and viewing them holistically was an important part of the therapeutic radiographer's role. They also infer a real-time reaction that not only requires embodiment of knowledge and understanding, but also application and adaptation of skills which Eraut and Hirsh (2007) contend are an important part of workplace learning.

Findings show that relationships between patients and students are significant, explaining how students learn with, from and about patients, who not only provide motivation and job satisfaction, but also encourage empowered learning. Participants' comments suggest that empathy for patients is enhanced when further insight is gained by putting the learner in the patient's position, for example, lying them on a treatment couch. Of note is that individual and socially-constructed concepts converge within each unique patient interaction, facilitating development and application of new knowledge constructs that can only be afforded within the specific culture of the placement environment. Although learners may feel uneasy in their interactions with patients, nevertheless, such encounters develop key aspects of professional competence (Bleakley and Bligh, 2006).

4.2.3. Practice-based staff

Comments from participants indicated that placement staff embraced a number of roles including: expert; supervisor; and mentor; all of which assumed importance to learning. Some roles and titles appeared to be used interchangeably, for example, mentor and supervisor, which could be because there are no formally-recognised, universally-enforced clinical roles within the radiotherapy profession (McPake, 2019). Additionally, participants may have employed terminology according to the systems used in their education and with which they were familiar. Notwithstanding, placement staff assumed many 'hats' according to the situation in which learning occurred. Ramani and Leinster (2008) note that this is typical in clinical education and placement staff are required to have an education 'toolkit' at their disposal which includes nurturing, supporting, shaping learner experiences as well as being experts in their field of professional practice (Blakey *et al.*, 2019).

4.2.3.1. Novice and experts

Some placement staff were considered specialists and experts in their field:

> "In my planning block, we were able to speak to [...] physicists [...] who also like plan IMRT treatment and are teaching some things and know things that we hadn't touched upon at university [...] so I think that helped me gain more knowledge of IMRT kind of aspect of planning as well and understanding that technique more." (Staff D)

> "I sat with a planning radiographer who's, they do a 50/50 role so they have a really good knowledge of radiotherapy." (Student K)

Although simulation of planning in HEIs encourages knowledge of planning principles, the more people with expert planning knowledge to whom a learner can talk, the more likely they are to not only connect with some-one to whom they can relate, but also acknowledge gaps in learning (Taylor and Hamdy, 2013). These concepts reflect the Johari Window (Figure 2.3 on page 40) where students may be 'blinded' to knowledge; exposing them to a range of 'experts' increases the likelihood of students discovering their 'unknowns'. Some elements of adult learning theory are also in play here: self-regulation and the motivation and orientation for learning (Knowles, 1980) which enable a student to appreciate their own learning needs.

Experts in radiotherapy planning and pre-treatment were also seen to supervise, teach and support students, thus displaying the many 'hats' worn by placement staff, as intimated by participants' comments below:

> "We were quite lucky in our department because even though it's quite busy in CT there's often quite a lot of staff around so there was a lot of opportunities where we could get taken aside and gone through like a plan, like a V-SIM plan and how to do it, like slowly, and then go and do one on our own and then come and get checked, so that was quite good, and just to go through like the anatomy and that, so again like the one-to-one like tuition from radiographers is really useful." (Student C)

> "So things like tattooing, ... getting that procedure correct, like, in my mind, and knowing how to do it properly, they [radiographers] can spend a lot more time with you and perhaps, like, show you the needle, show you the ink and show you what to do, and how you can do it better, so yes, I think it's just about having more time for you in that, kind of, way." (Student D)

Participants' comments suggest that when staff are available they not only invest time in supervising students to aid them in developing knowledge and skills of discrete radiotherapy procedures, but also create time in which learning can occur, as evidenced by "how to do it [...] slowly" (Student C) and "it's just about having more time" (Student D). These comments imply characteristics of a novice; someone who breaks down tasks into component parts (Benner, 1984). Eraut (2011) recognises in his typology of workplace learning trajectories (Table 2.9 on page 49), that speed and fluency are ways in which performance may be described, yet, exposure to the experience is required to enable development of proficiency. As this is afforded within the community of practice, then not only will knowledge and skills of specific tasks be developed, but also there will be progressive legitimate peripheral participation within the placement site (Lave and Wenger, 1991); thus through social learning opportunities and relationships formed between students and experts, students may begin to feel accepted in the workplace as well as develop key skills.

Participants' comments suggested an expert hierarchy amongst practitioners as evidenced below:

> "New Band 5s who are learning themselves, [. . .] they're quite happy to take you aside and be, like, "This is what I'm trying to do," and this and that, so you're sort of learning with them, so they're telling you the basics of what they know, and then they get told it more by the senior members of staff, so you're, sort of, learning as you go along." (Student F)

'Junior' staff were perceived to empower learning of 'basics' which could be because of the cognitive and social congruence between staff who are recently qualified and students (Lockspeiser *et al.*, 2006). This could also be explained by Novice to Expert theories of Benner (1984) and Dreyfus and Dreyfus (1980) in which the 'novice' (as would be the case of learners) and 'competent' (which could apply to Band 5 radiographers) behave according to a set of specific rules that are easily identifiable; therefore tasks may be more easily explained and transmitted between learners and junior practitioners. In contrast, those of a higher grade or age were perceived as 'experts' in the field, having a wealth of knowledge and using their experience to make judgements and decisions:

> "You sort of look at the older radiographers and you're like "they know like everything." (Staff I)

> "It's always a learning curve for you when you start and I think it's better you work with a senior member of staff rather than just two Band 5s together [as they display professional judgement]." (Staff D)

However, an expert practitioner may not translate readily into being an expert mentor or teacher as noted by Student F:

> "I know it's more of the older, like, older members of staff, more superior staff, that are sometimes less, like, understanding. The newly qualified people are usually the ones that are always really good with it. So it might just be a fact that maybe even, like, the senior staff, sometimes, need a bit more mentor training, or to do, like, a refresher or something, just to, like, make sure thy understand that students don't always get it right, and they just need to take it easy on them a bit." (Student F)

Staff I and Student F both make reference to 'older' radiographers, with Student F suggesting that they are 'less understanding'. This could be because younger practitioners are likely to have qualified more recently, thus they may have a better grasp of undergraduate curricula and its delivery (Taylor and Hamdy, 2013). Additionally, younger staff may be able to identify more with learners who may be of a similar age and have greater insight into the needs and learning requirements of a student (Bernstein, 2000; Meyer, 2010).

The inference of 'expert' could highlight that the practitioner possesses an abundance of tacit knowledge and an intuitive grasp of situations (Dreyfus and Dreyfus, 1980; Benner, 1984; Eraut, 2007). Practitioners at Band 6 and above may be considered 'experts' because they are immersed in and managing radiotherapy practices or perhaps they are working as advanced practitioners in a specific field such as palliative radiotherapy. For a student to appreciate learning from an expert it may be necessary to break down the tacit knowledge by asking questions that focus on thinking processes, such as, “how did you decide that?” By drawing the expert’s attention to tacit knowledge which is instinctively used to inform their practice, there may be some realisation that what may appear obvious and simple to the expert, may need explaining to the learner. Despite the potential differential cognition between an expert and student, the expert may be able to identify the core of the specialist practice which may not be easily identifiable by those with less experience. Thus learners should be encouraged to work alongside experts, which not only reflects the first principle of good teaching practice suggested by Chickering and Gamson (1987), but also is a work process which has learning as a by-product as espoused by Eraut and Hirsh (2007).

4.2.3.2. Mentors and supervisors

The terms mentor and supervisor were used interchangeably. Kilminster *et al.* (2007, p.2) define supervision as “the provision of guidance and feedback on matters of personal, professional and educational development in the context of a trainee’s experience of providing safe and appropriate patient care”. The Society and College of Radiographers (2009) suggest that a mentor is an experienced practitioner with clinical expertise who is able to advise a mentee on their professional performance and development, offering psychological and psychosocial support. As can be seen, the two definitions overlap which could account for some of the uncertainty and interchangeability of the terms. Notwithstanding, participants’ comments indicate that both roles provided support and guidance for students:

> “Having someone that kind of has that enthusiasm and can mentor someone

> really well, I think it is really good and really beneficial to have that one person because that's what I had all that year but it was only that I could always go to about anything, no matter what and alright, my answer (sic) might not be answered straightaway but it would be eventually. . . " (Student K)

> "We do things where like your mentor will sit down with you for like an hour or so and will bring up loads of offline images and then be like, "right, match that", and then check if you're right, so you just sit there for an hour and match those images and like mark down how many you get right and any you don't understand then ask why, ... and like they'll come and ask you like, "how could you make this better, what would the patient need to do?" (Student C)

Learning appears empowered through the positive relationship the student has with their mentor; they appear willing to ask questions when they do not understand something which implies trust and confidence in the relationship. Being non-judgmental and trustworthy, and having enthusiasm and an awareness of a learner's needs are key characteristics of mentors who enable empowered student learning (Kilminster *et al.*, 2007; Perram *et al.*, 2016). Whilst helpful attitudes and supportive supervision are conducive to student learning, Student D and Student L noted:

> "I think you are, kind of, at the disposal of your mentor, in that respect, whether they involve you or they don't involve you." (Student D)

> "It will only really work with a mentor that you trust though." (Student L)

These comments intimate that effective mentoring and supervision cannot be assumed and there was a suggestion that younger mentors were more approachable and more effective:

> "With my mentors, they've all probably been a little bit younger, just because the overlap there is a little bit easier, so they can understand what it was like to be 18 on the course, coming out of A-levels. They know what the difficulties could be." (Student D)

> "One of my mentors was a newly qualified radiographer, so she knew that you don't really go over imaging matching at uni, so we went through some offline images where she matched them and I had a go at trying to match them back." (Student G)

Comments suggest that younger mentors appeared to have more empathy with students; a characteristic which permits the practitioner to recognise and correctly interpret learner behaviour and is more likely to promote good relationships and opportunity for effective learning (Hativa, 2000). Student G's comment also infers greater appreciation of programme curriculum and its delivery; knowing this engenders identity with the learner, who is able to seek and gain reassurance from the practitioner (Kilminster *et al.*, 2007). Such a positive relationship provides a basis on which confidence in learners can be enhanced and this in turn empowers learning and learner decision-making (White *et al.*, 2014). Confidence gained from mentors was highlighted in this study:

> "Sometimes they just need to give you the confidence to go and do something. They just need to say, "You can do this, I've seen you do it before, go and do it," rather than tell you how to do it again. So sometimes it is just about giving someone confidence rather than giving someone information. That's what I think my mentor did well for me." (Student D)

As the competence and capability of learners is unique to the individual, so is the ability of mentors and supervisors. Indeed, the SCoR, (2009, p.6) states "not everyone has the necessary skills to be a mentor, and the best mentor may not be the best teacher." This point was picked up by Staff E and Student D:

> "I think having different mentors as well throughout, like your student years 'cos one mentor will say something to you and another one will say something else so they can pick out little things about you that you can improve on, and then you build relationships with them as well and you're getting along with them. I think that helps having different people, like yeah, different placement forums and all of that, just so you can get a fresh kind of feedback with what you're doing from different points of view." (Staff E)

> "...... sometimes if you're outside a room, some staff members will see you and say, "Come and I'll show you how to match an image," or show you, or, if you're switching on will let you get involved in that." (Student D)

Findings from this study have revealed the multi-faceted relationships between practitioners and students, discussing how social and situated learning and the attitudes, experience, commitment and behaviours of staff impact on the learning experience. Having time to work with experts and regular direct working with supportive clinical supervisors and mentors is generally seen to be conducive to learning, allowing knowledge and skills development as well as providing orientation to and acceptance into the placement site. Effective relationships encompass practice staff observing and commenting on students' performance; being approachable and showing empathy; taking an interest in the learner; creating a positive learning environment; and providing teaching, information and support. These align to the ideal practice educator espoused by Perram *et al.* (2016) (Figure 2.6 on page 61). Ineffective relationships with staff appeared to be associated with a lack of time due to competing demands and professional responsibilities; a lack of enthusiasm and empathy; and limited understanding of curricula delivery, which participants intimated was associated with older and more senior practitioners. Overall, participants' responses suggest that partnerships with practice-based staff are key to a student's development of the learning required to become a therapeutic radiographer; they also confirm that effective and positive relationships result in empowered learning, yet, absence of these, results in disempowerment.

4.2.4. Academic staff

Participants' comments suggested that the presence of academic staff in placement appeared enabling and supportive:

> "It was quite nice to have someone different, someone who hadn't seen how you worked, doesn't know what the department protocols are because then it was just, because they spent a lot of time with me just before my assessment and then just ripped everything to shreds and was just like, "so don't do this", but they were, it wasn't a case of like you're doing it wrong, it was a case of why are you doing it, have you thought of better ways of doing it, because then it's quite nice to be like "oh, actually I've never really thought about why we do it that way, it's just that's how [PLACEMENT SITE NAME REMOVED] does it so that's how I've done it, so it's really nice to have someone who doesn't know anything about that environment to then come in and question because then it makes you question your practice and then it's quite a nice way to move on for your CPD because then it was quite a nice thing to reflect on." (Student B)

> "I had a very good personal tutor....... [....] if I didn't understand something they would, they'd like spend time with you to sort it out which

> was quite good. And like also they visit you when you're on placement. We [. . .] had two personal tutors, they'd come out once a week to see us and they'd sit with us until whatever and they'd go through everything that we needed to do for like all our assignments and whatever, like any worries we had about placement and sort of just get you on track." (Staff I)

> "When you used to have (NAME REMOVED) [visit] I think that was quite good because you get feedback whereas [on placement] you see the staff every day, [. . .] they fill out your forms but they don't really give you feedback you can use . . . . [. . .] when you had staff from uni coming out, it would be like, oh you need to work on this, this and this, this is going well, like it was something you would have got it and you know what you're working towards where because you're on a placement for example, you have a clinical block, they [practitioners] see you every day and it becomes like, it becomes blasé, [. . .] they just fill out the form, you move onto the next one and it's just a routine and it's not... I don't feel like there's anything you could pick up on so when you have them just coming in for mocks or like assessment it's not enough, we need more, give more goals and more focus." (Staff B)

Empowerment appears to come from the objective stance afforded by the tutor as well as the ability to engage learners with critical reflection. Chickering and Gamson's (1987) seven principles of good practice purport that contact between learners and academia should be maintained both within and external to academia as this increases student motivation and provides support. Being external to the community of practice enabled the tutor to be impartial and challenge departmental processes and procedures in order to encourage abstract conceptualisation and deeper understanding through engaging students with reflective and analytical processes. McPake (2019) recommends regular group debriefing sessions so students are able to learn from each others' experiences in placement; participants' comments suggest that reflection is enabled, but there is no evidence from the data collected to suggest this was performed in a group setting. Indeed, Staff B speaks of being given feedback on particular aspects of performance, suggesting individualised and personalised feedback. They also indicate this is insufficient and benefit would be given by being provided with more focus and outcomes. It could be that this participant struggled with self-regulation or undertook placement in a busy radiotherapy department where time was an issue or supervision was ineffective, as intimated by "they [staff] fill out your forms but they don't really give you feedback you can use"; indeed it could be that practice staff were not particularly gifted in providing feedback which Kilminster *et al.* (2007) suggest can be one reason for ineffective supervision. However, Staff C offers another insight that could aid explanation:

> "Now that we're working you understand that and you understand a bit more, you know, [qualified staff] weren't being mean it's just that they are just genuinely busy." (Staff C)

It appears that an academic's presence within the department engenders further student learning. This is achieved by them asking questions about radiotherapeutic practices inherent within the particular culture and placement learning environment, of which the tutor is not an accepted member. The independence of thought and observations of the tutor are an external motivator for students and appears to encourage reflective processes which Schön (1983) contends enables active learning. Whilst the tutor may be fully cognisant and understanding of the reasons behind the processes, nevertheless, applying the novice to expert theory of Benner (1984) and workplace theories of Eraut and Hirsh (2007), occasional attendance could be seen to preclude progression to expert where intuitive grasp and embedded tacit knowledge generates an unconscious response to the given situation. As the tutor remains distant to the community of practice, they are able to convey an analytic ability, recognising the nature of the clinical situation. Furthermore, they are able to present information to the learner in terms that are understandable and have meaning for them, conveying information compatible with the stage of learning; this is something explored in the next section.

4.3. The learner journey

4.3.1. Introduction

Analysis of data revealed that development of skills, knowledge and behaviours related to therapeutic radiography involved a journey, influenced not only by the learner at an individual level, but also by the range and variety of experiences to which they were exposed. Whilst there exists a diversity in aptitude for learning between students, affected by personal attributes, previous knowledge, understanding and experience (Eraut and Hirsh, 2007; Houser and Frymier, 2009), nevertheless, entering into a healthcare arena which has its own unique professional identity can cause disorientation within students due to an underdeveloped professional state of mind (Crossley, 2014). To acquire the professional skills necessary for competent practice, data gathered from participants suggests that the student undertakes a personal learning journey, noting that distinct activities are associated with different stages of learning. This section begins with being a novice in the radiotherapy department and progresses through to competence, analysing the influences on learning within the contexts of learning principles and theories.

4.3.2. The ‘novice’ learner

Young and Muller (2014) note that where the culture, knowledge and skills associated with the professional domain are new to a learner, exposure to the defining features and activities specific to the profession is key, not only because this permits application of theoretical learning to a practical context, but also because it exposes the learner to the culture and characteristics specific to the profession. Although the novice may possess elements of some of the required skills, for example communication, the skill has yet to be developed within the professional domain and participants’ comments suggested that this was a very different context and could be intimidating:

> “From the beginning of the first year, [....] it was just like I don’t know how to talk to these patients, what do you say to them because when you say to them, how are you, most of them say I’m not well, well you can’t say, oh don’t worry, so at first I was even afraid to speak to them.” (Staff C)

> “It sounds silly now, but to go out and actually ask the patient to come in and sit down you know, get the patient from the waiting area, that was so scary when they first asked me... ” (Student A)

> “Because I think when you first go out, like, on placement in first year, it’s like, you feel a bit uncomfortable .....” (Student J)

> “I was just trying to pick it up as I went along and obviously just asking questions but also quite nervously sort of staying back.” (Student K)

Comments show that novice learners can suffer a lack of confidence and connectivity during their first interactions with a patient which is unsurprising as much of professional identity development and ways of working are learnt through social-cultural processes that only exist within specific situational learning, as described by the theories of communities of practice (Lave and Wenger, 1991) and social constructivism (Vygotsky, 1978). New situations provoke strong emotional reactions as reflected by the words 'uncomfortable', 'afraid', 'scary' and 'silly'. 'Silly', used by Student A, could reflect an opinion that communication is an innate skill so they presume that learners should display this. However, a student new to the professional environment and culture requires time to develop such capabilities using formal and informal learning situated in the workplace (Eraut and Hirsh, 2007). Student A is approaching the concept from the position of an experienced final-year student and they appear puzzled as to why such emotions were evoked. This can be explained by Eraut's (2007) theory which acknowledges that learning practices within the workplace are often acquired informally, causing people to be unaware of the influences that shape performance. Thus, appreciation of communication skills development becomes lost within the tacit knowledge of the final year student; they have gained an inherent behavioural response through their experiences in the workplace. However, participants suggested that professional communication did not come easily and was a skill that needed to be learnt and practised during undergraduate programmes:

> "I couldn't do any (first day chats) in the first year because I was too nervous..... it [first day chat competency assessment] was really nerve-racking because you've got, not only the patient but also the radiographer as well but, you know, the sooner you do it the better." (Staff J)

> "I didn't always feel ready but I just did it anyway, the chats, because you know, it felt like you'd a safety blanket as well because the radiographer was with you and if you did say anything stupid or, God forbid, you did say anything wrong, they would step in." (Student A)

> "My communication's, like, always needed improving." (Student G)

> "If you know what you're talking about it just makes you feel good within

> yourself that you don't feel humiliated." (Staff C)

Participants' opinions reflect the anxieties, insecurity and lack of confidence when a person feels uncomfortable in the learning environment. However, Student A and Staff J display self-regulation and an orientation to learn (facets of adult learning theory (Knowles, 1980)); thus they recognise that it is necessary to overcome caution to develop skills; a fact which may become lost with experience. Because experienced practitioners may fail to recall those novice feelings of stress, it may be good practice to define explicit learning objectives that facilitate learner acknowledgement of the newness of the situation and encourage reflection so novice learners can make meaning of their experiences and emotions and, through sharing their thoughts (and fears) with others, may feel supported through emotionally-demanding processes. This strategy concurs with the notion of guided reflection opportunities to enhance placement learning as suggested by McPake (2019).

Staff C's comment highlights the rewards and empowerment that come when a skill is learnt. It also emphasises the self-awareness that a learner develops through reflection, a key part of professional development (Epstein and Hundert, 2002), and suggests that development of communication skills continues over the learner journey. Interestingly, participants noted that communication did not necessarily become easier as the learner journey progressed; new pressures, both external through assessment and internal related to expectations of self, arose:

> "At the beginning of the third year you feel that you need to step up. It's like you're in at the deep end, you need to [. . . .] be professional now. Stop being like a first year" (Student E)

> "First day chats, it takes a little while to get into a rhythm of what information you're delivering, and the way in which you deliver it. So I definitely know that when I get back out to placements, the first two

> or three first day chats are going to be a little bit mechanical in how I give them, purely because I've not been recalling that information on a day-to-day basis for, like, nine weeks now, something like that. So yes, it's not going to come off the tip of my tongue, but then after two or three weeks of placement, hopefully that'll be much more [fluent]." (Student D)

These perceptions bear out aspects of Eraut's (2007; 2009) learning theories in which he notes that learning trajectories progress or regress according to time and use. Use of skills and the repetitive action of learning was picked up by participants in this study:

> "Just doing chats as much as possible, it gets you in that, sort of, professional mindset that you need to be in." (Student E)

> "When I'm on planning, [. . .], it's just like, sort of, repetitiveness, gives me, like, more of an understanding of what I'm doing." (Student F)

> " You need to actually practice doing it." (Staff I)

> "The more you do it just the more comfortable you are in doing it." (Student A)

According to Benner (1984) when experiences are repeated, there is progression from explicit learner behaviour to a more implicit automative state in which the learner accepts the situation in which they find themselves. Student A describes this as feeling 'comfortable' and Staff D suggests this enables a student to gain confidence:

> "I think some things are a bit repetitive here so I think that's helped me gain confidence in what I actually do . . . " (Staff D)

Automation begins with the cognitive phase in which deliberate thought, knowledge and action combine (Mehay, 2012); this occurs at the start of repetition. Next comes the fixative phase where repeated practice leads to skill accuracy; this is followed by the pattern recognition (autonomous) phase where the skill becomes automatic

(Mehay, 2012); this was remarked on by Student K and Staff F:

> "Seeing these things regularly, it forms that pattern of what is it? What's it likely to be next . . . " (Student K)

> "So you've got certain sentences you say to certain scenarios, like if you're asking people about their skin and then you sort of just give out advice without really thinking about what you're saying." (Staff F)

An automative state reduces the cognitive load on the learner (Sweller *et al.*, 2019) and once this has been achieved, application of the skill to a potentially more complex situation can occur. Additionally, routinisation leads to tacit knowledge and intuitive decision-making; the learner is so practised that the action or skill no longer requires thought and it is only when an extraordinary event occurs, that thought is engaged (Eraut and Hirsh, 2007). Achieving tacit knowledge demonstrates a move from being novice to competent and thus learning of the particular skill has occurred which, although it may be difficult for the learner to discern (Eraut and Hirsh, 2007), should be perceived as successful.

Repetition of other tasks, such as assessment performance, can also engender empowered learning as noted by participants' comments:

> "..The fact that they started to do it [Vivas] from the second year was good because it wasn't a shock when we got to the third year." (Staff J)

> "An exam every week so just forced you to do so much, I did love that actually. . . that was really good learning." (Student A)

> "Sometimes you find like you learn things and you learn more and more and you have an exam and you've forgotten what you learnt in the first place, whereas this [weekly testing] was like you've learnt it, do a test on it, and it was very, it helped kind of make it stick a bit more I think." (Student C)

Whilst a learner may not become an 'expert' in doing assessment, nevertheless, by practicing the assessment task at spaced intervals, a learner may become reasonably competent through pattern recognition processes and therefore have increased confidence and better ability to cope with the task (Kang, 2016; Speelman and Shadbolt, 2018). The findings of this study concur with those reported by Kang (2016) who noted that the benefits of repetition, which include improved memory, problem-solving ability and application and transfer of learnt knowledge to new situations, are amplified when spacing between repetition occurs. This is an important concept that should be utilised when considering assessments. Conversely, a gap in performing tasks appeared to have a negative effect on student learning:

> "Where we have such a break between CT in first year and second year, like, you sort of forget it at the start, and I haven't had my third year CT yet, so, it's just getting used to it again." (Student G)

This comment highlights how learning and skill development can be interrupted, which deters the progression to codified knowledge (Eraut and Hirsh, 2007). This not only has implications for defining academic and placement curricula learning objectives, but also patterns of placement and continuity of rotations.

In addition to repetition of task, a novice learns through observing and listening, engendered by workplace processes such as work-shadowing as indicated by participants' comments below:

> "I really just learnt by watching the other radiographers and understanding why they were doing things" (Student C)

> " .... the more you think [when observing] this is what I'd do, the radiographers' have done it the same, you start to get a little more confidence in what you're doing and obviously that helps you ... " (Student L)

> "I think when we observe [radiographers] all throughout our three years

> and then we have to deliver the chats at the end of it, I think you can really gauge what good communication is from those experiences." (Staff A)

> "I think like kind of just shadowing like radiographers like when they go and talk to patients for chats or go and get them from the waiting room or anything like that, then just going with them and then when you know, when you feel ready doing it with them, following you, ... that helped me." (Student C)

Work shadowing, of which role modelling is a related and integral part, are formal processes and part of an informal hidden curriculum delivery enabling novices to learn by example from experienced others (Curry *et al.*, 2011; Passi *et al.*, 2013). Positive role models typically display excellence in clinical skills, teaching ability and have personal attributes such as good interpersonal skills, a positive outlook and integrity (Passi *et al.*, 2013); such characteristics were highlighted by participants in this study:

> "During last placement, because my communication's, like, always needed improving, and so at the last placement I was sharing a machine with a student who was, like, really good at communication, so I was, like, watching how he spoke, and how he spoke to patients, and that helped, and my communication's got better." (Student G)

> "There's one radiographer at where I work, he's really good at reading the situation, so first day chats, if there's someone who's really nervous he can, like, settle them down and just, like, makes himself, like, nice and slow, and makes sure they're really calm about everything, but he can also assess when they're, like, quite happy to have a chat, he makes them laugh and joke and he's, everybody loves him, so it's brilliant." (Student

F)

> "I still see it when like even if you're working with a Band 6 or 7, that they're unsure about anything they will ask, so they kind of know their own limits and the boundaries, so you still see it and it's really good practice, they will refer sort of up the chain if they're unsure." (Staff F)

Student F notes how attributes such as calmness can impact on interactions with patients; a finding which concurs with a study by Curry *et al.* (2011) that researched role-modelling and medical students' opinions of exemplary professional conduct. However, participants' comments also indicated that there is learning from negative role-modelling:

> "Being honest with them [patients] like sometimes you see radiographers that try and sugar coat the information or not tell the patient exactly why they're delayed or anything like that, and the best ones I've seen just tell them the truth." (Student C)

> "I literally had to go round to everyone before, before we could actually get it, because some people were really helpful and then other people weren't as helpful, they were just like, "oh for God sakes!", you know, so dismissive of them, and I thought this is a big thing because it brings up the issue of informed consent… …I mean she consented to this treatment but she did not know what she was here for, so I was surprised when some people were so blasé about it,…..one of the radiographers was just like, "oh for God sakes, this should have been sorted out at this stage", I was like, "well it's not, so, that's not going to help." (Student A)

> "If you have like a really scary team I don't think you'd be so inclined to say something. So make yourself look a bit dim just to like, so they'll have a look at it and maybe realise that it's not quite right." (Staff I)

Comments from senior students and graduates imply criticism and disappointment when high standards of professional values and behaviours are not displayed, yet, there appears appreciation that such behaviour should not be imitated. I have some reservations about Staff I's opinions, yet, they appear to have developed a strategy of managing conflict which student's can find hard to reconcile (White *et al.*, 2009). Negative role modelling and its impact on learners is an interesting concept; what is worth noting is that this behaviour has been commented on by participants who are at a relatively advanced stage of their learning journey. It would be interesting to explore whether these views are expressed by students at the start of their learner journey as learning afforded through role modelling and work-shadowing embraces passive processes and cultural knowledge, which are hard to define and quantify in the workplace setting (Eraut, 2007). The disadvantage of passive learning includes there is less opportunity to understand reasons behind actions, particularly when actions are intuitive and knowledge is tacit (Eraut, 2000).

To enhance empowered learning and progression, active learning activities, such as, reflective practices described by Schön (1983) and cycles of learning akin to Kolb's (1984) theory of experiential learning, can be employed as intimated by participants' comments:

> "Sometimes you just know, as well, just by reflecting on things, you know if you've done a decent chat or not a very good chat, just by how the patient responds, things like that." (Student D)

> "I feel I've learnt more from [reflecting on . . . ..] mistakes that I've made in terms of communication, in terms, not finding out exactly what I needed to, so I think that helped, [. . . .], me develop more." (Student J)

Student D's comment shows that reflective processes can include analysis of a whole situation, in this case, assessing a patient's response to a conversation. Student J conveys how reflection can be combined with a specific action that, in the future, can lead to change; that is, errors in their communication led the participant to reflect on and analyse their mistakes; this in turn resulted in further development of their communication skills which it could be assumed would then be applied and tested in new but similar situations. This resembles Kolb's (1984) learning cycle noting that consolidation of learning is achieved not only through gaining new knowledge, but also by recognition of the learning processes involved. Thus the reflection-change model is an important learning strategy in radiotherapy curricula delivery as it enables progression of skills, knowledge and understanding as well as identifying methods of learning (metacognition).

Knowing how to learn and progress is an important concept in student education (Tanner, 2012). If a student knows how they learn best, they can employ useful strategies and opportunities to aid their development, as evidenced by participants' comments:

> "I think being able to ask the questions and troubleshoot what you're doing so that you understand it better has been a big thing because I think, oh okay, now I get it, I get why we do this." (Staff A)

> "I make sure I always go up and be like, "What can I do better next time?" because that way you always know what you need to do." (Student F)

Student F highlights a desire to improve, portraying both a readiness and motivation to learn which concurs with adult learning theory (Knowles, 1980; Taylor and Hamdy, 2013). Staff A is using questioning as a metacognitive tool to aid self-reflective processes that enable measurement of learning (Tanner, 2012). Self-reflection and analysis allow transfer of learning of specific knowledge, concepts and skills from one domain to another (Kolb, 1984; Saavedra and Opfer, 2012) thereby developing higher order critical reflective skills that, as purported by Benner (1984), allows progression up the novice to expert ladder towards the state of competence, as discussed in the next section.

4.3.3. The 'competent' learner

A final-year student is expected to apply learnt skills to a multiplicity of situations following internalisation and analysis of similarities and differences between contexts, as explained by cognitive aspects of work-based learning that contend associations and the construction of new knowledge is dependant on existing learning (Eraut, 2007; Eraut, 2010). A more experienced student tends to display self-regulation and is likely to be a more efficient learner (Crossley, 2014). When they face an unknown or stressful situation, they are able to cope better, not only because they are more oriented into the practice environment and orientation is known to reduce anxiety (Crossley, 2014), but also because an experienced learner has developed better coping strategies and initiative to engender learning and take on responsibility. This was evidenced by participants' comments:

> "Once you get into third year, they do a lot more about, "Okay, we want you to do this, but you should be thinking about it yourself," sort of thing. So like, take the initiative yourself, to do things. Because...... once you qualify, it'll be what you're doing anyway, so you need to learn to manage yourself." (Student F)
>
> "Thinking ahead, being a bit more proactive [comes with experience]." (Student D)
>
> "I think I've done it [been in charge of a treatment unit] for like an hour but that was it, but they let you just do like a couple of hours at a time and just go you set out the list, you decide, you make all the decisions and that, obviously if any of them are wrong they'll stop you but... it

> gets you thinking more past like a Band 5, it gets you thinking about the future and stuff [. . . .] so you're in charge of the patient like who's going next, you get to go and like set-up the patients, it's really fun." (Student C)

> "Once they can trust you they'll leave you alone, let you do everything." (Student F)

> "It's quite nice having that trust placed in you because it makes you feel like you're more part of the team and you're not just the student who's off doing some random errands. . . .. and the patient looks at you as more than just a student because they're like, "oh like, so you're in charge of this so you know what's going on." (Student B)

> "It does definitely seem to boil down to confidence with a lot of these things, if you're confident in what you're doing, you tend to end up making the right decision, you're not over thinking things, you're confident that you know what you're doing." (Student K)

Comments demonstrate that internal reference points such as confidence, trust and being part of a team appear measures of competence and success along a learner's journey. Confidence, as noted by Student K, is an important concept as much of learning comprises seeking out and performing coherently in the workplace which cannot be achieved without convictions of capability to perform (Eraut and Hirsh, 2007). Thus it is an activating emotional response which aids learning and is a measure of relative success (Pekrun *et al.*, 2002; Finch *et al.*, 2015).

Trust, mentioned by Student F and Student B, is an emotion that engenders feeling supported and it too represents empowerment and accomplishment that reflect personal growth (Finch *et al.*, 2015). Personal and professional development of a student are evidenced by the inference from Student F: "once you qualify, it'll be what you're doing anyway"; the positive feelings of achievement are portrayed by Student C who noted that additional responsibility enabled through development was "really fun".

Competence appears related to gaining acceptance into the community of practice, as noted by Student B who felt "part of the team" and "not just the student". Using the word 'just' implies that a student is not as 'worthy' as being a team member; team membership and acceptance appear to be a learning goal. Progression on the learner journey also appears enabled by undertaking elective placements, as Staff A commented:

> "I think being encouraged to do an elective as well was a good thing for you, like that was a positive experience because you're able to, after three years of being in the same place compare being somewhere just for one week just comparing it, so you either get a snapshot of somewhere else, then you can think, oh okay, they do things differently, how and why, it helps to develop that understanding and in that third year you're trying to analyse things so it helps to analyse the differences and compare and like you think okay, they do this different, that actually is probably a better way of doing it but then we are achieving the same things." (Staff A)

Having an elective experience which can promote comparison between learnt and new practices appears to aid development of critical reflection and analytical skills, not only allowing students to build on their existing knowledge, but also challenging their perceptions of placement environments and cultures, thereby enhancing transformative skills (Lumb and Murdoch-Eaton, 2014). This broadly aligns to the constructivist view purported by Vygotsky (1978) which considers learning to be a process of building on existing knowledge through experiences which are key to engendering meaning and thus learning. Participants' responses also suggest that a student in their final year of study is able to deconstruct and reconstruct knowledge: there appears to be an ability to analyse parts of the radiotherapeutic set-up and processes as well as acknowledge the holistic aim of treatment evidenced by "we are achieving the same things." The concept of breaking down a problem into its component parts in order to explore, learn in depth and create new insights acknowledges the complexity of the procedures that comprise radiotherapy practices. Furthermore, although elective placements were cited as positive learning experiences by a number of participants across a range of focus groups, it should be recognised that the process of reconstruction may vary according to the individual and thus meaning is subjective and personal as intimated below:

> "It was only when I went on my elective that you see that they actually do things differently. Also it's quite good as well because it's good to move around to sort of get used to starting somewhere new so it's not so daunting when you start." (Staff I)
>
> "I think just going to another department, sort of prepares you for then going to elsewhere for work as well." (Staff F)
>
> "I did an elective at a different hospital and that was quite different." (Staff B)
>
> "It's nice to see how different places work and I went to a place with Elekta so that was good to see [. . . .] it was good to see what that machine was all about and everything." (Staff G)
>
> "You do end up comparing departments as well because I think like oh, this site does this differently, oh if it's better the other sites should do it like this, like so you do end up comparing and you make your own opinions or what you think is what's a good way to do something.." (Staff B)

> “ [After an elective] you do feel very inspired and you want to come back and you want to make all these changes but you know, at least you... I feel like you being inspired is enough because at this stage you’ve just started at least being awake and knowing that there’s this difference I guess that can, you know, lead to you one day maybe even making the changes but for now at least you’ve got inspiration.” (Staff C)

Staff I and Staff F both comment on the relationship between elective placements and socialisation and adaptation to the culture of other departments. The use of the word “daunting” by Staff I highlights the uncertainty that comes with the move to a new department, yet, they recognise that a change in behaviour and flexibility of attitude are necessary within other workplaces where cultural and organisational procedures differ. This concurs with Eraut’s (2007) theory of work-place learning that acknowledges that socialisation into a department requires adaptation as well as recognition that departments have different ways of working and acceptable norms, all of which must be learnt, and in this case, all of which assume importance in preparing for the role of the therapeutic radiographer.

Staff G’s comment indicates that electives can fulfil an individual’s need which not only improves competence, but also may improve the chances of employability; another advantage of elective placements (Lumb and Murdoch-Eaton, 2014). Furthermore, they can be seen to inspire and provide personal aspiration and motivation (Staff C) which reassures radiotherapeutic values of striving to do the best for the patient, thereby refreshing the impetus to continue with professional development. Staff A comments on how undertaking an elective helped expose professional development opportunities:

> “So when I went to my elective in TRUST NAME REMOVED, every Friday or I think it was every second Friday, they would have one of

> the members of staff give a lecture to the students .... it keeps the staff involved in terms of the work that they have to give and then the students are all there able to ask questions and stuff and then it's like, I think it was really good because I sat in on them and it was all about, you know, it was all about guiding patients and they were talking chemo, they were talking about like cell cycles and everything like that but it was just something that you're at placement, you're going to do a session, you're going to probably go downstairs and see a patient and know you have a bit of background knowledge, okay, they've come down in chemo, okay, they've gone on this spinal, whatever, you know, it gives you something to think about and then also the radiographers know a little bit about, oh so-and-so did a session on that for you so you must know a little bit about that, we can ask questions, it kind of ties it together and it links I think as well the staff with the learning process a bit more ... because yes you learnt it at uni but you forget when you come here, so it's hard when they ask you questions, like oh you should know that by now but you don't know if you should know that by now........the staff know what they're telling you, they have to do some research so it refreshes their knowledge as well, I think it's a good learning way for the profession not just for just students." (Staff A)

To conclude, the learner journey embraces enculturation into departments, an important aspect for novices achieved by repetition of tasks and work shadowing. Participants' responses indicated that positive role modelling is an effective teaching practice as it portrays accepted working practices and, when mimicked by learners, can increase the confidence of novices. Because role modelling appears a key method of conveying professional attributes, professional identity and professionalism, conscious appreciation of good role models in undergraduate practice placements and explicit encouragement of graduates to develop and enhance their status as effective role models, is recommended.

This section has also highlighted the features and emotions associated with a competent student. It has noted the personal and professional development that elective placements afford, alluding to the competencies that can be enhanced and the amelioration of employability skills. It has presented the transformative learning that electives encourage and the insights that are offered through critical reflection and analysis.

4.4. Framework of activities conducive to learning

This study sought to answer the question: what positive learning experiences facilitate the development of knowledge, skills and understanding required of a qualified therapeutic radiographer? The fourth objective of the study was to provide a framework of educational activities that not only are conducive to developing these skills, but also are recognised as valid educational activities as expounded by teaching and professional learning theories. The reasonings and analyses presented earlier within this chapter have provided explanation of the validity of the activities which participants believed empowered them to learn. Table 4.2 on the next page provides a framework of the findings and because the study employed a semi-structured questioning approach, it has been possible to relate positively-viewed activities to specific aspects of the therapeutic radiographer's role (Table 4.2 on the following page).

In addition to summarising positive learning experiences, this study has discovered and acknowledged other influences on learning such as factors peculiar to individuals, for example, mastery-performance or goal-oriented biases. Table 4.3 on page 211

Table 4.2.: Externally situated activities that impact on learning of aspects of the role

Teaching and Learning activity: EXTERNALLY-SITUATED influences	**C**	**TP**	**PA**	**V**	**GP**
Receiving written & verbal feedback on performance	X	X			X
Being supervised / mentored by practice staff	X	X	X	X	X
Being supervised by ‘experts’		X			
Being taught by an excellent teacher					X
Listening and observing / work shadowing	X		X		
Role modelling - both negative and positive to develop professionalism	X		X		
Role playing / simulation in academic	X			X	X
Role playing / simulation in placement	X	X			
Peer learning in groups	X	X		X	
Having a tutorial / one-to-one teaching on placement	X	X		X	
Repeating specific tasks / building on previous experiences / Developing ‘routine’ answers	X	X	X		
Engagement with patients	X		X		
Being ‘on the job’ in clinical / hands-on in placement	X	X		X	X
Problem-solving scenarios	X		X	X	
Being asked questions	X	X		X	
Preparing for assessment	X				X
Doing assessments and competencies	X	X			
Doing research to determine approaches to specific situations / patient conditions and implementing these in practice	X	X	X		
Guided learning: portfolios / workbooks / worksheets		X		X	
Referring to Trust protocols		X	X		
Annual updating				X	
Teaching others				X	
Running a unit					X
Lying on the couch					X

Key: C = communication; TP = treatment planning; PA = professional autonomy; V = verification; GP = general preparation for the role

Table 4.3.: Intrinsic factors that empower learning in relation to aspects of the role of the therapeutic radiographer

Teaching and Learning activity: INTRINSIC factors (self-regulation)	**C**	**TP**	**PA**	**V**	**GP**
Reflection in and on action: on performance / on situated learning / learning from mistakes	X		X	X	X
Interacting with patients	X		X		
Developing 'on the job' in clinical / hands-on in placement	X	X		X	X
Problem-solving	X		X	X	
Asking questions	X	X	X	X	
Preparing for assessment	X				X
Being able to adapt practice to specific situations / patient conditions and implementing these in practice	X	X	X		
Creating checklists	X				
Applying academic theory to practice		X	X		
Recognising limitations	X		X		
Building relationships	X				X

Key: C = communication; TP = treatment planning; PA = professional autonomy; V = verification; GP = general preparation for the role displays intrinsic factors related to learner self-regulation, personal ability and skill. Some of these are aspects for which the learner has responsibility and control, yet, others will depend on the individual's orientation, motivation, need and readiness to learn, in essence, aspects that align to Knowles's (1980) adult learning theory.

As an educator, I have found some findings enlightening, for example, I had given scarce attention to the deliberative learning embodied within repetition of task that enables learner movement on the novice to expert continuum, yet, opinions offered by key stake-holders have highlighted its value. Taken together, Tables 4.2 on page 210 and 4.3 on the previous page provide a framework of educational activities and intrinsic factors conducive to learning key aspects of the therapeutic radiographer role, as voiced by the key stakeholders and provide useful evidence for those who are responsible for designing, delivering and / or assessing undergraduate radiotherapy curricula and its delivery.

4.5. Conclusions

This chapter has presented the perceptions of participants explored during the the *discovery* and *dream* phases of the AI cycle in relation to teaching and learning activities and experiences that enable therapeutic radiography knowledge, understanding and skills acquisition. It has explained where, why and how learning takes place, utilising learning theories and concepts relevant to professional programmes. Successful learning involves a combination of generic-cognitive and specialist skills and, whilst it may not be necessary to teach a student to speak in the generic sense as it is an inherent skill, it is necessary to situate learning within authentic therapeutic radiography contexts for learning to be effective and successful. Enhanced learning may be achieved through role play, simulation, peer learning, guided learning and assessment and feedback processes, yet, for learning to be motivating, radiotherapy-specific interactive scenarios where relevancy to the professional role is overt, should be deployed.

Therapeutic radiography is delivered in a complex environment in which treatment delivery accuracy is paramount and patient-centred care is unquestionable. To novice students it presents a number of challenges which can be addressed by simulation, followed by the individual experiencing socio-cultural processes which encourage the development of professional identity (Crossley, 2014). Legitimate peripheral participation (Lave and Wenger, 1991) describes acceptance into the community of practice, obtained though interaction with those in the work-place who engender understanding of the learning that is enabled there. Although repetition of skills was noted as encouraging skill development, work-shadowing and role-modelling were key to developing professional identity, professionalism and professional competence. Competence of students was associated with a journey and with competence came confidence: an enabling, motivating emotion; acceptance into the community of practice was viewed as important and confidence-building. Participants' responses also suggested that undertaking elective placements affords further evaluative, educational and skill development through transformative learning and reflection; it also enhances employability skills in addition to personal and professional development.

Also highlighted has been participants' responses with regard to the influences of relationships on empowered learning. Relationships with peers, patients, practice staff and university staff have been analysed, portraying the different aspects that each group brings to a learner's experience. Aspects of effective and ineffective relationships and the consequences and impact of those associations have also been discussed. Good practice principles and individual and social learning theories have been used to illicit how learning occurs and the variety of emotions associated with different types of interactions. Interactions with patients motivate and encourage students to achieve, making the learning worthwhile; other positive emotions occur when students interact with positive, professional and supportive practice staff.

Emotions and the intrinsic and external influences on learning have been highlighted, positing how and why students may report struggles with radiotherapy undergraduate education, in particular, the issues that appear to be associated with radiotherapy planning which, it could be argued, is a specialist role of the therapeutic radiographer. Although an appreciative inquiry methodology was adopted, participants have cited barriers to empowered learning; this chapter has presented those related to time and staff availability, a perceived lack of clarity and relevance regarding learning objectives and the influence and authority that peers, mentors and supervisors have on students' experiences and learning.

Finally this chapter has presented a framework of activities and intrinsic factors that past and present learners believe educates them for the professional role of a therapeutic radiographer, with the suggestion that this may be a useful reference for those with responsibility for designing and assessing undergraduate radiotherapy programmes.

5. Conclusions, Reflections and Recommendations

This chapter summarises the findings from the study and gives recommendations for further work. I also include a note on the *destiny* phase of appreciative inquiry, explaining how some of the findings have been utilised in one radiotherapy programme. Finally, I conclude with some personal reflections on undertaking this study.

5.1. Summary of key findings

This thesis has explored and presented the educational experiences which participants found conducive to learning for the role of a therapeutic radiographer. It has determined that active authentic learning in academia such as role play and simulation is appreciated in a preparatory context prior to placement learning, particularly when peer and reflective learning processes are employed. In addition, it has highlighted that skills acquisition associated with peer learning should be made explicit and that the emotions evoked should be advertised as part of the learner journey.

Placement learning embodied socio-cultural learning processes that facilitate acceptance into the placement culture and environment. Key personnel, actively involved in placement learning, included patients, peers, practitioners and academic staff, although the type and mode of learning afforded from the groups differed significantly. Visiting academic lecturers, by maintaining their external position and therefore objective stance to the placement environment, were able to promote critical thinking and analysis of departmental procedures and radiotherapy techniques. Patients engendered feelings of worth within the learner which gave impetus and meaning to learning; supervisors and mentors who embodied professional values and exhibited student empathy were able to form positive relationships with students which empowered learning. Work shadowing and role-modelling were important learning activities and practitioners with enhanced professional interpersonal skills were seen as key in the development of a student's professional identity, professionalism and competence. Experts in the field were also useful, providing opportunity for learners to realise gaps in knowledge. However, if the expert was distant to the learner in age, unable to describe tacit knowledge or had little appreciation of university programmes, they were perceived as less approachable and empathetic.

External factors impacting on learning included the environment in which the skills were learnt; a no-blame culture engendered learning, as did empathetic and supportive attitudes and behaviours of practitioners and fellow peers. Activities such as undertaking elective placements enabled comparison of placement learning cultures and facilitated critical thinking and aspiration in learners. Intrinsic learning factors included learner's self-regulation and mindset; their attitudes and emotional responses.

How learning was enabled was presented with reference to established learning theories and principles. It was seen that undergraduate radiotherapy curricula employed methods of curricula delivery recommended and supported by theories. The study employed an AI methodology, focussing on positive experiences of learning, nevertheless, barriers and limitations which affect learning were also highlighted. These were cited as: incidences when learning intention was less explicit or the cognitive load too high for a learner; less time given to knowledge and skill development than was necessary to attain appropriate learning; negative examples of role-modelling and professional behaviour; external extenuating circumstances, such as low levels of staffing and lack of staff availability.

5.2. Further work

The findings of this study, both from the focus groups and review of data related to undergraduate programme curricula, have raised a number of questions worthy of further investigation. There is a need to explore learning of radiotherapy planning and the standards achieved, as this topic area seemed to give participants concerns. Alongside this it should be established whether planning be regarded as a standard graduate role or whether this is a specialist skill. I assume that planning principles underpin knowledge of all radiotherapy techniques and processes and are therefore necessary to engender safe radiotherapy practice. This may be my biased assumption, so gaining others' perceptions is important to me. In particular, I would like to explore views of fellow educators, novice and expert practitioners, those recently-graduated and those who have been in practice or academia for over fifteen years in order to realise their thoughts around planning knowledge and skills; not only the extent to which planning concepts may be applied or utilised in daily radiotherapy practice, but also explore more about when, where and how planning education may or should be delivered.

Another area worthy of exploration is the impact of negative role-modelling; positive role modelling was seen to shape and heavily influence participants' experiences and learning. What impact then does negative role-modelling have on a learner? Could this influence a novice student's decision to withdraw from a programme after they have undertaken their first clinical placement?

Most questions posed during the focus groups resulted in in-depth conversations, however, one question appeared to present a slight challenge to participants, namely, the one focused on professional autonomy. Prior to starting the study, I had been informed by a Professional Officer from the College of Radiographers that therapeutic radiographers struggled with the concept of professional autonomy and this proved to be the case. An exploratory study on perceptions of professional autonomy in therapeutic radiography would make an interesting research project.

Two other areas worthy of further investigation relate to radiotherapy curricula content: whether ultrasound verification techniques and application are covered in undergraduate programmes; and if educational theories are taught to undergraduate students. It was noted that teaching is a core part of a therapeutic radiographer's role and there is a clear relationship between excellence in teaching and learner clinical performance (Griffith *et al.*, 2000; Blakey *et al.*, 2019). This therefore poses the question: to what extent, if any, are educational theories taught to undergraduate students on radiotherapy programmes? Without wanting to presume a negative response, but, if that was the case, a further study to investigate the effect of the addition of educational theory to undergraduate curricula on the teaching ability of a therapeutic radiography graduate, would also be an interesting project.

Finally, trawling through the terms used to describe practitioner roles was time-consuming and a personal plea would be to encourage the professional body to co-construct and adopt universally-accepted terms of practitioner roles after, of course, an exploratory study with radiotherapy practitioners, academics and students has been undertaken, all of whom are key stakeholders.

5.3. A note on the *destiny* phase

Some of the findings from the *destiny* phase of AI have been incorporated into one undergraduate HEI programme that was undergoing programme review. This provided an ideal time in which to propose change, as expectations associated with review processes include evaluation of the existing curriculum and delivery methods and introduction of new practices and concepts, thus changes are more readily accepted. This, however, was not an original aim of my research and therefore my thesis concludes with the framework built on data acquired in the *discovery* and *dream* phases rather than implementation and evaluation of the *destiny* phase. However, as the new programme rolls out over the next few years, changes will be evaluated. What should be remembered is that AI philosophy professes that implementation is not an end-point, rather it forms part of an ongoing cyclical transformative processes (Cooperrider *et al.*, 2008). Therefore it will be within this context that evaluation of new learning activities, embedded within the new programme as a result of this study, will occur.

5.4. Original contribution

This is a unique in-depth study exploring delivery of undergraduate radiotherapy education. To my knowledge, it is the first qualitative study in the radiotherapy profession that has employed an AI methodology to explore learner experiences and review them in the context of the role of the radiographer and teaching and learning theories. It has provided opportunity for learners to have their say and permitted in-depth, co-created conversations to occur within enabling and supportive environments. By exploring the learner experience from the perceptions of current students and new graduates, it has shown how academic and practice-based educational activities contribute to the overall curricula delivery and the development of the knowledge, understanding and skills required of a therapeutic radiographer.

This study has, through the stages of the AI cycle, intimated some practitioners' and students' thoughts and aspirations on where curricula delivery may enhance learning, laying down challenges and suggestions to those who design and deliver radiotherapy curricula. It has also illuminated processes for in-depth evaluation of learning, exceeding the scope of other evaluation studies by providing positive examples of overt, nuanced and multi-factorial learning practices that engender empowerment and shape the learner journey.

5.5. A personal reflection

Completion of this study has challenged and developed my existing knowledge and understanding of radiotherapy curricula delivery and educational theories. It has provided opportunities to develop my thinking and increased the depth and breadth of my understanding of not only the topic area, but also research processes and their alignment to methodologies. I have also been able to reflect on and learn more about my personal beliefs and values which were hitherto unknown to me and therefore unacknowledged. Undertaking this study has enabled me to make an original contribution to an understanding of undergraduate radiotherapy curriculum delivery and has afforded the opportunity for my continuous development as an educator, practitioner and researcher.

On reflection, the study may have benefited from being more focussed; exploring all possible teaching and learning aspects that can occur within academia and placement and the myriad of theories with which learning is associated was a huge undertaking and reflected my initial naive view; indeed, I was a novice doctoral student! The more I listened to participants' views the more I appreciated wider contexts, yet, the more I needed to learn. It also made me realise the tokenism employed with previous evaluations of undergraduate radiotherapy curricula where there had been perfunctory attention given to the category of teaching and learning; indeed, little or no attention had really been given to whether delivery was appropriate and useful.

Although I was an insider so had some knowledge around how delivery occurred, I used a data collection tool that minimised my influences on participants' perceptions of empowered learning and that was both satisfying and exciting. I enjoyed learning about positive experiences, and this not only engendered motivation in me to do more of what was perceived to be empowering, but also made me appreciate the privilege of contributing to the wider radiotherapy community. I discovered much about the emotions associated with learning, not only from participants but also from being a student myself and, having that insight, has engendered empathy with my own students.

Because I came from a positivist background and had little knowledge of qualitative research methods, I brought with me a novice attitude that I would be able to apply research 'rules'. As such, there are some areas where I could have explored or probed more deeply, yet, I believe the data gained was rich, detailed and enabled the outcomes of the study to be met. I became more comfortable the more I facilitated focus groups and because of adopting the AI positive stance, I found data collection an enriching, humbling, enlightening and enjoyable experience. If I were to undertake another qualitative research project, I would like to adopt a more iterative approach that enables follow up of noteworthy data. However, in my next project, I would still like to undertake all data collection as this has been a worthwhile, enjoyable and informative process that has not only impacted on my practice as a lecturer, but also on my knowledge, understanding and skills as a researcher. In my wider professional roles, as some-one who provides feedback and assesses undergraduate and postgraduate radiotherapy programmes, my doctoral studies have been invaluable. In many ways, I feel I have changed and developed throughout this Doctoral journey, and, overall this has been a very worthwhile and liberating experience.

5.6. Summary of the concluding chapter

This chapter has summarised the findings from this study and given recommendations for further work related to some of the concepts and issues raised which would benefit from further research. I have included a note on the *destiny* phase of appreciative inquiry and, finally, I have provided some personal reflections on undertaking this study.

Reference List

Aggarwal, R., Mytton, O.T., Derbrew, M., Hananel, D., Heydenburg, M., Issenberg, B., MacAulay, C., Mancini, M.E., Morimoto, T., Soper, N., Ziv, A. and Reznick, R. (2010). Training and simulation for patient safety. *BMJ Quality & Safety* [Online], 19(Suppl 2), pp.34–43. eprint: https://qualitysafety.bmj.com/content/19/Suppl_2/i34.full.pdf. Available from: https://doi.org/10.1136/qshc.2009.038562.

Ahmad, S.S., Duke, S., Jena, R., Williams, M.V. and Burnet, N.G. (2012). Advances in radiotherapy. *BMJ (Clinical research ed.)* 345 (7886), pp.33–38. Available from: https://doi.org/10.1136/bmj.e7765.

Alinier, G. (2007). A typology of educationally focused medical simulation tools. *Medical Teacher*, 29 (8), pp.243–250. Available from: https://doi.org/10.1080/01421590701551185.

Alsobaie, M.F. (2015). Power and authority in adult education. *Journal of Education and Practice*, 6(15), pp.155–159.

Argyris, C. and Schön, D.A. (1978). *Organizational learning: a theory of action perspective.* [Online]. Reading, MA: Addison-Wesley. Available from: https://www.amazon.com/Organizational-Learning-Addison-Wesley-Organization-Development/dp/0201001748?SubscriptionId=AKIAIOBINVZYXZQZ2U3A&tag=

chimbori05-20&linkCode=xm2&camp=2025&creative=165953&creativeASIN=0201001748.

Aronson, L. (2013). The value of medical education programmes: what are the right questions? *Medical Education*, 47 (4), pp.333–334. Available from: https://doi.org/10.1111/medu.12137.

Azer, S.A., Guerrero, A.P.S. and Walsh, A. (2013). Enhancing learning approaches: practical tips for students and teachers. *Medical Teacher*, 35 (6), pp.433–443. Available from: https://doi.org/10.3109/0142159x.2013.775413.

Baskar, R., Lee, K.A., Yeo, R. and Yeoh, K.-W. (2012). Cancer and radiation therapy: current advances and future directions. *International Journal of Medical Sciences*, 9(3), pp.193–199. Available from: https://doi.org/10.7150/ijms.3635.

Bate, E., Hommes, J., Duvivier, R. and Taylor, D.C.M. (2014). Problem-based learning (PBL): getting the most out of your students, their roles and responsibilities: AMEE Guide No. 84. *Medical Teacher*, 36 (1), pp.1–12. Available from: https://doi.org/10.3109/0142159x.2014.848269.

Beals, R.L., Hollier, H. and Beals, A.R. (1977). *An introduction to anthropology.* 5th ed. London: Collier Macmillan Publishers.

Beldham-Collins, R. and Milinkovic, D. (2009). A new graduate education program in radiation therapy. *Radiography.* 15, pp.26–33.

Benner, P. (1984). *From novice to expert.* California: Addison-Wesley.

Benner, P. and Tanner, C. (1987). Clinical judgment: how expert nurses use intuition. *The American Journal of Nursing*, 87 (1), pp.23–31. Available from: https://doi.org/10.2307/3470396.

Bennett, D., O'Flynn, S. and Kelly, M. (2014). Peer assisted learning in the clinical setting: an activity systems analysis. *Advances in Health Sciences Education*, 20 (3), pp.595–610. Available from: https://doi.org/10.1007/s10459-014-9557-x.

Bentley, H.B. (2005). Early days of radiography. *Radiography.* 11 (1), pp.45–50. Available from: https://doi.org/10.1016/j.radi.2004.11.001.

Benware, C.A. and Deci, E.L. (1984). Quality of learning with an active versus passive motivational set. *American Educational Research Journal*, 21 (4), pp.755–765. Available from: https://doi.org/10.3102/00028312021004755.

Bergstrom, P. (2010). Process-based assessment for professional learning in HIgher Education: perspectives on the teacher relationship. *International Review of Research in Open and Distance Learning*, 11(2), pp.33–48.

Bernstein, B.B. (2000). *Pedagogy, symbolic control and identity (revised).* [Online]. Maryland: Rowman & Littlefield Publishers. Available from: https://www.ebook.de/de/product/4304009/basil_b_bernstein_pedagogy_symbolic_control_and_identity_revised.html.

Blakey, A.G., Smith-Han, K., Anderson, L., Collins, E., Berryman, E. and Wilkinson, T. (2019). They cared about us students: learning from exemplar clinical teaching environments. *BMC Medical Education*, 19 (1). Available from: https://doi.org/10.1186/s12909-019-1551-9.

Bleakley, A. and Bligh, J. (2006). Students learning from patients: let's get real in medical education. *Advances in Health Sciences Education*, 13 (1), pp.89–107. Available from: https://doi.org/10.1007/s10459-006-9028-0.

Boshuizen, H.P., Jochens, W.M., Eraut, M. and Gijselaers, W.H. (2003). *Expertise development : the transition between school and work*. Heerlen: Open Universiteit Nederland.

Boud, D., Cohen, R. and Sampson, J. (2001). *Peer learning in Higher Education*. Ed. by D. Boud, R. Cohen and J. Sampson. London: Kogan.

Bowen, K. and Prentice, D. (2016). Are Benner's expert nurses near extinction? *Nursing Philosophy*, 17 (2), pp.144–148. Available from: https://doi.org/10.1111/nup.12114.

Brannick, T. and Coghlan, D. (2007). In defense of being native: the case for insider academic research. *Organizational Research Methods*, 10 (1), pp.59–74. Available from: https://doi.org/10.1177/1094428106289253.

Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology* [Online], 3(2), pp.77–101. eprint: https://www.tandfonline.com/doi/pdf/10.1191/1478088706qp063oa. Available from: https://doi.org/10.1191/1478088706qp063oa.

Bridge, P., Giles, E., Williams, A., Boejen, A., Appleyard, R. and Kirby, M. (2017). International audit of Virtual Environment for Radiotherapy Training (VERT) usage. *Journal of Radiotherapy in Practice*, 16 (4), pp.375–382. Available from: https://doi.org/10.1017/s146039691700022x.

Bridge, P., Appleyard, R., Ward, J., Philips, R. and Beavis, A. (2007). The development and evaluation of a virtual radiotherapy treatment machine using an immersive visualisation environment. *Computers & Education*, 49 (1), pp.481–494. Available from: https://doi.org/10.1016/j.compedu.2005.10.006.

Brown, N. and Doshi, M. (2006). Assessing professional and clinical competence: the way forward. *Advances in Psychiatric Treatment*, 12 (2), pp.81–89. Available from: https://doi.org/10.1192/apt.12.2.81.

Bryman, A. (2012). *Social research methods, 4th Edition* [Online]. Oxford: Oxford University Press. Available from: https://www.amazon.com/Social-Research-Methods-Alan-Bryman/dp/0199588058?SubscriptionId=AKIAIOBINVZYXZQZ2U3A&tag=chimbori05-20&linkCode=xm2&camp=2025&creative=165953&creativeASIN=0199588058.

Bushe, G.R. and Paranjpey, N. (2015). Comparing the generativity of problem solving and appreciative inquiry: a field experiment. *The Journal of Applied Behavioral Science*, 51 (3), pp.309–335.

Bushe, G.R. and Kassam, A.F. (2005). When is Appreciative Inquiry transformational? *The Journal of Applied Behavioral Science*, 41 (2), pp.161–181. Available from: https://doi.org/10.1177/0021886304270337.

Caruana, C.J. and Plasek, J. (2006). An inventory of biomedical imaging physics elements-of-competence for diagnostic radiography education in Europe. *Radiography.* 12 (3), pp.189–202. Available from: https://doi.org/10.1016/j.radi.2005.07.005.

Chapman, N., Dempsey, S.E. and Warren-Forward, H.M. (2009). Workplace diaries promoting reflective practice in radiation therapy. *Radiography.* 15, pp.166–170.

Chickering, A.W. and Gamson, Z.F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin*, 39(7), pp.3–7.

Citrin, D.E. (2017). Introduction. *Seminars in Oncology*, 27(4), p.298.

Citrin, D.E. and Mitchell, J.B. (2017). Mechanisms of normal tissue injury from irradiation. *Seminars in Radiation Oncology*, 27 (4), pp.299, 316–324. Available from: https://doi.org/10.1016/j.semradonc.2017.05.001.

Clarke, M. and Thornton, J. (2014). Using appreciative inquiry to explore the potential of enhanced practice education opportunities. *British Journal of Occupational Therapy*, 77(9), pp.475–478.

Cohen, L., Manion, L. and Morrison, K. (2011). *Research methods in education.* [Online]. London: Routledge. Available from: https://www.amazon.com/Research-Methods-Education-Louis-Cohen/dp/0415583365?SubscriptionId=AKIAIOBINVZYXZQZ2U3A tag=chimbori05-20&linkCode=xm2&camp=2025&creative=165953&creativeASIN=0415583365.

College of Radiographers (2013). *Education and career framework for the radiography workforce.* London: College of Radiographers.

Cook, D.A. (2010). Twelve tips for evaluating educational programs. *Medical Teacher*, 32, pp.296–301.

Cook, D.A. and Artino, A.R. (2016). Motivation to learn: an overview of contemporary theories. *Medical Education*, 50 (10), pp.997–1014. Available from: https://doi.org/10.1111/medu.13074.

Cooperrider, D.L. and Godwin, L.N. (2012). *Positive organisation development: innovation-inspired change in economy and ecology of strengths.* Oxford University Press.

Cooperrider, D.L., Whitney, D. and Stavros, J.M. (2008). *Appreciative inquiry handbook for leaders of change.* 2nd ed. Berrett-Koehler.

Cooperrider, D.L. and Avital, M. (2004). *Constructive discourse and human organizations* [Online]. Bingley, UK: Emerald Group Publishing Limited. Available from: https://www.ebook.de/de/product/3857843/constructive_discourse_and_human_organizations.html.

Cooperrider, D.L. and Srivastva, S. (1987). Appreciative inquiry in organizational life. *Research in Organizational Change and Development*, 1, pp.129–169.

Corbin-Dwyer, S. and Buckle, J.L. (2009). The space between: on being an insider-outsider in qualitative research. *International Journal of Qualitative Methods*, 8 (1), pp.54–63. Available from: https://doi.org/10.1177/160940690900800105.

Cribb, A. and Bignold, S. (1999). Towards the reflexive medical school: the hidden curriculum and medical education research. *Studies in Higher Education*, 24 (2), pp.195–209. Available from: https://doi.org/10.1080/03075079912331379888.

Crocker, J.C., Boylan, A., Bostock, M.A. and Locock, L. (2016). Is it worth it? Patient and public views on the impact of their involvement in health research and its assessment: a UK-based qualitative interview study. *Health Expectations*, 20, pp.519–528.

Crossley, J.G.M. (2014). Addressing learner disorientation: give them a roadmap. *Medical Teacher*, 36(8), pp.685–691.

Curry, S.E., Cortland, C. and Graham, M.J. (2011). Role-modelling in the operating room: medical student observations of exemplary behaviour. *Medical Education*, 45(9), pp.946–957.

Deasy, C., Doody, O. and Tuohy, D. (2011). An exploratory study of role transition from student to registered nurse (general, mental health and intellectual disability) in Ireland. *Nurse Education in Practice*, 11 (2), pp.109–113. Available from: https://doi.org/10.1016/j.nepr.2010.11.006.

Denzin, N.K. (1989). *The research act. A theoretical introduction to sociological methods.* 3rd ed. New York: McGraw Hill.

Department of Health (2004). *The NHS Knowledge and Skills Framework (NHS KSF) and the development review process* [Online]. Department of Health. Available from: http://www.libraryservices.nhs.uk/document_uploads/KSF/NHS_KSF_Document.pdf.

Department of Health (2007). *Cancer reform strategy* [Online]. Department of Health. Available from: https://www.nhs.uk/NHSEngland/NSF/Documents/Cancer%20Reform%20Strategy.pdf.

Dewey, J. (1938). *Experience and education.* New York: Macmillan.

Donohoe, C.L., Conneely, J.B., Zilbert, N., Hennessy, M., Schofield, S. and Reynolds, J.V. (2015). Docemur Docemus: peer-assisted learning improves the knowledge gain of tutors in the highest quartile of achievement but not those in the lowest quartile. *Journal of Surgical Education*, 72 (6), pp.1139–1144. Available from: https://doi.org/10.1016/j.jsurg.2015.07.001.

Douglas, D.A., Douglas, A., McClelland, R.J. and Davies, J. (2015). Understanding student satisfaction and dissatisfaction: an interpretive study in the uk higher education context. *Studies in Higher Education.* 40(2), pp.329–349.

Dreyfus, S.E. and Dreyfus, H. (1980). *A five-stage model of the mental activities involved in directed skill acquisition.* University of California Berkeley Operations Research Center.

Dunlosky, J., Rawson, K.A., Marsh, E.J., Nathan, M.J. and Willingham, D.T. (2013). Improving students' learning with effective learning techniques. *Psychological Science in the Public Interest*, 14 (1), pp.4–58. Available from: https://doi.org/10.1177/1529100612453266.

Dunscombe, P. (2012). Recommendations for safer radiotherapy: what's the message? *Frontiers in Oncology*, 2. Available from: https://doi.org/10.3389/fonc.2012.00129.

Durning, S.J. and Artino, A.R. (2011). Situativity theory: a perspective on how participants and the environment can interact: AMEE Guide no. 52. *Medical Teacher*, 33 (3), pp.188–199. Available from: https://doi.org/10.3109/0142159x.2011.550965.

Entwistle, V.A., Renfrew, M.J., Yearley, S., Forrester, J. and Lamont, T. (1998). Lay perspectives: advantages for health research. *British Medical Journal*, 316, pp.463–466.

Epstein, R.M. and Hundert, E.M. (2002). Defining and assessing professional competence. *JAMA*, 287 (2), pp.226–235. Available from: https://doi.org/10.1001/jama.287.2.226.

Eraut, M. (2010). Knowledge, working practices and learning. In: Billett, S. ed. *Learning through practice. Professional and practice-based learning*. Dordecht: Springer. Chap. 3.

Eraut, M. (2014). *How professionals learn through work* [Online]. Available from: http://learningtobeprofessional.pbworks.com/w/page/15914995/Michael%20Eraut [Accessed 13 June 2014].

Eraut, M. (1998). Concepts of competence. *Journal of Interprofessional Care*, 12 (2), pp.127–139. Available from: https://doi.org/10.3109/13561829809014100.

Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work. *British Journal of Educational Psychology*, 70 (1), pp.113–136. Available from: https://doi.org/10.1348/000709900158001.

Eraut, M. (2004). Informal learning in the workplace. *Studies in Continuing Education*, 26 (2), pp.247–272. Available from: https://doi.org/10.1080/158037042000225245.

Eraut, M. (2007). Learning from other people in the workplace. *Oxford Review of Education*, 33 (4), pp.403–422. Available from: https://doi.org/10.1080/03054980701425706.

Eraut, M. (2011). Informal learning in the workplace: evidence on the real value of work-based learning (WBL). *Development and Learning in Organizations: An International Journal*, 25 (5), pp.8–12. Available from: https://doi.org/10.1108/14777281111159375.

Eraut, M. and Hirsh, W. (2007). *The significance of workplace learning for individuals, groups and organisations*. Oxford: ESRC Centre on Skills, Knowledge and Organisational Performance (SKOPE).

Ericsson, K.A. (2015). Acquisition and maintenance of medical expertise. *Academic Medicine*, 90 (11), pp.1471–1486. Available from: https://doi.org/10.1097/acm.0000000000000939.

Erlich, D.R. and Shaughnessy, A.F. (2014). Student–teacher education programme (STEP) by step: transforming medical students into competent, confident teachers. *Medical Teacher*, 36 (4), pp.322–332. Available from: https://doi.org/10.3109/0142159x.2014.887835.

Evans, C., Mujis, D. and Tomlinson, D. (2015). *Engaged student learning: high impact strategies to enhance student achievement*. York: Higher Education Academy.

Farnsworth, J. and Boon, B. (2010). Analysing group dynamics within the focus group. *Qualitative Research*, 10 (5), pp.605–624. Available from: https://doi.org/10.1177/1468794110375223.

Fergy, S., Marks-Maran, D., Ooms, A., Shapcott, J. and Burke, L. (2011). Promoting social and academic integration into higher education by first-year student nurses: the APPL project. *Journal of Further and Higher Education*, 35 (1), pp.107–130. Available from: https://doi.org/10.1080/0309877x.2010.540318.

Finch, D., Peacock, M., Lazdowski, D. and Hwang, M. (2015). Managing emotions: a case study exploring the relationship between experiential learning, emotions, and student performance. *The International Journal of Management Education*, 13, pp.23–36.

Fletcher, J.F. and Painter-Main, M.A. (2014). An elephant in the room: bias in evaluating a required quantitative methods course. *Journal of Political Science Education*, 10, pp.121–135.

Flick, U. (2014). *The SAGE handbook of qualitative data analysis*. 5th ed. London: SAGE Publications Ltd. Available from: https://doi.org/10.4135/9781446282243.

Flinton, D.M. (2015). *Competency based assessment using irvtual reality (VERT): is it a realistic possibility ?* PhD thesis. The University of East London. Available from: https://doi.org/10.15123/pub.5174.

Frye, A.W. and Hemmer, P.A. (2012). Program evaluation models and related theories: AMEE Guide No. 67. *Medical Teacher*, 34, pp.288–299.

General Medical Council (2015a). *Assessment in undergraduate medical education. Advice supplementary to Tomorrows Doctors (2009)*. London.

General Medical Council (2015b). *Organising placements: Advice supplementary to Tomorrows Doctors (2009)*. London.

General Medical Council (2015c). *Promoting excellence - standards for medical education and training*. London.

Gobet, F. and Chassy, P. (2008). Towards an alternative to Benner's theory of expert intuition in nursing: a discussion paper. *International Journal of Nursing Studies*, 45 (1), pp.129–139. Available from: https://doi.org/10.1016/j.ijnurstu.2007.01.005.

Gooding, H.C., Mann, K. and Armstrong, E. (2017). Twelve tips for applying the science of learning to health professions education. *Medical Teacher*, 39(1), pp.26–31.

Greenhalgh, T. (2014). *How to read a paper. the basics of evidence based medicine.* 5th ed. Oxford: Blackwell Publishing Ltd.

Griffith, C.H., Georgesen, J.C. and Wilson, J.F. (2000). Six-year documentation of the association between excellent clinical teaching and improved studentsâ examination performances. *Academic Medicine*, 75(10), pp.62–64.

Haji, F., Morin, M. and Parker, K. (2013). Rethinking programme evaluation in health professions education: beyond did it work. *Medical Education*, 47, pp.342–351.

Hanley, B., Truesdale, A., King, A., Elbourne, D. and Chalmers, I. (2001). Involving consumers in designing, conducting, and interpreting randomised controlled trials: questionnaire survey. *British Medical Journal*, 322, pp.519–523.

Hart, A.M. and Bowen, A. (2016). New nurse practitioners perceptions of preparedness for and transition into practice. *The Journal of Nurse Practitioners*, 12(8), pp.545–552.

Hativa, N. (2000). *Teaching for effective learning in Higher Education*. Netherlands: Kluwer Academic Publishers.

Health and Care Professions Council (2013). *Standards of proficiency - Radiographers*. London: Health and Care Professions Council.

Health and Care Professions Council (2014). *Standards of education and training*. London: Health and Care Professions Council.

Health and Care Professions Council (2015). *Approved programmes* [Online]. Health and Care Professions Council. Available from: https://www.hcpc-uk.org/education/approved-programmes/approved-programmes-results/?Professions=270450014&ProviderQueryString=&IntakeModes=Open [Accessed 20 January 2015].

Heaven, C., Clegg, J. and Maguire, P. (2006). Transfer of communication skills training from workshop to workplace: the impact of clinical supervision. *Patient Education and Counseling*, 60 (3), pp.313–325. Available from: https://doi.org/10.1016/j.pec.2005.08.008.

HEFCE (2017). *Unistats data* [Online]. Available from: https://www.hesa.ac.uk/collection/c17061 [Accessed 12 March 2017].

Helmich, E., Bolhuis, S., Dornan, T., Laan, R. and Koopmans, R. (2012). Entering medical practice for the very first time: emotional talk, meaning and identity development. *Medical Education*, 46 (11), pp.1074–1086. Available from: https://doi.org/10.1111/medu.12019.

Hilman, S., Smith, R., Masson, S., Coomber, H., Bahl, A., Challapalli, A. and Jacobs, P. (2017). Implementation of a daily transperineal ultrasound system as image-guided radiotherapy for prostate cancer. *Clinical Oncology*, 29 (1), pp.49–54. Available from: https://doi.org/10.1016/j.clon.2016.07.002.

Holloway, I. and Wheeler, S. (2013). *Qualitative research in nursing and healthcare.* 3rd ed. West Sussex: Wiley-Blackwell Publications.

Holmboe, E.S., Sherbino, J., Englander, R., Snell, L. and Frank, J.R. (2017). A call to action: the controversy of and rationale for competency-based medical education. *Medical Teacher*, 39(6), pp.574–581.

Houser, M.L. and Frymier, A.B. (2009). The role of student characteristics and teacher behaviors in students' learner empowerment. *Communication Education*, 58 (1), pp.35–53. Available from: https://doi.org/10.1080/03634520802237383.

Humphrey, C. (2012). Dilemmas in doing insider research in professional education. *Qualitative Social Work: Research and Practice*, 12 (5), pp.572–586. Available from: https://doi.org/10.1177/1473325012446006.

Immordino-Yang, M.H. (2011). Implications of affective and social neuroscience for educational theory. *Educational Philosophy and Theory*, 43(1), pp.98–103.

Irby, D.M. (2014). Excellence in clinical teaching: knowledge transformation and development required. *Medical Education*, 48 (8), pp.776–784. Available from: https://doi.org/10.1111/medu.12507.

Issenberg, S.B., Mcgaghie, W.C., Petrusa, E.R., Gordon, D.L. and Scalese, R.J. (2005). Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. *Medical Teacher*, 27 (1), pp.10–28. Available from: https://doi.org/10.1080/01421590500046924.

Jackson, C. (2007). Assessment of clinical competence in therapeutic radiography: a study of skills, characteristics and indicators for future career development. *Radiography.* 13 (2), pp.147–158. Available from: https://doi.org/10.1016/j.radi.2005.12.003.

James, S. and Dumbleton, C. (2013). An evaluation of the utilisation of the virtual environment for radiotherapy training (VERT) in clinical radiotherapy centres across the UK. *Radiography.* 19 (2), pp.142–150. Available from: https://doi.org/10.1016/j.radi.2012.11.008.

Beyond facilitation in adult education: power dynamics in teaching and learning practices, (1997) [Online]. 27th Annual SCUTREA conference proceedings 1997 Crossing borders, breaking boundaries: Research in the education of adults. Available from: http://www.leeds.ac.uk/educol/documents/000000248.htm.

Johnson, B.A. (2014). Transformation of on-line teaching practices through implementation of appreciative inquiry. *Journal of Asynchronous Learning Network*, 18(3), pp.1–21.

Johnson, M. (2004). Real-world ethics and nursing research. *NT Research*, 9 (4), pp.251–261. Available from: https://doi.org/10.1177/136140960400900403.

Kalaniti, K. and Campbell, D.M. (2015). Simulation-based medical education: time for a pedagogical shift. *Indian Pediatrics*, 52 (1), pp.41–45. Available from: https://doi.org/10.1007/s13312-015-0565-6.

Kang, S.H.K. (2016). Spaced repetition promotes efficient and effective learning. *Policy Implications for Instruction Behavioral and Brain Sciences*, 3(1), pp.12–19.

Kaplan, A. and Maehr, M.L. (1999). Achievement goals and student well-being. *Contemporary Educational Psychology*, 24 (4), pp.330–358. Available from: https://doi.org/10.1006/ceps.1999.0993.

Kelly, M.A. and Hager, P. (2015). Informal learning: relevance and application to health care simulation. *Clinical Simulation in Nursing*, 11 (8), pp.376–382. Available from: https://doi.org/10.1016/j.ecns.2015.05.006.

Kember, D. (2000). Lecturers approaches to teaching and their relationship to conceptions of good teaching. *Instructional Science*, 28(5), pp.469–490. Available from: https://doi.org/10.1023/a:1026569608656.

Kemmis, S. and McTaggart, R. (2000). Participatory action research. In: *Handbook of qualitative research*. Ed. by N. Denzin and Y. Lincoln. 2nd ed. Thousand Oaks CA.: SAGE.

Khan, F.M., Gibbons, J.P. and Sperduto, P.W. (2016). *Khan's treatment planning in radiation oncology*. Philadelphia: Lippincott Williams and Wilkins.

Khan, K. and Ramachandran, S. (2012). Conceptual framework for performance assessment: competency, competence and performance in the context of assessments in healthcare – deciphering the terminology. *Medical Teacher*, 34 (11), pp.920–928. Available from: https://doi.org/10.3109/0142159x.2012.722707.

Kilminster, S., Cottrell, D., Grant, J. and Jolly, B. (2007). AMEE Guide No. 27: effective educational and clinical supervision. *Medical Teacher*, 29 (1), pp.2–19. Available from: https://doi.org/10.1080/01421590701210907.

Kirschner, P.A., Sweller, J. and Clark, R.E. (2006). Why minimal guidance during instruction does not work: an analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist*, 41 (2), pp.75–86. Available from: https://doi.org/10.1207/s15326985ep4102_1.

Knowles, M.S. (1980). *The modern practice of adult education: from pedagogy to andragogy.* Chicago, IL: Follet.: Follet.

Kolb, D.A. (1984). *Experiential learning: experience as the source of learning and development.* Englewood Cliffs NJ: Prentice-Hall.

Lane, C. and Rollnick, S. (2007). The use of simulated patients and role-play in communication skills training: a review of the literature to August 2005. *Patient Education and Counseling*, 67 (1), pp.13–20. Available from: https://doi.org/10.1016/j.pec.2007.02.011.

Lave, J. and Wenger, E. (1991). *Situated learning* [Online]. Cambridge: Cambridge University Press. Available from: https://www.ebook.de/de/product/2985304/jean_lave_etienne_wenger_situated_learning.html.

Leeuw, R.M. van der, Schipper, M.P., Heineman, M.J. and Lombarts, K.M.J.M.H. (2016). Residents' narrative feedback on teaching performance of clinical teachers: analysis of the content and phrasing of suggestions for improvement. *Postgraduate Medical Journal*, 92 (1085), pp.145–151. Available from: https://doi.org/10.1136/postgradmedj-2014-133214.

Lockspeiser, T.M., O'Sullivan, P., Teherani, A. and Muller, J. (2006). Understanding the experience of being taught by peers: the value of social and cognitive congruence. *Advances in Health Sciences Education*, 13 (3), pp.361–372. Available from: https://doi.org/10.1007/s10459-006-9049-8.

Loomis, J.A. (2016). Expanding the use of simulation in nurse practitioner education: a new model for teaching physical assessment. *The Journal for Nurse Practitioners*, 12 (4), pp.151–157. Available from: https://doi.org/10.1016/j.nurpra.2015.11.010.

Ludema, J. and Fry, R. (2008). The practice of appreciative inquiry. In: *The SAGE handbook of action research: participative inquiry and practice*. Ed. by P. Reason and H. Bradbury. 2nd ed. London: SAGE.

Luft, J. and Ingham, H. (1955). *The Johari window, a graphic model of interpersonal awareness. Proceedings of the western training laboratory in group development.* Los Angeles: UCLA.

Lumb, A. and Murdoch-Eaton, D. (2014). Electives in undergraduate medical education: AMEE Guide No. 88. *Medical Teacher*, 36, pp.557–572.

Mason, S.A., O'Shea, T.P., White, I.M., Lalondrelle, S., Downey, K., Baker, M., Behrens, C.F., Bamber, J.C. and Harris, E.J. (2017). Towards ultrasound-guided adaptive radiotherapy for cervical cancer: evaluation of Elekta's semiautomated uterine segmentation method on 3D ultrasound images. *Medical Physics*, 44 (7), pp.3630–3638. Available from: https://doi.org/10.1002/mp.12325.

McConnell, M.M. and Eva, K.W. (2012). The role of emotion in the learning and transfer of clinical skills and knowledge. *Academic Medicine*, 87 (10), pp.1316–1322. Available from: https://doi.org/10.1097/acm.0b013e3182675af2.

McIntosh, P., Freeth, D. and Berridge, E.J. (2013). Supporting accomplished facilitation: examining the use of appreciative inquiry to inform the development of learning resources for medical educators. *Educational Action Research*, 21(3), pp.376–391.

McPake, M. (2018). *An exploration of the practice placement models used in UK radiotherapy departments.* PhD thesis. Glasgow Caledonian University.

McPake, M. (2019). Radiographers' and students' experiences of undergraduate radiotherapy practice placement in the United Kingdom. *Radiography.* 25, pp.220–226.

Mehay, R. (2012). *The essential handbook for GP training and education* [Online]. Oxford: Radcliffe Publishing. Available from: https://www.ebook.de/de/product/18703069/ramesh_mehay_the_essential_handbook_for_gp_training_and_education.html.

Menter, I. (2014). *Theories of professional learning. a critical guide for teacher educators.* Northwich: Carey Philpott.

Mercer, J. (2007). The challenges of insider research in educational institutions: wielding a double-edged sword and resolving delicate dilemmas. *Oxford Review of Education*, 33 (1), pp.1–17. Available from: https://doi.org/10.1080/03054980601094651.

Merriam, S.B. (2001). Andragogy and self-directed learning: pillars of adult learning theory. *New Directions for Adult and Continuing Education*, 2001(89), p.3. Available from: https://doi.org/10.1002/ace.3.

Merton, R.K. (1972). Insiders and outsiders: a chapter in the sociology of knowledge. *American Journal of Sociology*, 78 (1), pp.9–47. Available from: https://doi.org/10.1086/225294.

Metcalfe, P., Kron, T. and Hoban, P. (2007). *The physics of radiotherapy X-rays and electrons* [Online]. London: Medical Physics Pub Corp. Available from: https://www.amazon.com/Physics-Radiotherapy-X-Rays-Electrons/dp/1930524366?SubscriptionId=AKIAIOBINVZYXZQZ2U3A&tag=chimbori05-20&linkCode=xm2&camp=2025&creative=165953&creativeASIN=1930524366.

Meyer, J.H.F. (2010). *Threshold concepts and transformational learning (educational futures: rethinking theory and practice)* [Online]. Rotterdam: Sense Publishers. Available from: https://www.amazon.com/Threshold-Concepts-Transformational-Learning-Educational/dp/9460912052?SubscriptionId=AKIAIOBINVZYXZQZ2U3A&tag=chimbori05-20&linkCode=xm2&camp=2025&creative=165953&creativeASIN=9460912052.

Miles, M.B. and Huberman, A.M. (1994). *Qualitative data analysis: an expanded sourcebook, 2nd edition* [Online]. London: SAGE Publications, Inc. Available from: https://www.amazon.com/Qualitative-Data-Analysis-Expanded-Sourcebook/dp/0803955405?SubscriptionId=AKIAIOBINVZYXZQZ2U3A&tag=chimbori05-20&linkCode=xm2&camp=2025&creative=165953&creativeASIN=0803955405.

Miller, G.E. (1990). The assessment of clinical skills competence and performance. *Academic Medicine*, 65(9), pp.63–67.

Moher, D., Liberati, A., Tetzlaff, J. and Altman, D.G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the prisma statement. *British Medical Journal*, 339(1), pp.25–35.

Moore, R., Arnot, M., Beck, J. and Daniels, H. (2006). *Knowledge, power and educational reform: applying the sociology of Basil Bernstein*. United Kingdom: Routledge.

Motola, I., Devine, L.A., Chung, H.S., Sullivan, J.E. and Issenberg, S.B. (2013). Simulation in healthcare education: a best evidence practical guide. AMEE Guide No. 82. *Medical Teacher*, 35 (10), pp.1511–1530. Available from: https://doi.org/10.3109/0142159x.2013.818632.

Murre, J.M.J. and Dros, J. (2015). Replication and analysis of Ebbinghaus' forgetting curve. *PloS One.* 10 (1), pp.1–42. Available from: https://doi.org/10.1371/journal.pone.0120644.

National Occupational Standards (2017). *National occupational standards for radiotherapy* [Online]. Available from: https://www.ukstandards.org.uk/Pages/results.aspx?k=radiography#Default=%7B%22k%22%3A%22radiotherapy%22%2C%22r%22%3A%5B%7B%22n%22%3A%22RefinableString01%22%2C%22t%22%3A%5B%22%5C%22%C3%87%C2%82%C3%87%C2%82526164696f746865726170793b20%5C%22%22%5D%2C%22o%22%3A%22and%22%2C%22k%22%3Afalse%2C%22m%22%3Anull%7D%5D%7D [Accessed 17 March 2017].

Naylor, S., Ferris, C. and Burton, M. (2016). Exploring the transition from student to practitioner in diagnostic radiography. *Radiography.* 22, pp.131–136.

Nestel, D. and Tierney, T. (2007). Role-play for medical students learning about communication: guidelines for maximising benefits. *BMC Medical Education*, 7 (1), pp.1–9. Available from: https://doi.org/10.1186/1472-6920-7-3.

Newstrom, J.W. and Rubenfeld, S.A. (1983). The JOHARI window: a reconceptualixation. *Developments in Business Simulation & Experiential Exercises* [Online],

10. Available from: https://absel-ojs-ttu.tdl.org/absel/index.php/absel/article/download/2298/2267.

Newton, J.M. and McKenna, L. (2007). The transitional journey through the graduate year: a focus group study. *International Journal of Nursing Studies*, 44, pp.1231–1237.

Ng, C.K., White, P. and McKay, J.C. (2008). Establishing a method to support academic and professional competence throughout an undergraduate radiography programme. *Radiography.* 14, pp.255–264.

Nicol, D.J. and Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: a model and seven principles of good feedback practice. *Studies in Higher Education*, 31 (2), pp.199–218. Available from: https://doi.org/10.1080/03075070600572090.

Nixon, S. (2001). Professionalism in radiography. *Radiography.* 7 (1), pp.31–35. Available from: https://doi.org/10.1053/radi.2000.0292.

Nowell, L.S., Norris, J.M., White, D.E. and Moules, N.J. (2017). Thematic analysis. Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, 16 (1), pp.1–13. Available from: https://doi.org/10.1177/1609406917733847.

Palmer, C. and Cherryman, F. (2009). Supporting student success. *Journal of Medical Imaging and Radiation Sciences*, 40 (1), pp.38–44. Available from: https://doi.org/10.1016/j.jmir.2009.01.003.

Passi, V., Peile, S.J. andEd, Wright, S., Hafferty, F. and Johnson, N. (2013). Doctor role modelling in medical education: BEME Guide No. 27. *Medical Teacher*, 35(9), pp.1422–1436.

Paterson, A. (2012). Cancer: implications for pre-registration radiography curricula. *Radiography.* 18 (1), pp.47–50. Available from: https://doi.org/10.1016/j.radi.2011.11.002.

Pekrun, R., Goetz, T., Titz, W. and Perry, R.P. (2002). Academic emotions in students: self-regulated learning and achievement: a program of qualitative and quantitative research. *Educational Psychologist*, 37 (2), pp.91–105. Available from: https://doi.org/10.1207/s15326985ep3702_4.

Perez, C.A. and Mutic, S. (2013). Advances and future of radiation oncology. *Reports of Practical Oncology & Radiotherapy*, 18 (6), pp.329–332. Available from: https://doi.org/10.1016/j.rpor.2013.10.010.

Perram, A., Hills, C., Johnston, C., MacDonald-Wicks, L., Surjan, Y., James, D. and Warren-Forward, H. (2016). Characteristics of an ideal practice educator: perspectives from undergraduate students in diagnostic radiography, nuclear medicine, nutrition and dietetics, occupational therapy, physiotherapy and radiation therapy. *Radiography.* 22 (4), pp.295–305. Available from: https://doi.org/10.1016/j.radi.2016.04.007.

Pijl-Zieber, E.M., Barton, S., Konkin, J., Awosoga, O. and Caine, V. (2014). Competence and competency-based nursing education: finding our way through the issues. *Nurse Education Today*, 34, pp.676–678.

Pilcher, J.W. and Bedford, L. (2011). Willingness and preferences of nurses related to learning with technology. *Journal for Nurses in Professional Development.* 27(3), pp.10–16.

Piquette, D., Moulton, C.-A. and LeBlanc, V.R. (2015). Balancing care and teaching during clinical activities: 2 contexts, 2 strategies. *Journal of Critical Care*, 30 (4), pp.678–684. Available from: https://doi.org/10.1016/j.jcrc.2015.03.002.

Poskitt, J. (2014). Transforming professional learning and practice in assessment for learning. *The Curriculum Journal*, 25(4), pp.542–566.

Preskill, H. and Coghlan, T. (2003). *Using appreciative inquiry in evaluation*. San Francisco: Jossey-Bass.

Price, R. (2009). Diploma to degree 1976 to 1993. *Radiography.* 15 (1), pp.67–71. Available from: https://doi.org/10.1016/j.radi.2009.10.007.

Ramani, S. and Leinster, S. (2008). AMEE Guide No. 34: teaching in the clinical environment. *Medical Teacher*, 30 (4), pp.347–364. Available from: https://doi.org/10.1080/01421590802061613.

Reed, J. (2007). *Appreciative inquiry: research for change.* Thousand Oaks, CA.: SAGE Publications.

Reisberg, D. and Hertel, P. (2003). *Memory and emotion (series in affective science)* [Online]. Oxford: Oxford University Press. Available from: https://www.amazon.com/Memory-Emotion-Affective-Science-Reisberg/dp/0195158563?SubscriptionId=AKIAIOBINVZYXZQZ2U3A&tag=chimbori05-20&linkCode=xm2&camp=2025&creative=165953&creativeASIN=0195158563.

Ritchie, J., Lewis, J., Nicholls, C.M. and Ormston, R. (2014). *Qualitative research practice. A guide for social science students and researchers* [Online]. 2nd ed. Los Angeles: SAGE Publications Ltd. Available from: https://www.ebook.de/de/product/21214796/jane_ritchie_qualitative_research_practice.html.

Ross, M.T. and Cameron, H.S. (2007). Peer assisted learning: a planning and implementation framework: AMEE Guide No. 30. *Medical Teacher*, 29 (6), pp.527–545. Available from: https://doi.org/10.1080/01421590701665886.

Russell, B. (1959). *My philosophical development.* London: George Allen and Unwin.

Saavedra, A.R. and Opfer, V.D. (2012). *Teaching and learning 21st century skills: lessons from the learning sciences.* Global Cities Education.

Sandars, J. and Murdoch-Eaton, D. (2017). Appreciative inquiry in medical education. *Medical Teacher*, 39(2), pp.123–127.

Schön, D.A. (1983). *The reflective practitioner. How professionals think in action.* USA: Basic Books.

Schutz, P. and Lanehart, S.L. (2002). Emotions in education. *Educational Psychologist*, 37 (1), pp.67–134.

Scott, C.L. (2015). *The futures of learning 3: what kind of pedagogies for the 21st century?* [Online]. UNESCO Education Research and Foresight, (technical report). Available from: http://repositorio.minedu.gob.pe/bitstream/handle/123456789/3747/The%20Futures%20of%20Learning%203%20what%20kind%20of%20pedagogies%20for%20the%2021st%20century.pdf?sequence=1&isAllowed=y.

Shafiq, J., Barton, M., Noble, D., Lemer, C. and Donaldson, L.J. (2009). An international review of patient safety measures in radiotherapy practice. *Radiotherapy and Oncology*, 92 (1), pp.15–21. Available from: https://doi.org/10.1016/j.radonc.2009.03.007.

Shanahan, M. (2016). Student perspective on using a virtual radiography simulation. *Radiography.* 22, pp.217–222.

Sheffield Hallam University (2017). *BSc (Hons) Radiotherapy and Oncology course handbook* [Online]. Sheffield Hallam University. Available from: https://www3.shu.ac.uk/HWB/placements/RadiotherapyAndOncology/documents/BScCourseHandbook%20201718.pdf [Accessed 20 March 2017].

Shepard, L. (2009). The role of assessment in a learning culture. *Education Research*, 29, pp.4–14.

Silverman, D. (2000). *Doing qualitative research: a practical handbook.* London: Sage Publications Ltd.

Silverman, D. (2016). *Qualitative research.* 4th ed. London: SAGE Publications Ltd.

Society and College of Radiographers (2009). *Mentoring guidance and advice.* London: Society and College of Radiographers, pp.1–8.

Society of Radiographers (2017a). *Analysis of student and recently qualified radiographers survey 2014* [Online]. Available from: https://www.sor.org/learning/document-library/analysis-student-and-recently-qualified-radiographers-survey-2014 [Accessed 10 September 2017].

Society of Radiographers (2017b). *Careers information* [Online]. Society of Radiographers. Available from: https://www.sor.org/about-radiography/career-radiography [Accessed 17 March 2017].

Society of Radiographers (2019). *A career in radiography* [Online]. Society of Radiographers. Available from: https://www.sor.org/about-radiography/career-radiography [Accessed 10 September 2017].

Speelman, C.P. and Shadbolt, E. (2018). The role of awareness of repetition during the development of automaticity in a dot-counting task. *Peer Journal*, 6 (1), pp.4329–4337.

St Georges University of London (2017). *Programme specification BSc (Hons) Therapeutic Radiography* [Online]. Available from: https://www.sgul.ac.uk/about-us/governance/quality-assurance/programme-specifications [Accessed 20 March 2017].

Sutton, R. (2013). *A focused ethnography of radiotherapy students learning on their first clinical placement.* PhD thesis. School of Social Sciences, Cardiff University: Cardiff University.

Sweller, J., Merrienboer, J. van and Paas, F. (2019). Cognitive architecture and instructional design: 20 years later. *Educational Psychology Review*, 31 (2), pp.261–292. Available from: https://doi.org/10.1007/s10648-019-09465-5.

Tamachi, S., Giles, J.A., Dornan, T. and Hill, E.J.R. (2018). You understand that whole big situation they're in: interpretative phenomenological analysis of peer-assisted learning. *BMC Medical Education*, 18 (1), pp.1–8. Available from: https://doi.org/10.1186/s12909-018-1291-2.

Tanner, K.D. (2012). Promoting student metacognition. *CBE—Life Sciences Education*, 11 (2), pp.113–120. Available from: https://doi.org/10.1187/cbe.12-03-0033.

Tartwijk, J.V. and Driessen, E.W. (2009). Portfolios for assessment and learning: AMEE Guide No. 45. *Medical Teacher*, 31 (9), pp.790–801. Available from: https://doi.org/10.1080/01421590903139201.

Taylor, D.C.M. and Miffin, B. (2008). Problem-based learning: where are we now? *Medical Teacher*, 30, pp.742–763.

Taylor, D.C. and Hamdy, H. (2013). Adult learning theories: implications for learning and teaching in medical education: AMEE Guide No. 83. *Medical Teacher*, 35, pp.1561–1572.

UK Houses of Parliament (2017a). *Ionising Radiation (Medical Exposure) Regulations 2017* [Online]. London.

UK Houses of Parliament (2017b). *Ionising radiation regulations 2017.* [Online]. London. Available from: https://www.legislation.gov.uk/uksi/2017/1075/contents.

University of Hertfordshire (2017). *Programme Specification. BSc (Hons) Radiotherapy and Oncology* [Online]. University of Hertfordshire. Available from: https://www.herts.ac.uk/courses/radiotherapy-and-oncology [Accessed 22 March 2017].

University of Liverpool (2017). *Programme specification undergraduate* [Online]. University of Liverpool. Available from: https://www.liverpool.ac.uk/media/livacuk/tqsd/programmespecs/Radiotherapy,BSc.pdf [Accessed 19 March 2017].

University of Portsmouth (2017). *BSc (Hons) Radiotherapy and Oncology programme specification* [Online]. Available from: http://psd.docstore.port.ac.uk/C2719F.pdf [Accessed 20 March 2017].

Vygotsky, L.S. (1962). *Thought and language.* Cambridge MA: MIT Press.

Vygotsky, L.S. (1978). *Mind in society. The development of higher psychological processes.* [Online]. Cambridge MA: Harvard University Press. Available from: https://www.ebook.de/de/product/3598246/l_s_vygotskii_mind_in_society.html.

Wenger, E. (1998). *Communities of practice: learning, meaning, and identity.* Cambridge University Press.

Westbrook, C. (2016). *Shedding new light on magnetic resonance imaging practitioner education: jack of all trades or master of one?* PhD thesis. Anglia Ruskin University.

Westwood, O.M.R. (2013). *How to assess students and trainees in medicine and health* [Online]. West Sussex: Wiley-Blackwell. Available from: https://www.ebook.de/de/product/20466707/olwyn_m_r_westwood_how_to_assess_students_and_trainees_in_medicine_and_health.html.

White, C.B., Kumagai, A.K., Ross, P.T. and Fantone, J.T. (2009). A qualitative exploration of how the conflict between the formal and informal curriculum influences student values and behaviors. *Academic Medicine*, 84 (5), pp.597–603. Available from: https://doi.org/10.1097/acm.0b013e31819fba36.

White, C., Bradley, J., Martindale, J., Roy, P., Patel, K., Yoon, M. and Worden, M.K. (2014). Why are medical students 'checking out' of active learning in a new curriculum? *Medical Education*, 48 (3), pp.315–324. Available from: https://doi.org/10.1111/medu.12356.

Whitney, D. and Cooperrider, D.L. (2012). The appreciative inquiry summit: an emerging methodology for whole system positive change. *Journal of the Organization Development Network*, 32 (1), pp.13–26.

Williams, P.L., White, N., Klem, R., Wilson, S.E. and Bartholomew, P. (2006). Clinical education and training: using the nominal group technique in research with radiographers to identify factors affecting quality and capacity. *Radiography.* 12 (3), pp.215–224. Available from: https://doi.org/10.1016/j.radi.2005.06.001.

Winch, C. (2010). *Dimensions of expertise: a conceptual exploration of vocational knowledge* [Online]. London: Continuum International Publishing Group. Available from: https://www.amazon.com/Dimensions-Expertise-Conceptual-Exploration-Vocational/dp/1847062687?SubscriptionId=AKIAIOBINVZYXZQZ2U3A&tag=chimbori05-20&linkCode=xm2&camp=2025&creative=165953&creativeASIN=1847062687.

Woodhouse, H. (2017). Contrasting views of emotion in learning: Alfred North Whitehead and Jerome Bruner. *Interchange: A Quarterly Review of Education*, 48 (3), pp.217–230. Available from: https://doi.org/10.1007/s10780-016-9299-1.

Wright, A., Moss, P., Watson, K., Rue, S., Jull, G., Mandrusiak, A., Reubenson, A., Connaughton, J., Redmond, C., MacIntosh, S., Alison, J., Chipchase, L., Clements, T., Blackstock, F., Morgan, P., Laakso, L., Zwan, K. van der, Corrigan, R., Jones, A., Teys, P. and Palmer, T. (2015). A profession-wide collaboration to embed role-play simulation into Australian entry-level physiotherapy clinical training. *Physiotherapy.* 101 (1), pp.1047–1057. Available from: https://doi.org/10.1016/j.physio.2015.03.1924.

Yardley, S., Teunissen, P.W. and Dornan, T. (2012). Experiential learning: AMEE Guide No. 63. *Medical Teacher*, 34 (2), pp.102–115. Available from: https://doi.org/10.3109/0142159x.2012.650741.

Young, J.Q., Merrienboer, J.V., Durning, S. and Cate, O.T. (2014). Cognitive Load Theory: implications for medical education: AMEE Guide No. 86. *Medical Teacher*, 36 (5), pp.371–384. Available from: https://doi.org/10.3109/0142159x.2014.889290.

Young, M. (2014). Towards a professional curriculum. Cross disciplinary perspectives on expertise, know-how and professional education. 21 March 2014. London.

Young, M. and Muller, J. (2014). *Knowledge, expertise and the professions*. London: Routledge.

Zhao, J. and Gallant, D.J. (2012). Student evaluation of instruction in higher education: exploring issues of validity and reliability. *Assessment & Evaluation in Higher Education.* 37(2), pp.227–235.

Ziv, A., Ben-David, S. and Ziv, M. (2005). Simulation based medical education: an opportunity to learn from errors. *Medical Teacher*, 27 (3), pp.193–199. Available from: https://doi.org/10.1080/01421590500126718.

Appendices

A. Radiotherapy programme data

RT Courses accessed 2017.03.19

HCPC Approved courses (SEARCH TERM - RADIOGRAPHERS ALL ENGLISH REGIONS)

HEI WEBSITES & UNISTATS DATA (RADIOTHERAPY / THERAPEUTIC RADIOGRAPHY)

HEI	Name of Degree	Date of Prog Spec	Comments	Website Info
Birmingham City Uni	BSc (Hons) Radiotherapy	2014-15 AND 2017-18	2014-15 is current so will resemble website Begins Sept 017 Downloaded	Not for 2017
City, Uni of London	BSc (Hons) Radiography (Radiotherapy and Oncology)	2016-17	Aug 2016	Yes
Hertfordshire	BSc (Hons) Radiotherapy and Oncology	2016-17		
London South Bank Uni	BSc (Hons) Therapeutic Radiography	2010-11	Downloaded	Yes
Liverpool	BSc (Hons) Radiotherapy	2014-15	Downloaded	Yes
Portsmouth	BSc (Hons) Therapeutic Radiography	2016-17	Downloaded	
Suffolk	BSc (Hons) Radiotherapy and Oncology	2016	Online	Only version available
SHU	BSc (Hons) Radiotherapy and Oncology	-	2016 Prog Handbook	Yes
St George's	BSc (Hons) Therapeutic Radiography	2016-17	Downloaded	Yes
UWE, Bristol	BSc (Hons) Radiotherapy and Oncology	2016-17	Nov 2016 Downloaded	Yes

BCU

Year 1

Physics for Radiotherapy
In this module you will develop your understanding of the underpinning aspects of physics related to radiography and radiotherapy.

Professional and Compassionate Care
This module will equip you with the fundamental patient care skills that are needed to practice as a safe and competent therapeutic radiographer.

Principles of Oncology & Radiotherapy
In this module you will be introduced to the core aspects of oncology, cancer management and the principles of radiotherapy treatment techniques and planning.

Radiotherapy Theory and Practice 1
Within this module of study you will develop knowledge of anatomy, physiology, management and radiotherapy treatment techniques of cancers. Your studies within this module will form the foundation of your developing clinical skills.

Year 2

Applied Radiotherapy Technology and Radiobiology
In this module you will cover the principles of radiobiology and the effects of ionising radiation on cells, tissues and body systems.

Evidence Based Practice
In this module you will be developing an understanding of a range of research tools including basic statistics. You will explore how your professional practices are based upon the best evidence available.

Radiotherapy Theory and Practice 2
Whilst studying this module you will further develop your specialist knowledge relating to cancers that affect the bones, head and neck region, the haemopoietic, endocrine and nervous systems, and will use your clinical practice to apply this learning.

Year 3

Advanced Management of the Oncology Patient
In this module you will be focussing on the needs of the oncology patient on an individual basis. You will be able to discuss clinical decision making with respect to management of cancer, and will also study other aspects of health including dementia, obesity and cardiovascular disease.

The Competent Radiotherapy Practitioner

This module will support your final transition from student to registered practitioner. You will be exploring the role of the therapeutic radiographer within the radiotherapy and oncology settings and across different healthcare systems.

Radiography Research
This module provides you with first-hand experience of devising a research proposal and develop your skills of enquiry and research in your own chosen area of interest.

As radiotherapy is one of the main methods used in the treatment of cancer, this course will develop your knowledge and understanding of oncology, radiotherapy technology, professional practice and the psychosocial issues surrounding healthcare. Once developed, these skills will enable you to use specialist technology to relieve and/or cure the symptoms for patients as well as supporting and developing relationships with them during their treatment.
We place a strong emphasis on clinical experience, which we offer via placements. These are your chance to be a part of the working world of health and social care as it really is: your first taste of your career.
Placements help you with your confidence, by putting theory from the classroom into practice. We make sure you get a quality experience and that you are fully supported by a workplace mentor on hand throughout your placement.
Your time spent at the university involves accessing learning opportunities that support your knowledge of radiotherapy practice. You will be accessing a wide range of teaching session including lectures, seminars, and small group workshops and electronic resources. You will work closely with other students in your group and will collaborate with students from other year groups and other courses.
Number of hours in the classroom per week
You will study a minimum of 18 hours per week within taught sessions at the university. The nature of this contact time may vary from week to week dependent on the activities you will access (such as lectures, seminars, workshops or tutorials).
Examples of classroom activities
You will be employing your team working skills within the classroom setting within teaching workshops. This may include collaboration with more senior students who may work with you as mentors to help guide you and offer their advice with respect to study skills for example.
You will also be learning within our virtual environment for radiotherapy training (VERT) where you can practice treatment techniques and study cross sectional anatomy using 3D immersive technology.

Students studying within the Department of Radiography have accessing to the following dedicated specialists teaching resources:
- VERT Suite
- Radiotherapy planning system
- Radiotherapy lasers
- PACS viewing room
- Diagnostic Computed Radiography imaging suite (‘X-Ray room’)
- Ultrasound simulator and ultrasound scanner

We are constantly investing in our estate and are currently in the process of spending £260 million on new learning facilities.
We boast up-to-date, innovative facilities that simulate the real situations that medical staff may come across.
These resources are essential in offering students a hands-on introduction to health and social care practice. Much of our teaching is carried out within our state-of-the-art, £30m Seacole Building, which houses some of the best learning facilities in the UK.

In a sector where new techniques are constantly being discovered, we work hard to ensure that students learn using the most up-to-date equipment available. These include the only mock operating theatre in an English university and a cutting-edge radiography virtual clinical training facility, virtual ward and virtual case creator.

VERT
We are also a major pilot site for a state-of-the-art, radiotherapy virtual clinical training facility, which will help to support you with your training. This unique facility will allow you to simulate x-ray techniques using the latest computer software. With this new technology, we are the best equipped radiography centre in the region.

XRay Room/PACS Room
This is a real, working X-ray room, where students can practice taking x-rays and also to digitise them to view on the PACS system. We use a portable camera system that can record and stream video to any other classroom on the campus so we can simulate scenarios with our students.

Lectures and seminars	Self-directed study	Work based placements	Year
8	10	82	1
9	28	63	2
14	32	54	3

Assessment

% Written exams	% Coursework	% practical exams	Year
65	35	0	1
39	61	0	2
38	62	0	3

CITY

The compulsory modules in the first year will introduce you to the principles and practice of radiotherapy. Year one is spent primarily studying at City.
Core modules include:

- Common module I
- Common module II
- Principles of radiotherapy practice
- Anatomy, physiology and oncology I
- Anatomy, physiology and oncology II
- Radiotherapy equipment.

Year 2
In the second year, you will move on to more specialised subjects and begin to apply the knowledge and experience gained in year one.
Core modules include:

- Radiotherapy research and statistics
- Management and radiotherapy technique A
- Competence to practice A
- Radiotherapy physics and planning
- Radiobiology.

Year 3

During the final year, the modules help you to become more critical and evaluative in your work.
Core modules include:

- Holistic patient care
- Management and radiotherapy technique B
- Competence to practice B1
- Competence to practice B2
- Healthcare policy and quality management
- A research exercise/project.

Teaching and learning
The BSc (Hons) Radiography (Radiotherapy and Oncology) course is taught by expert staff who are leaders in the field, many of whom have worked in specialised roles and advanced practice prior to their commencing their teaching career.
You will be taught in various ways including lectures, workshops, seminars, self-directed study, research exercises, group-learning and work-based activity and tutorials. City also reinforces teaching through the use of e-learning that enables you to learn interactively using the internet, with self-tests and quizzes as well as online lecture notes being made available.
Practical training takes place within the Centre for Radiography based in the School's Clinical Skills Centre and provides a unique and safe environment for students to practice their skills in preparation for clinical practice. City's state-of-the-art centre offers access to the latest equipment in a self-contained

simulated hospital environment where students can prepare for their clinical placements. The centre has specialist rooms including radiotherapy planning, virtual environment radiotherapy training (VERT) treatment room, and clinical skills training rooms.
Work is assessed through coursework, written examinations, class tests, multiple choice tests, practical examination and clinical assessments while on clinical placement. In a typical three year degree, your final degree classification is calculated from the first, second and final years, with weightings of 20 per cent, 30 per cent and 50 per cent respectively.

Academic facilities

City, University of London has one of the most well equipped radiography training facilities in the country. We offer students a unique environment mirroring many of the facilities you will encounter whilst undertaking your practice placements in the clinical environment, providing a challenging yet supportive environment in which to study.
Within the Clinical Skills Centre at our Northampton Square campus you will benefit from the VERT (Virtual Environment of a Radiotherapy Treatment) room which creates a fully immersive, life-sized 3D simulation of a radiotherapy treatment room. You will also use the Varian Eclipse radiotherapy dosimetry planning system. These facilities provide models, simulation, enhanced visualisation and training aids for the planning and treatment of radiotherapy patients.

Placements

Placements are a vital part of your programme and prepare you for entering the work place when you graduate. City works in partnership with a range of hospital trusts in London and Essex including The Royal Free Hospital, University College London Hospital, The London Clinic and St Bartholomew's Hospital in London and in Essex, Queen's Hospital Romford and Southend University Hospital. During your course, you will have one primary clinical placement as your main site, as well as rotating through other hospitals to gain greater clinical experience. During clinical placements you will learn through observation and supervised practice, this is then supported by tutorials which allow you to reflect upon practice.
Whilst on placement you will be fully supported by City and will receive regular visits by your link lecturer (approximately once a week). You will also be supervised by qualified clinical staff within the workplace who will support your development whilst on placement.

Lectures and seminars	Self-directed study	Work based placements	Year
22	78	0	1
31	64	5	2
13	49	38	3

Assessment

% Written exams	% Coursework	% practical exams	Year
92	8	0	1
5	37	58	2
0	30	70	3

HERTFORDSHIRE

About the course

Oncology is the study and practice of treating malignant disease (cancer). One method of treating people with cancer is radiotherapy, a dynamic and ever-changing area of oncology, which uses ionising radiation at high energies to either cure the patient or improve their quality of life.
The BSc (Hons) Radiotherapy and Oncology course prepares you for a future career in radiotherapy and provides the training to become a highly skilled practitioner who will be capable of planning and administering radiotherapy treatment. The necessary radiotherapy skills combine a high degree of technical expertise with the ability to manage the physical needs of the patient.
When you work in a radiotherapy department you also need additional skills, which you will be taught in this radiotherapy and oncology course, such as communication skills to manage the psychological and emotional aspects of cancer for patients, their relatives and friends.
Key qualities include an affinity for science, good interpersonal skills, the ability to work in a team or independently and an enthusiastic, motivated and caring attitude.
The BSc (Hons) Radiotherapy and Oncology course has been designed in collaboration with practitioners and health service managers and combines both academic and clinical placements. Our accredited clinical placement sites are located in cancer centres covering a wide geographical area including centres located in the west of London, Northampton, Northwood, Oxford, Peterborough and Reading.
There is full integration of theory with practice and highly qualified clinical personnel work closely with our academic team to ensure the highest standard of education, support and professional development during your clinical placements. Approximately half your time is spent in practice each year. You will be allocated to a host placement site where most of your clinical practice takes place, however in your final year, there will be opportunities for specialist placements, and for elective placements of your choice either in the UK or abroad.

First Year

During the first year you will study modules designed to underpin your understanding of clinical practice including fundamental physical, biological, psychological and social sciences, as well as introducing topics specific to oncology and radiotherapy.

Second Year

The second year will build on your first year study, with focus on the understanding and application of planning and treatment delivery, including a widened range of clinical techniques. There is coverage of practical clinical oncology and cancer management.

Final Year

The final year gives a wider perspective of health and health care. Your knowledge is consolidated with topics covering current radiotherapy practice. Advice and information on securing your first post is provided with the structure of the degree is designed to equip you for a life-long learning approach and to encourage future continuous development. On graduation (and subject to state registration) you will be able to commence your career without further training.

Why choose this course?

- The course prepares you for a demanding but rewarding career in therapeutic radiography
- It is a full and varied course that gives you the therapeutic radiography skills, knowledge and attributes expected of the highly skilled practitioner
- It has been designed in collaboration with practitioners and health service managers and combines both academic and clinical placements

Entry requirements...

2017 entry

120 - 136 UCAS Points

UCAS have introduced a new tariff for 2017 entry so the points being asked for are substantially different to previous years.
We operate a flexible admissions policy and treat everyone as an individual. This means that we will take into consideration your educational achievements and predicted grades (if applicable) together with your application as a whole including work experience and personal statement and may make an offer at any point within the stated tariff range. We also welcome applicants who are predicted grades in excess of our published tariff.

All Applicants must have a minimum of 5 GCSEs (or equivalent) at grade C / grade 4 or above which must include Maths, English and Science taken at one sitting.

- 120 UCAS points from **GCE A2/AS levels** to include 96 points from A2 subjects and should include grade C or above from a Science subject or Mathematics
- **BTEC Extended Diploma** in Applied Science with DDM profile, or BTEC Extended Diploma in Health & Social Care with DDM profile plus Grade C or above in a GCE A level Science or Maths subject.
- **Irish Leaving certificate** 120 points calculated from 5 higher level subjects to include B2 or above from science
- A science based **foundation degree** in which all modules are passed with an average mark of 60% over all.
- **Access to HE** in Science or Health Studies (or similar) to include: 45 credits at level 3 of which 24 credits are Distinction including 9 credits from a Science subject and 21 credits are Merit For those applicants who do not have GCSE english grade C or equivalent we require 6 credits in English and for those that do not have GCSE Maths Grade C or equivalent we require 6 credits in numerical subjects.
- **Extended Degree** in Science UH progression route average mark of 60% or greater. Must also have completed including a minimum of 60% in Mammalian Physiology and 55% in Maths for Science. Students may also find it useful to take Physics.
- **International Baccalaureate** 120 points from 1 HL subject at grade 5 or above and 1 HL subject at grade 4 or above to include a life science or maths subject.
- For a science based degree minimum of 2:2 classification achieved.

For all applicants where English is not their first language IELTS at level 7 (with no less than 6.5 achieved in any one band) are required.
If you do not have the required IELTS or equivalent for direct entry on to your degree programme, our Pre-sessional English and International Foundation courses can help you to achieve this level.
For country specific qualifications, please visit our Your Country page.
All offers will be subject to the applicants demonstration of the NHS constitution's "Values and Behaviours", satisfactory interviews, numeracy and literacy test, health screening and the Disclosure and Barring Services (DBS) checks. You can view the full NHS Constitution for England on the Government website:
https://www.gov.uk/government/publications/the-nhs-constitution-for-england
Guidelines for work experience and clinical visits

Key staff

Sam Glendinning

Proffesional Accreditations

Professional Accreditations

Eligibility to apply for membership of the Society of Radiographers and registration with the Health and Care Professions Council as a Therapeutic Radiographer

Careers

Successful completion of this radiotherapy and oncology course leads to an honours degree and eligibility to apply for state registration with the Health and Care Professions Council as a Therapeutic Radiographer.
Radiotherapy provides excellent career prospects with the opportunity for continuous career development and opportunities to work in various specialties such as advanced practice, education, research and as an application specialist. The qualification is also recognised by other countries around the world providing prospects to work abroad.

Teaching methods

A variety of teaching methods are employed in order for you to learn and develop the necessary skills to become a competent practitioner. These can include lectures, small group tutorials, seminars and clinical practice.
We also spend time in our radiotherapy labs including our planning suite, our VERT simulation centre and our imaging lab

Work Placement

As a student on the BSc (Hons) Radiotherapy and Oncology course, you will spend approximately 18-20 weeks per year on clinical placement gaining the valuable radiotherapy experience that you will need when you graduate and pursue a career as a Therapeutic Radiographer.
The placements will give you the opportunity to link the theoretical knowledge you gain via the lectures and seminars with the practical experiences.
Clinical placement are arranged in six accredited cancer centres in Berkshire, Cambridgeshire, Middlesex, London, Oxfordshire and Northamptonshire. They are managed and supported by a dedicated team of university lecturers, practice placement staff and clinical co-ordinators who work together to ensure that each student's clinical practice experience is of the highest quality.

Year 1

Core Modules

An Introduction to Interprofessional Education

The module is designed to give students the opportunity to work in multi-professional groups in order to improve understanding of a range of professional roles and encourage co-operative learning and working. The rationale for and benefits of inter-professional working are explored. Learning will be through multi-professional group seminars and tutorials that require students to access and gather appropriate data from a range of sources and apply this to a series of practice-based, simulated scenarios and exercises

Introduction to Anatomy, Physiology and Pathology for Radiotherapy

This module introduces students to the study of anatomy, physiology and pathology, providing an overview of body systems and giving an insight into how the body maintains a healthy balance. Regional and surface anatomy are taught using clinical terminology and a range of images, most of which students will encounter in the radiotherapy planning and treatment delivery process.

Principles of Oncology and Management I

This module will consider how normal cells are transformed into malignant tumours and includes how tumours are classified. The principles underpinning epidemiology, pathology, investigations and diagnosis, staging,grading, spread, signs and symptoms will be delivered. Students will also be introduced to the psychology of illness and methods of treating cancer.

Radiotherapy Practice 1

Students will be introduced to the clinical environment where under direct supervision; they begin to develop the skills and competencies required as a therapeutic radiographer. Emphasis is placed on interactions with patients and staff, beginning with identify patients according to protocol and maintaining confidentiality at all times. Acting in a professional manner, whilst adhering to safe and appropriate working practices students will contribute to patient set ups as directed. Students will reflect on their own practice in order to develop both as a professional and demonstrate the need for lifelong learning.

Radiotherapy Science

This module introduces the scientific conversance required for informed and safe practice as a therapeutic radiographer. Students will be introduced to radiation science and topics taught will include the physical principles of radiation generation, interaction, modification and protection underpinning radiation therapy. Students will need to have an understanding of the regulations associated with the use of ionising radiation in order to operate in a safe manner whilst in the clinical environment.

Radiotherapy Science

Skills for Research and Radiotherapy Practice 1

This module introduces the skills required for academic learning and practice as a therapeutic radiographer. Students will be introduced to enquiry and methods of learning and assessment as well as professional requirements for the programme. Students will develop an understanding of the regulations associated with the clinical environment as well as the inter-personal skills needed of a healthcare professional.

Year 2
Core Modules

Oncology and Management II

This module builds on the Principles of Oncology and Management I. It will consider the anatomy, oncology and management of common tumours arising within the breast, thoracic, abdominal and pelvic regions. The diagnosis and natural history of these tumours will be covered alongside the impact this may have on the patient and their families. Students will review the evidence-base related to the management of these tumours and will appraise the role of radiotherapy, and issues related to side effects and living beyond a diagnosis of cancer. A basic overview of pharmacology will be given so that students may better understand the role of anticancer drugs and drug therapies.

Radiotherapy Equipment & Radiobiology

This module will equip the student with the knowledge and skills necessary for understanding the design and safe operation of radiotherapy related equipment. Included in the module will be equipment for the purposes of radiotherapy localisation and delivery of treatment. The module will also cover image acquisition, beam characteristics and the biological effects of ionising radiation. Design of a radiotherapy department will be considered with reference to the variety of equipment available.

Radiotherapy Localisation and Planning

This module covers the principles of radiotherapy localisation and planning and enables students to gain the knowledge and skills necessary to generate and evaluate clinically-acceptable isodose distributions.

Radiotherapy Practice II

This module is the second in a series of three that is devoted to developing the clinical skills necessary to become a therapeutic radiographer. Learning is undertaken in the clinical environment where, under direct supervision, students continue to develop practice-based skills. Emphasis is placed on interactions with patients and clinical staff, safe and appropriate professional working practices as well as working within the boundaries of Level 5 study. Students will perform parallel-opposed calculations and will continue to accurately identify patients according to protocol, maintain confidentiality and comply with rules and regulations at all times.

Skills for Research and Radiotherapy Practice II

This module builds on the foundations laid down in Skills for Research and Radiotherapy Practice I; it will enable students to develop an understanding of the legislative, ethical and research frameworks that underpin, inform and influence the practice of radiotherapy. Research principles, processes and methods will be studied in order that students recognise the value of research to the critical evaluation of practice and to facilitate the students' understanding of the philosophy behind evidence based practice. Medico-legal and ethical issues and philosophy of clinical governance will be examined in order to promote and underpin safe and professional radiotherapy practice.

Year 3
Core Modules

Contemporary Issues in Radiotherapy Practice

This module not only considers current practices and developments in radiotherapy but also extends to other equally important areas such as changes in service delivery and updates regarding statutory and professional body policies and documentation. Additionally it covers key areas related to the expectations of employers post-qualification and provides an opportunity to consolidate employability skills. By making this module broad, it can reflect new and potential practices in service/departments at the time of delivery.

Enhancing Health & Social Care through Inter-professional Education
The module is designed to give students further opportunities of working in multi-professional groups in order to improve understanding across professional boundaries and encourage collaborative learning and working that will bring benefit to patient/service-users. The justification for inclusion of inter-professional working within health care is addressed. The module requires students to bring specialist in-depth knowledge of their profession and professional codes of conduct to a group setting so that health and social care pathways are critically reviewed in the context of professional practice.

Oncology and Management III
This module builds on Oncology and Management II. It will consider the anatomy, oncology and management of a range of adult and paediatric malignancies not previously considered in the level 4 and 5 oncology management modules. The diagnosis and natural history of these tumours will be covered alongside the impact this may have on the patient and their families. Students will appraise the evidence-base related to the management of these tumours in order to evaluate the role of radiotherapy and post-treatment issues, side-effects and survivorship (living with and beyond cancer). The role of palliative care and end of life issues in cancer management will be explored.

Radiotherapy Practice III
This module is the last in a series of three that is devoted to developing the clinical skills necessary to become a therapeutic radiographer. Learning is undertaken in the clinical environment where, under direct supervision, students refine their practice-based skills. Students will demonstrate the necessary level of competency required to practise effectively as a graduate radiographer including complex radiotherapy dose calculations.

Radiotherapy Research Exercise
A series of facilitated workshops/ tutorials covering topics related to the research process will enable students to plan and structure a research proposal. Individual supervision will be provided and supervisors allocated on the basis of the topic identified.

Fees & funding
Fees 2017*
UK/EU Students
Full time: £9,250 for the 2017 academic year

International Students
Full time: £11,350 for the 2017 academic year

NHS Funding for UK/EU Students
Students studying on nursing, midwifery or allied health professional courses funded by Health Education England, who start from September 2017 will have access to the same student loans support package and support for living costs as other students. The new arrangements also apply to students planning to take these courses as a second qualification.

The NHS will no longer grant bursaries. There will be, however, additional funding by the NHS Business Services Authority for some nursing, midwifery and allied health professional students because of the compulsory clinical placement required by these courses. This funding will cover students with child dependants and severe hardship. It will also cover travel and accommodation expenses incurred over and above the daily travel costs to university and for those who need dual accommodation.

For more information about the changes visit the gov.uk website and the Funding Clinic.
Discounts are available for International students if payment is made in full at registration

*Tuition fees are charged annually. The fees quoted above are for the specified year(s) only. Fees may be higher in future years, for both new and continuing students. Please see the University's Fees and Finance Policy (and in particular the section headed "When tuition fees change"), for further information about when and by how much the University may increase its fees for future years.
View detailed information about tuition fees

Additional course-related costs

There may be some additional costs or charges associated with studying on this course. These costs or charges may be compulsory (ie you have to pay them if you are studying this course) or they may be optional (ie you don't have to pay them, but they may help you get the most out of your course).
Any such costs or charges will be outlined in the About your course factsheet that can be found on the course Overview page.

Additional course costs

Compulsory

Accommodation costs during clinical placements - indicative prices are: £230-£560.

Transport to clinical placements (students can claim if eligible for NHS Bursary and travel costs): up to £600 per placement

Eligible students for an NHS Bursary can claim all, or part depending on circumstances. EU students who are not eligible for an NHS Bursary cannot claim it (in this case the figures quoted are top-end and depend upon placement venue and distance travelled).

Optional

Society of Radiographers student membership. Indicative fee for the first year is £163

Other financial support

Find out more about other financial support available to UK and EU students

Living costs / accommodation

The University of Hertfordshire offers a great choice of student accommodation, on campus or nearby in the local area, to suit every student budget.
View detailed information about our accommodation

Lectures and seminars	Self-directed study	Work based placements	Year
19	38	43	1
18	33	49	2
10	53	37	3

Assessment

% Written exams	% Coursework	% practical exams	Year
25	54	21	1
25	35	40	2
0	61	39	3

LSBU

Yr 1 Fundamentals of radiation science

This module will introduce the basic concept of atomic structure and will then build on this to explain how x-rays are produced and how radiation interacts with matter. Fundamentally, this module will concentrate on using radiation in a safe manner and will therefore include sessions on radiobiology (including genetics), radiation protection (including personal dosimetry and QA) and the legislation surrounding the use of ionising radiation in the clinical environment. Assessment method: 100% exam.

Biological science

This module will provide you with the foundation knowledge of anatomy, the function of the systems comprising the human body, and changes resulting from the development of malignant disease. You'll develop an appreciation of the discipline of oncology and the holistic approach to management of people with cancer with specific reference to evidence-based practice. Assessment methods: 50% coursework, 50% exam.

Radiotherapy practice 1

This module will provide an introduction to the professional practice of radiotherapy. It will identify the various radiotherapy modalities employed in the treatment of people with cancer and will require you to justify your chosen method with reference to evidence-based practice. This module will also complement the knowledge and learning gained within clinical practice by focusing on the acquisition of basic skills required for the safe, accurate planning and treatment of patients with cancer. Assessment methods: 50% coursework, 50% exam.

Concepts of inter-professional and collaborative practice

During this module you'll be introduced to the place and value of inter-professional and collaborative working in health and social care delivery. The module aims to support the development of the necessary communication, personal, partnership working and reflective practice skills required to meet the needs of clients/carers and diverse populations who are at the centre of inter-professional health and social care delivery.

Year 2 Applied radiation sciences

This module provides the basic physical concepts of the production, detection and interaction of ionising radiations and the importance of safe working practices. You'll gain an understanding of the structure and operation of equipment in the clinical environment and the means by which safety is maintained. Assessment method: 100% exam.

Radiotherapy imaging and dosimetry

This module addresses contemporary imaging methods available in the localisation and verification of tumour volumes before and during radiation treatment delivery. You'll be required to evaluate their relative usefulness in patients undergoing radiotherapy treatments, with specific reference to cancers of the respiratory, upper alimentary, central nervous and endocrine systems. You'll also gain experience in image interpretation of 2D and 3D images. Assessment methods: 50% coursework, 50% exam.

Radiotherapy practice 2

This module requires you to develop a deeper understanding of the anatomy and physiology of the organs comprising the respiratory, upper alimentary, central nervous and endocrine systems in order to address issues surrounding the radiotherapy management of patients with malignant diseases. Emphasis will be placed on management of disease with justification for the treatment chosen. You'll have academic teaching to underpin the clinical skills development required for the safe and accurate radiotherapy treatment delivery. Assessment methods: 50% coursework, 50% exam.

Year 3 Contemporary debates in radiotherapy and oncology

This module aims to prepare you to work in a changing environment and develop awareness of issues that impact on patients, service and professionals. Particular emphasis will be placed on the management of patients with complex needs or co-morbidities in the context of professional and technological developments, and changes in health care policy. It will enable critical evaluation of professional responsibility in relation to clinical, service and patient experience within the context of ethical frameworks and evidence-based practice. Assessment method: 100% coursework.

Radiotherapy practice 3

This module requires you to develop a deeper understanding of the radiotherapy management of patients with malignant diseases. It will provide you with knowledge and skills relevant to pre-treatment and verification processes employed in the radiotherapy management of patients. You'll be required to develop a critical awareness of advances in technology and practice. You'll be provided with opportunities to demonstrate achievement of clinically based competencies, which focus on more complex techniques found in radiotherapy, problem- solving skills required for successful performance in clinical practice, and transition to a band 5 role. Assessment method: 100% exam.

Improving quality, change management and leadership

This module is the final inter-professional learning module that will explore leadership, quality improvement and change within organisations from an inter-professional perspective. The module will look at a strategic, evidence-based approach to change management in a range of environments. It will integrate the perspectives of service users and take an inter-professional approach. Assessment method: 100% coursework.

Placements

Time spent on placement

Clinical placements are an essential element of the course. You will spend 50% of your time involved in academic study and 50% in clinical practice within a broad variety of healthcare settings. A clinical practice placement allows you to put theory into practice by working with a range of health professionals in clinical situations to develop the skills, knowledge and experience required to become a competent radiographer. Although sometimes initially challenging, practice learning is one of the most interesting and exciting aspects of learning to be a radiographer.

Clinical settings

At LSBU you will experience a variety of clinical settings such as NHS acute Trusts, community placements and independent sector. Placements include: Brighton and Sussex University Hospital: Sussex Cancer Centre Maidstone and Tunbridge Wells NHS Trust: Kent Oncology Centre Guy's and St Thomas' NHS Foundation Trust

Royal Surrey Hospital

Queen's Hospital, Romford

Structure of placements

Placements are spread over the three years. The first clinical placement; approximately seven weeks after the start of the course, gives a real taster of the role of the radiotherapy radiographer in the radiotherapy treatment process. It gives you an opportunity to confirm correct choice of career early within the course. Thereafter clinical placements follow the same pattern throughout the course.

Support from a mentor

An identified Link Lecturer and Personal Tutor from the University will be the person you can contact during working day hours whilst on placement with any concerns or questions you are unable to solve otherwise. As there is a close relationship between LSBU and the clinical placement; the Link Lecturer will pay regular scheduled visits to the different sites.

Facilities

Therapeutic Radiography VERT Lab; Virtual Environment Radiotherapy Training, is a virtual learning environment simulating a radiotherapy treatment room. Through captivating 3D views and life size visualisations, VERT is an excellent platform for supplying therapeutic radiography training to students.

You will have the opportunity to interact with a variety of virtual linear accelerators (treatment machines) to set up and treat a virtual patient. The virtual linear accelerator is controlled by hand control pendants and can be moved and orientated in much the same way as an actual treatment machine can.

Other facilities used on the course include a Xio Radiotherapy Planning Suite. XiO is a comprehensive 3D treatment planning platform that supports a range of treatment modalities, including 2D, 3D and intensity modulated radiotherapy (IMRT) planning. The training begins with comprehensive coverage of patient import and contouring in Patient File Maintenance and patient planning in Teletherapy. You will undertake practice exercises which are presented in a logical sequence, with each practice exercise building on the previous exercises completed. The VERT suite has the facility to load any radiotherapy treatment plan created by trainees so they can review their plans on a virtual patient and gain additional experience that is otherwise only available in the clinical setting.

Teaching and learning Assessment procedures

You'll be assessed by written and oral examinations, coursework and seminar presentations. Clinical practice is continually assessed and you are supported by an on-site practice educator.

Lectures and seminars	Self-directed study	Work based placements	Year
16	44	40	1
14	42	44	2
15	45	40	3

Assessment 1 RADIOTHERAPY

% Written exams	% Coursework	% practical exams	Year
12	51	37	1
11	52	37	2
5	47	48	3

Assessment 2 THERAPEUTIC RADIOGRAPHY 27%

% Written exams	% Coursework	% practical exams	Year
67	16	17	1
28	33	39	2
11	33	56	3

With an integrated approach enabling you to relate your academic work closely to your clinical experience, this programme aims to produce competent, caring therapeutic radiographers, who are able to work at the interface between the latest in medical technology and the cancer patient. The programme will provide the skills and knowledge to enable you to become a professional capable of delivering first class cancer care. You will learn about the nature and development of cancer, the role radiation plays in its management and gain the clinical skills necessary to care for your patients on a daily basis.

You will study a range of modules both inter professional for example communication skills, and profession-specific, such as radiation science and technology and oncology modules.

Clinical practice is integrated with the academic programme. The clinical placements increase in length from Year One through to Year Three, resulting in a programme attendance of up to 45 weeks per year with some extension into vacation time. All placements are arranged in North West of England Cancer Centres and there is an opportunity to spend an elective period in a Radiotherapy department of your choice.

Teaching and Learning

Learning is promoted through a wide variety of activities that enable students to become autonomous and continuous learners. Interactive lectures, practical and clinical skills group work, simulation, directed study, role play, problem-based learning, small group work, student-led seminars, collaborative project work and interactive tutorials are key learning strategies of the programmes. Practical work using our imaging suite digital equipment, 3D virtual reality radiotherapy facility, Clinical Skills Resource Room and the Human Anatomy Resource Centre complement teaching activities. Face-to-face interactions between all students will occur at shared lectures, tutorials and group work and online interaction will be encouraged and facilitated. There are also interprofessional education and learning opportunities across all healthcare professions programmes.

Assessment

Using a mixture of coursework and examination, a range of assessment methods can be seen across the programmes. These include seen and unseen written examinations, essay assignments with specific word lengths, multiple choice questions, case study presentations, video analysis and interactive practical examinations. Assessment of the work-based learning element of all programmes is an important aspect. Students will be required to communicate their views orally and in written form; analyse, implement and evaluate their practice; and to extend the research and evidence base of their chosen profession.

The various methods of assessments have been chosen to provide a balance that will permit the undergraduates to demonstrate their intellectual abilities in all areas to the full.

Year One

The first year of the programme is concerned primarily with the acquisition of knowledge in the sciences, with some integration and application of this knowledge to practice.

It provides a comprehensive introduction to the fundamental concepts and principles that underpin therapeutic radiotherapy and its role in the management of cancer. Year One modules include:

- Fundamentals of Radiation Science and Protection
- Foundations of Anatomy and Physiology
- Introduction to Professionalism
- Foundations of Radiotherapy Practice and Oncology
- Research Skills
- The Patient Journey and Oncology of the Skin

- Introduction to Radiotherapy Equipment, Treatment
- Planning and Radiation Protection

Year Two

The second year of the programme expands the previously acquired knowledge with an increasing emphasis on the understanding and application of scientific principles to practice. Students are encouraged to develop the skills of interpretation and evaluation and to relate them to all areas of the programme.

Year Two modules include:

- The Emerging Professional
- Fundamentals of Radiation Dosimetry and Radiobiology
- Radiotherapy and Oncology of the Abdomen, Pelvis and Breast
- Radiotherapy and Oncology of the Head, Neck and Thorax
- Operational Principles of Radiotherapy Equipment and Further Treatment Planning
- Research Methods

Year Three

The third year of the programme enables students to develop critical analysis of the impact of innovation and technological advances on practice. The greater part of this year is spent in the clinical environment allowing the student to consolidate and develop skills enabling them to become clinically competent and safe to practise.

Year Three modules include:

- Research Study
- Technology for Advanced Radiotherapy
- Challenging Issues in Cancer Care
- The Competent Professional

Lectures and seminars	Self-directed study	Work based placements	Year
21	40	39	1
19	42	39	2
17	30	53	3

Assessment

% Written exams	% Coursework	% practical exams	Year
57	24	19	1
15	27	58	2
27	50	23	3

Why take this course?

Radiotherapy Radiographers are integral members of the multidisciplinary team caring for cancer patients. They are responsible for planning and delivering radiation treatment while also offering support, guidance and advice to ensure the emotional wellbeing of patients. Radiotherapy Radiographers use highly-specialised equipment and their daily work revolves around the interface of medical technology, oncology and patient care. Consequently, this degree offers an exciting mix of radiation science, human anatomy, modern technology and applied communication to develop the knowledge and skills required for a rewarding lifelong career as a Radiotherapy Radiographer. It aims to provide insight, preparedness and flexibility for a career set in a clinical environment.

Values and the NHS Constitution

We endeavour to recruit students to our health and social care courses who have the right values base and demonstrate appropriate behaviours. We embed the values of the **NHS Constitution** throughout our admissions processes and they are an essential part of the curricula. Find out more about the **values we look for**.

We recommend that if you are interested in applying you complete a clinical visit in a Radiography department. Please download this **Clinical Visit Report Form** and return it to **Science.Admissions@port.ac.uk**.

For further health information, please see our **additional health information page**.

/.column

What will I experience?

On this course you can:

- Undertake simulated training tasks before putting your learning into action in the hospital setting.
- Shadow and receive mentoring from experienced practitioners within both the academic and clinical environment.
- Observe, examine, assess and engage with real patients at a vulnerable point in their life, across three clinical placement sites recurring throughout the course.

The first year of the course introduces the core knowledge for the underlying concepts and principles for Radiotherapy & Oncology.

- Radiotherapy Clinical Learning and Foundations of Patient Care
- Foundations of Oncology Practice
- Foundations of Scientific Enquiry
- Introduction to Radiotherapy
- Principles of Oncology Practice 1

The second year of the course builds upon the units studied in the first year to allow you to develop existing skills and acquire new competencies by applying theory to practice.

Core units in this year include:

- Radiotherapy Clinical Learning and Improving Standards of Care
- Principles of Oncology Practice 2
- Principles of Oncology Practice 3
- Radiotherapy Equipment
- Research Methods

The third year of the course builds upon the units that have been studied in preceding years to ensure that you meet the standards of proficiency expected of all newly-qualified radiographers. In this year, you will also develop skills that will prepare you for advanced practice, whilst also having the opportunity to undertake a dissertation that may involve supervised research.

Core units in this year include:

- Advanced Practice in Oncology
- Radiotherapy Clinical Learning and Professional Practice
- Imaging of Radiotherapy
- Project

Teaching and Assessment

The course is delivered in a block format with both placement and teaching blocks interspersed throughout the three years. The teaching ethos of the course is to ensure that subject specialists deliver your education and as such a collegiate approach is adopted, making best use of the expertise within our school. Teaching methods include: lectures, directed study, group work, reflective journals, tutorials, seminars, simulation (including technology enhanced learning), and clinical placement.

How are you assessed?

This course has a balanced approach towards assessment.

- Essays
- Presentations
- Written examinations
- Objective Structured Examinations (OSE's)
- Portfolios of evidence and practice outcomes to assess clinical capability which count towards your degree classification.

Naomi Dickie - tutor

Radiography

Both Radiography courses offer a high level of support in preparing you for your clinical placements, offering interactive, practical sessions to learn key skills in the University using the Diagnostic Imaging Suite and VERT platform. Moodle is also utilised to provide supporting information to you during your clinical placements.

Specialist Software and Scientific Equipment

We have an outstanding array of radiography facilities and excellent resources to support your clinical learning. This allows you to practise and exercise your clinical skills on campus before you venture into the clinical environment. This includes:

- A radiography clinical skills suite that incorporates a three-dimensional virtual environment radiotherapy unit (VERT). This is exclusively used by University of Portsmouth students to create an immersive radiotherapy treatment room.
- A radiotherapy treatment planning suit
- Ultrasound scanners and a high-resolution colour portable ultrasound system.

/.column

Centre for Simulation in Health and Care

Our aim is to enhance your learning and experiences through the use of innovative technologies. You'll practise profession-specific skills in a safe and supportive environment, as well as experience the types of clinical and informal healthcare situations that you'll encounter in the workplace. The Centre is used to simulate real-life scenarios – a great way to prepare you for the real thing during placement.

/.column

University Library

Modern, comfortable and a great learning environment, our library offers a wealth of information including 400,000 books, DVDs, maps and thousands of online ejournals and newspapers. Many electronic resources are available anywhere, 24/7 and our friendly staff are always on hand to help.

Upon graduation, you will be eligible to apply for Health and Care Professions Council (HCPC) registration as a Therapeutic Radiographer to practise in the United Kingdom. Radiotherapy is conducted within specialised centres in the United Kingdom. This means that the modern radiographer will find their specialist knowledge and skills in high demand. In addition to this, radiography is a rapidly changing profession due to advancements in technology and role extension; both of which provide plenty of opportunities for professional development and lifelong learning.

Roles our graduates have taken on include:

- A high percentage of our graduates obtain NHS posts in radiography with start dates soon after graduation. According to Unistats, 95% of our graduates from this course are in employment six months after finishing their studies.
- There are also many opportunities to specialise within radiography and, of course, there's always the option to take up postgraduate study.

At the first stage of your course, you will have the opportunity to observe radiographers working in a hospital setting. This is a great way to shadow, observe and receive direct mentoring from experienced practitioners. There is also continuous training throughout the course via simulated activities, which prepare you for your placements.

Approximately a third of your time will be spent in practice placements, supported by clinical mentors and other registered healthcare professionals. For 11-13 weeks of each year you will be on placement and we try to ensure that you receive a balanced clinical experience.

We also encourage you to find work-based experience in a healthcare-related outlet in the summer period. This extra experience will undoubtedly make you stand out to future employers.

o make sure you take the right steps on your career path, we're here to give you help, support and advice throughout your study. Even after you've graduated, we continue to give you support for up to five years.

Employers tell us that they want graduates to be able to demonstrate certain skills when they come out of university. Our courses take account of this. We make sure we prepare you for employment through work-related learning, projects, placements and working in simulated environments that are designed to prepare you for the working world.

Budgeting for your studies

There are extra costs associated with studying, which you will need to consider when planning your expenditure.

Recommended texts:

If you wish to purchase recommended texts, rather than borrow from the University Library, the average price is £50-£60. You may be studying up to 6 units a year, each with a standard recommended text.

General costs:

We recommend that you budget £75 a year for costs of photocopying, memory sticks, DVDs and CDs, printing charges, binding and specialist printing.

Final year project:

If your final year includes a major project, there could be cost for transport or accommodation related to your research activities. The amount will depend on the project you choose to develop.

Other costs to consider

You will receive an initial set of uniforms at no cost. Extra items of uniform cost of between £17 - £23. You will also be expected to wear your own suitable footwear for placements.

Accessory equipment, such as anatomical side markers, are provided in the first instance. In the event of loss, you will need to pay for replacement. These costs will vary, approximately £5.

For clinical placements, you are required to meet the costs of accommodation and travel. Clinical accommodation will be in the region of £400 per calendar month and travel costs will vary. The NHS may meet some of the costs incurred.

From 1 August 2017 students in England on nursing, midwifery and most allied health professional pre-registration courses will have access to the standard support package of tuition fee loans and support for living costs, rather than getting an NHS grant. More details: **Health Education Funding in England from 2017/18**

Lectures and seminars	Self-directed study	Work based placements	Year
22	54	24	1
17	52	31	2
11	61	28	3

Assessment

% Written exams	% Coursework	% practical exams	Year
50	27	23	1
25	70	5	2
0	90	10	3

SUFFOLK

Radiotherapy is the use of X-rays and other ionising radiations to treat patients who have been diagnosed with cancer. The therapeutic radiographer is someone who can combine technical skills with a caring attitude, has a sense of responsibility and enjoys working in a team. This course ensures students have the ability to undertake the accurate planning and delivery of treatment, the provision of a high standard of patient care, good inter-personal skills and the ability to adapt and respond to the individual needs of the patient. The course is accredited by The Health and Care Professions Council and the College of Radiographers and graduates are eligible to apply for registration with the Health and Care Professions Council.

The BSc (Hons) Radiotherapy and Oncology embeds the Standards of Proficiency determined by the regulator, the Health and Care Professions Council (**www.hcpc-uk.org**). Graduates are eligible to apply for HCPC registration which is a requirement for employment in a broad range of NHS and private radiotherapy roles. These include treatment preparation and delivery, posts in research, education, advanced practice and management. The Department of Health Studies is committed to embedding the NHS Constitution and Values into everything we do; they define the behaviours and expectations of all our staff and students underpinning the work we do in the university and in the practice setting. You can view the full NHS England Constitution and Values on the Gov.UK website: **www.gov.uk/government/publications/the-nhs-constitution-for-england**

Why you should study radiotherapy and oncology at the University of Suffolk:

- High proportion of clinical practice time at one of four NHS hospitals in East Anglia, supporting the development of excellent clinical skills
- Excellent levels of employability
- Extensive use of state of the art simulation suite on campus: The Virtual Environment for Radiotherapy Training (VERT), Varian Eclipse treatment planning system and Radiotherapy Practical Room
- Dedicated practice educator to support your clinical education
- Strong partnership links - we work closely with our placement Trusts to ensure that the course fully prepares you for the role of a therapeutic radiographer
- Robust support mechanisms - excellent support is provided by the course lecturers, personal tutor, practice educators and the wider University of Suffolk team

Content and Modules

As qualified therapeutic radiographers, graduates of the BSc (Hons) Radiotherapy and Oncology will be working in a rapidly evolving and complex area of healthcare. The course is designed to develop competent practitioners, capable of independent enquiry to support the provision of high quality, evidence-based care for patients undergoing radiotherapy.

In addition to studying modules that support the development of detailed knowledge, clinical competence and problem-solving abilities, students will be supported to develop excellent interpersonal and communication skills to enable them to provide high quality care, consistent with NHS values.

Interprofessional team working is essential to the delivery of safe and effective care and through the interprofessional learning strand students will be supported to develop appropriate communication skills, value the contribution of other professional groups and develop the confidence to appropriately articulate their professional opinion in an interprofessional context.

A wide range of teaching and learning strategies are used throughout the course, these include lectures, seminars, group work, presentations and practical sessions in the simulation suite designed to support effective learning in clinical practice.

A wide variety of assessment methods are also adopted such as unseen examinations, Objective Structured Practical Examinations (OSPEs), posters, presentations, and portfolios.

During the course students also have the opportunity to produce a professional development portfolio as part of Graduate Headstart which help to develop and evidence a wide range of transferable skills, enhancing employability.

Practice Placements

Approximately 60% of the course is spent on practice placements at one of four NHS Trusts in East Anglia (current placement sites are listed below), where students apply their developing theoretical knowledge and develop a full range of skills and competence needed to practice as therapeutic radiographers once registered with the HCPC.

Current practice placements:

Department of Clinical Oncology, Addenbrooke's Hospital
Radiotherapy Department, The Ipswich Hospital
Department of Clinical Oncology and Radiotherapy, Norfolk and Norwich University Hospital
Colchester Hospital University NHS Foundation Trust

Year 1

Oncology, Anatomy and Radiotherapy 1

The purpose of this module is to prepare students for entering practice placements for the first time by facilitating the development of foundational knowledge and by providing formative opportunities to gain basic practical skills.

Students will be introduced to the principles of oncology, radiotherapy technique and patient care through engagement with material relating to some of the cancers most commonly treated with radiotherapy. In addition, students will be introduced to the anatomy and physiology associated with the musculo-skeletal system, cardiovascular system and sites of malignancies covered in this module.

Working in Healthcare

The theory delivery of this module will precede the first clinical placement and learning will be assessed at the end of the first semester thus incorporating induction into the work place and work based learning.

This module will provide the student with a sound knowledge base of health care principles which can be applied in the clinical environment to provide safe and effective care. It will introduce and prepare the students to work within the NHS and embody the NHS constitution and core values. This module encourages the start of professional growth and ensure the development of essential personal skills such as resilience and responding to constructive feedback. It will enable students to recognise safe and unsafe practices and react or adapt to practical clinical situations appropriately. The module introduces students to the joint responsibilities of the inter-professional health care team and will be delivered to the joint diagnostic and therapeutic radiography cohort.

Radiotherapy Physics and Technology

This module will introduce the students to the technologies available for cancer treatment using radiotherapy. It will also introduce fundamental physical principles and relate them directly to the equipment and technologies being employed. In this way the fundamental principles will be taught in light of the equipment being considered and hence will be of greater relevance, value and interest. Direct clinical relevance and application will be discussed with encouragement given in order to enable the students to make links wherever possible to their own clinical practice. The technologies will be underpinned by quality assurance essential for their safe operation and safe practice.

Interprofessional Learning - working with others

This module will introduce the principles of interprofessional working, contextualising each student's growing professional identity within the broader interprofessional arena. There will be recognition of the individuality and commonalities within and between professionals, with subsequent analysis of effective interpersonal communication skills at a personal, professional and service user level. The aim is for the student to engage in effective professional relationships with colleagues and service users.

Students need to be able to identify the challenges, benefits and issues in providing care within the wider context of organisation and society. An understanding will be fostered throughout that the service user is at the core of effective care within a complex and changing wider environment.

Radiotherapy Practice 1

This is the first clinical practice module, providing an introductory experience for students and an opportunity to apply foundational theoretical knowledge gained on campus to practice. It is timed to provide an early opportunity for students to experience clinical practice; in line with guidance from the Society and College of Radiographers.

Preparation for this module will be provided at the University through semester one academic content, extensive use of the simulation suite and engagement with practice educators to facilitate the transition in to the practice environment.

The primary focus of this module is on the core elements of the radiotherapy pathway: localisation in CT, megavoltage and superficial treatment with a short placement in an allied area e.g. clinic. Students will be required to demonstrate competence related to the core areas of practice, commensurate with level 4 and mapped to the HCPC standards of proficiency.

Radiotherapy Practice 2

This clinical practice module will provide an opportunity for students to build upon their experiences from Radiotherapy Practice 1 and continue to apply theoretical knowledge to practice.

The primary focus of this module will be on the core elements of the radiotherapy pathway: localisation in CT, megavoltage and superficial treatment with a short placement in an allied area e.g. admin and clerical. Students will be required to demonstrate competence related to the core areas of practice, commensurate with level 4 and mapped to the HCPC standards of proficiency.

Year 2

Oncology, Anatomy and Radiotherapy 2

This module introduces five new body systems and explores the various malignancies that can occur within these systems. Themes from the level 4 oncology, anatomy and radiotherapy one module will be continued, for example, exploring oncological aspects of each malignancy and the role of radiotherapy in the treatment of malignancy.

The module is designed to introduce the anatomy, oncology and management of the male and female reproductive systems, the digestive system, the urinary system and integumentary system (anatomy component taught in OAR1).
This module will build on the anatomical and oncological knowledge introduced during level 4 and provide the students with the opportunity to expand their knowledge of radiotherapy techniques and clinical decision making. This theme will be developed further within the oncology, anatomy and radiotherapy three module.

Radiotherapy Planning

The purpose of this module is to facilitate the development of a detailed understanding of the principles of radiotherapy localisation, planning and verification in addition to supporting the development of skills of plan production and evaluation.
This module will build upon the foundational knowledge of radiotherapy physics and equipment gained at level 4 and will provide essential preparation for practice placements in treatment planning in clinical practice 4.

Research Methods

The development of research skills is an essential requirement for all graduates. This module is designed to build on the principles of evidence-based practice that have been introduced at level 4 and prepare students to make informed choices regarding their approach to a research project to be undertaken at level 6.
This module will develop in the students a critical awareness of the diversity and relevant strengths of different research tools and approaches used healthcare. The module will draw on published research, its analysis and interpretation, enabling students to critically examine the various research methods used in professional practice.

Oncology, Anatomy and Radiotherapy 3

This module will build on the anatomical and oncological knowledge introduced during OAR1 and OAR2 and provide the students with the opportunity to expand their knowledge of radiotherapy techniques and clinical decision making.
This module will conclude the oncology, anatomy and radiotherapy technique content for the programme, by enabling students to develop a detailed understanding of the remaining body systems and associated oncology.
Students will be suitably prepared to continue the critical evaluation of the patient journey during and beyond initial treatment when introduced to the cancer survivorship module at level 6.

Radiotherapy Practice 3

This clinical practice module will provide an opportunity for students to build upon their experiences from Radiotherapy Practice 1 and 2 and to draw on theoretical knowledge and sources of evidence to develop a growing level of independence in practice. The primary focus of this module will be on the core elements of the radiotherapy pathway: localisation in CT, megavoltage and superficial treatment with short placements in the allied areas of diagnostic imaging and radionuclide imaging. Students will be required to demonstrate competence related to the core areas of practice, commensurate with level 5 and mapped to the HCPC standards of proficiency.

Radiotherapy Practice 4

This clinical practice module will provide an opportunity for students to build upon their earlier experiences in practice and to draw on theoretical knowledge and sources of evidence to develop a growing level of independence in practice. The focus of this module is on the pre-treatment part of the radiotherapy pathway (CT and dosimetry), whilst maintaining progress in megavoltage treatment. A short placement in an allied area of practice e.g. clinic, will complement the practice experience.
Students will be required to demonstrate competence related to the core areas of practice, commensurate with level 5 and mapped to the HCPC standards of proficiency.

Year 3

Research Project

The purpose of this module is to provide students with a meaningful experience of conducting collaborative research, whilst enabling individuals to develop the skills and confidence to become research-active practitioners following graduation. This approach has been guided by the Society and College of Radiographers' research strategy 2016-21.

Small groups of students will be supported as partners in learning alongside an academic and a practice partner to design and conduct a small scale study. This approach will provide opportunities to contribute directly to an evidence based approach to practice; to enhancing patient care; or to service improvement.

The assessment for the module has been designed to support students to develop the confidence to write for publication in order to disseminate their findings and to reflect upon the experience of conducting research.

Cancer Survivorship, Palliative and End of Life Care

This module will introduce cancer survivorship and explore the physical, psychological and social factors that impact on survivorship for the individual, their friends and relatives. It will allow the student to critically reflect on the impact of treatment on the health and wellbeing of those affected by cancer and evaluates the need for support for people affected by cancer.

Interprofessional Learning: The Professional in the Team

This module builds on the interprofessional modules at level 4 and level 5. It is designed to prepare students from a variety of professional backgrounds to work within practice in health and social care organisations. Interprofessional working in practice is an essential component of the role of new and established practitioners. The module promotes multi-agency working across health and social care teams. Interprofessional working is promoted through the exploration of topical issues within health and social care.

Students will be encouraged to work as flexible practitioners and critical thinkers.

Management of self is key to evaluating their role and the role of others within the interprofessional team.

A problem based approach will be used to develop managerial, leadership and advocacy skills in order to become an effective practitioner. Students will be encouraged to explore the issue of corporate responsibility.

By learning to work together as an interprofessional group, differences will be exposed, prejudices will be examined and students will learn how to manage themselves and others.

Radiotherapy Practice 5

This clinical practice module will provide an opportunity for students to build upon their earlier experiences in practice and to draw on theoretical knowledge and sources of evidence to develop problem-solving abilities in practice. Practice placements will be scheduled between Radiotherapy Practice 5 and 6 to allow students to gain a full range of competence in CT, megavoltage and superficial treatments, plus short placements in brachytherapy and palliative care. Students will be required to demonstrate competence commensurate with level 6 and mapped to the HCPC standards of proficiency.

Radiotherapy Practice 6

This final clinical practice module will provide an opportunity for students to continue to develop problem-solving abilities in practice and to develop the confidence to take up their first posts after completion. Practice placements will be scheduled between Radiotherapy Practice 5 and 6 to allow students to gain a full range of competence in CT, megavoltage and superficial treatments, plus short placements in brachytherapy and palliative care.

Students will be required to demonstrate competence commensurate with level 6 and mapped to the HCPC standards of proficiency.
Attendance in practice will be monitored across Radiotherapy Practice 5 and 6 to ensure that students attain 90% at the point of completion of the programme.

Lectures and seminars	Self-directed study	Work based placements	Year
13	52	35	1
21	43	36	2
5	58	37	3

Assessment

% Written exams	% Coursework	% practical exams	Year
43	50	7	1
17	73	10	2
0	100	0	3

What you study

Take advantage of an increasing demand for graduate therapeutic radiographers in the health service and private sector by completing this course.

Key areas include • principles of radiation oncology • principles of anatomy and image interpretation • interprofessional learning • applications of radiotherapy science • clinical education • research methods • imaging and treatment planning • preparation for practice • accuracy and reproducibility.

You learn to use radiation equipment, software and systems for treatment and treatment planning to treat cancer patients. You also learn to apply theory to practice and tailor the treatment to the patient by accurately targeting high dose radiation beams and sparing surrounding normal tissues.Radiotherapy treatment, more than most careers, is a profession based around teamworking to plan and safely deliver effective radiation treatment. That's why you study interprofessional education modules alongside students from other health disciplines, such as nurses, physiotherapists and diagnostic radiographers. This shared learning experience allows you to develop teamworking skills and understand the contribution different professionals make to the care of cancer patients.

Facilities

Your on-campus training is based at the £13 million purpose-built Robert Winston Building, where you use the state-of-the-art virtual environment for radiotherapy training (VERT). It creates a life-size 3D replica of a linear accelerator (equipment which is used to treat cancer patients) and the potential to walk around the room. We also have 20 networked Eclipse planning computers with specialist staff on hand to teach you radiotherapy planning.

Expertise

You get real insights into all aspects of radiotherapy and learn from a lecturing team who are all qualified radiographers, many of whom are involved in research at a national level, some of whom are internationally renowned. We invite guest lecturers to share their expertise and skills via a dedicated research forum and you also meet and hear from ex-patients and service users who share their experiences of treatment.

Placements and work experience

Your studies are put into practice in clinical practice placements that give you essential professional experience and skills. Placements take place at

• St James's University Hospital, Leeds • The Royal Derby Hospital, Derby • Leicester Royal Infirmary, Leicester • Lincoln County Hospital, Lincoln • Freeman Hospital, Newcastle • Nottingham City Hospital, Nottingham • Queens Centre for Oncology and Haematology, Castle Hill Hospital, Hull • Weston Park Hospital, Sheffield • James Cook University Hospital, Middlesbrough.

You are based at one hospital for the majority of your training, but at the end of year two you complete an elective placement at a different training site of your choice. This broadens your knowledge and experience of radiotherapy services and your chosen career. Some students have gone on self-funded trips to observe radiotherapy practice abroad.

Course structure: Three years full-time

Typical modules may include

Year one modules

- principles of radiation oncology 1 and 2 • principles of anatomy and image interpretation • foundations for effective collaborative practice • applications of radiotherapy science • clinical education 1

Year two modules

- principles of radiation oncology 3 and 4 • developing capability for effective collaborative practice • introduction to research methods • imaging and treatment planning • clinical education 2

Year three modules

- dissertation • enhancing quality of services through effective collaborative practice • preparation for practice • accuracy and reproducibility • clinical education 3

Assessment
examinations
assignments
project work
portfolio
poster presentations
continuous assessment of clinical practice vivas

Assessment

% Written exams	% Coursework	% practical exams	Year
42	50	8	1
17	75	8	2
17	66	17	3

Lectures and seminars	Self-directed study	Work based placements	Year
12	51	37	1
11	52	37	2
5	47	48	3

ST GEORGES

The Therapeutic Radiography BSc equips you with the knowledge, technical expertise and care skills needed to plan and deliver radiotherapy treatment to patients with cancer. You will learn how to use advanced radiotherapy equipment and digital technology such as CT scanners in a safe and responsible manner to target the tumour with millimetre accuracy, delivering the maximum dose with minimum impact on healthy tissue.

The therapeutic radiographer works alongside clinical oncologists, physicists and other healthcare professionals in a multi-disciplinary oncology team to provide patient-centred care. You will care for patients of different ages, social classes and ethnic backgrounds. It is important that the therapeutic radiographer has both the appropriate caring personality and technical and analytical skills.

- This course is run by the Faculty of Health, Social Care & Education, which is a partnership between St George's, University of London and Kingston University. You will benefit from a multi-faculty experience combined with the health science expertise offered at St George's.
- Interprofessional education: Learning opportunities exist for our students to learn alongside one another reflecting the multidisciplinary nature of healthcare workplace environment
- 50 per cent of your time will be spent in a NHS trust on placement as a student radiographer

The majority of the academic part of this course is delivered at Kingston University, and focuses on basic biological and physical sciences along with oncology, radiobiology and radiotherapy practice.

In year one you participate in the interprofessional foundation programme at St George's. You will also learn the discipline specific knowledge related to therapeutic radiography practice.
In year two, you are introduced to practice where you will have the opportunity to apply your knowledge and learn the skills of radiotherapy practice. Simulation on the treatment planning system will develop your understanding of the complexity of radiotherapy treatments and provide the opportunity to develop skills of clinical reasoning.
In the final year, the focus is on the application of knowledge, technique and safe use of technology in the practice of therapeutic radiography. Additionally, skills development in clinical reasoning and evaluation of practice will prepare you for your professional practice. You will also complete a research project on a radiography related topic of your own choice.
Modules throughout the course may include:

Year one
University Campus - Interprofessional Foundation Programme
University Campus - Introduction to Radiography
University Campus - Radiotherapy and Oncology 1
University Campus - Personal and Professional Development 1
University Campus - Science and Technology 1

Year two
University Campus - Treatment Planning
University Campus - Radiotherapy and Oncology 2

University Campus - Personal and Professional Development 2
Practice Placement - Introduction to Practice
Practice Placement - Application of Skills

Year three
University Campus - Research Project
University Campus - Radiotherapy and Oncology 3
University Campus - Personal and Professional Development 3
Practice Placement - Competence and Practice

Lectures and seminars	Self-directed study	Work based placements	Year
31	62	7	1
23	33	44	2
11	51	38	3

Assessment

% Written exams	% Coursework	% practical exams	Year
72	23	5	1
32	38	30	2
31	56	13	3

Our students benefit from a cutting edge virtual reality suite and an interactive treatment planning system throughout the course to support learning and enhance practical skills.

Teaching and learning methods
Teaching methods include lectures, seminars, peer-assisted learning, case-based learning, simulated practical experience and clinical experience. Facilities include the Virtual Environment for Radiotherapy Training (VERT) and an interactive treatment planning system, both of which are used throughout the course to support learning and enhance practical skills.
Virtual Environment for Radiotherapy Training VERT

The Virtual Environment for Radiotherapy Training (VERT) creates a three-dimensional treatment suite and offers an interactive function that hones the psychomotor skills required to deliver radiotherapy with pinpoint accuracy. If you stduy with us, you'll practice your radiography skills in a safe and supportive environment using the latest virtual reality:

- VERT creates a three-dimensional treatment suite and offers an interactive environment that develops and refines psychomotor skills required to deliver radiotherapy with pinpoint accuracy
- This innovative equipment allows us to further enhance your teaching and learning experience

Our teaching draws on the wealth of experience of our placement collaborators and alumni who present masterclasses and workshops that enrich your learning. They also inform the curriculum to maintain its currency.

Practice placements provide an opportunity to put theory into practice and consolidate learning experiences. Practice placement sites include:

- Royal Marsden NHS Foundation Trust, Chelsea, London
- Royal Marsden NHS Foundation Trust, Sutton, Surrey
- Royal Surrey NHS Foundation Trust, Guildford, Surrey
- St Luke’s Cancer Centre, East Surrey Hospital, Redhill

Assessment methods

A combination of academic coursework (including essays, reports and presentations), written and practical examinations, portfolios, practice placement assessments and a research dissertation are used to assess your progress.

Because we want you to reach your full potential, we build in opportunities for formative assessments and provide feedback on assessment tasks so you know what you need to do to optimise your performance.

Find out how this course is structured and assessed on the Unistats website

Therapeutic radiography requires the use of a diverse range of equipment and techniques to prepare and deliver the individualised treatment that every patient needs.

Constant advances in technology allow therapeutic radiographers to continue to improve the outcomes for patients with cancer, making this a rewarding career choice. On completion of this course you can choose to study at postgraduate certificate, diploma and masters level for radiography qualifications.

Careers

- Treatment planning
- Teaching
- Management
- Quality assurance
- Treatment delivery
- Treatment review
- Research
- Treatment and patient support
- Palliative care

Advanced career paths

- Complex treatment planning
- Drug prescribing
- Consultant practitioner

On graduation you can register with the Health and Care Professions Council and apply for membership with the Society of Radiographers.

Why study BSc(Hons) Radiotherapy and Oncology?

Therapeutic radiographers provide vital services and support to millions of people, planning and delivering prescribed treatments for cancer, using x-rays and other types of radiation. The ability to make a positive difference to people's lives is highly rewarding and the course will equip you with the knowledge and professional skills to provide safe, effective and compassionate care.

Why study our course?

BSc(Hons) Radiotherapy and Oncology is accredited by the Health and Care Professions Council (HCPC) and leads to eligibility to apply for registration with the HCPC. As well as learning the theory of good professional practice and studying the science that underpins it, you will develop strong inter-professional and interpersonal skills, along with the ability to operate highly specialised equipment. With fully integrated work-based training, state-of-the-art onsite facilities and the support of inspirational staff with a depth of experience in radiotherapy, our students are high achievers. A consistently high proportion graduate with first-class honours and a number of UWE Bristol students have been awarded Student Radiographer of the Year by the Society and College of Radiographers in the last ten years.

Real-world experience

The course has a strong practical focus, incorporating evidence-based learning, simulations and extensive use of cutting-edge equipment, such as our Virtual Linear Accelerator (VERT). Half your time will be spent on placements. This will be predominantly in NHS radiotherapy departments, in a variety of environments. Throughout the course, you willl engage with patients, practising radiographers and other healthcare professionals in placements, classes and in online learning. There are also options to develop and apply your skills by working abroad.

Where it can take you

Therapeutic radiographers are in demand across the UK and there are many exciting career opportunities for graduates in NHS and private radiotherapy departments, as well as specialist oncology centres. Some students choose to continue their studies with postgraduate courses.Radiotherapy provides the skills to safely use ionising radiation to cure cancer or give relief of symptoms. The course is designed to develop the knowledge, understanding and decision-making skills to operate highly specialised equipment and provide comprehensive patient care. In-depth knowledge of oncology practice is integrated into the course at all levels.

The course integrates academic studies with clinical experience within professional studies modules. These are incorporated through all three years of study. A strong science theme runs throughout the course: The Year one modules provide a solid foundation, which is developed and applied to new technology and procedures in Years two and three. Psychosocial aspects of health care are also incorporated into all years, as are the care and support needs of patients undergoing cancer treatment.

The development of effective inter-professional relationships and collaboration is promoted through shared, enquiry-based learning with other professional groups. Research is an integral element of the course and is an essential foundation for future professional development as a therapeutic radiographer.

Year one

You will study the following compulsory modules:

- Anatomy and Physiology for Radiographers
- Radiation Physics
- Applied Sciences for Radiographers
- Introduction to Radiotherapy and Oncology
- Preparation for Radiotherapy Practice

- Radiotherapy Professional Practice 1

Year two

You will study the following compulsory modules:

- Professional Issues in Radiography
- Research Principles for Radiography
- Service Improvement - A Collaborative Approach
- Intermediate Radiotherapy and Oncology Studies
- Radiotherapy Planning and Dosimetry
- Radiotherapy Professional Practice 2

Final year

You will study the following compulsory modules:

- Radiotherapy Professional Practice 3
- Progressive Radiotherapy and Oncology Studies
- Communications Skills in Cancer and Palliative Care
- Research Dissertation for Radiography
- Radiotherapy Imaging in Practice

The University continually enhances our offer by responding to feedback from our students and other stakeholders, ensuring the curriculum is kept up to date and our graduates are equipped with the knowledge and skills they need for the real world. This may result in changes to the course. If changes to your course are approved, we will inform you.

Learning and Teaching

In addition to lectures, a variety of methods are incorporated into the modules, including practical sessions/VERT/experiments, student led seminars, e-learning, guided self-study and problem based learning using scenarios and case studies. Like all radiography students, you will be allocated a personal tutor from the radiography lecturers.

For more details, see our full glossary of learning and teaching terms.

Assessment

A variety of assessment tools are utilised and include:

- examinations
- assignments
- case studies
- academic poster presentation
- appraisals of clinical skills
- student-led presentations
- clinical portfolio
- research study
- Objective Structural Clincal Examinations (OSCE).

Professional accreditation

BSc(Hons) Radiotherapy and Oncology at UWE Bristol is accredited by the Health and Care Professions Council (HCPC) and leads to eligibility to apply for registration with the HCPC. The course is also approved by the Society and College of Radiographers.

Placements

With a 14-week work placement each year, you will spend half the course applying your knowledge and building professional skills in the real-world. We have excellent links with leading oncology centres in hospitals throughout the South West, including Cheltenham General Hospital; Bristol Haematology and Oncology Centre; Royal Cornwall Hospital, Truro; and the Beacon Centre, Taunton.

Clinical placements will give you a variety of work experiences, helping you make informed career choices and putting you in a strong position for future employment. At each clinical site, Practice Educators trained to teach students will advise, support and feedback on progress during placements.

Study facilities

You will benefit from cutting-edge technology designed to train you in the delivery of radiotherapy, including our revolutionary Virtual Linear Accelerator (VERT). In Year one, you will visit a local radiotherapy centre to reinforce your learning and experience the environment before undertaking your placement. You will use our Varian Eclipse Radiotherapy Planning System to support your learning. We are the first Higher Education institution to offer this new and innovative software, which can be accessed remotely. Our healthcare library offers a huge selection of books, audio-visual materials and specialist health and social care software packages.

Find out more about our fantastic facilities at UWE Bristol.

International opportunities

You will have the option to arrange a self-funded five-week international placement in your final year. In the past, destinations have included Canada, Africa, Pakistan and Uganda. We have supported students through successful applications to the Society of Radiographers Work the World competition.

Lectures and seminars	Self-directed study	Work based placements	Year
20	47	33	1
17	44	39	2
17	65	18	3

Assessment

% Written exams	% Coursework	% practical exams	Year
50	37	13	1
25	62	13	2
0	87	13	3

B. Participant information sheets

Participant Information Sheet: GRADUATE RADIOGRAPHERS

What is the research exploring?

The purpose of the research is to explore graduates perceptions on the activities and experiences they feel best prepares them for practice as a qualified radiographer.

What is involved?

You will be asked to attend a focus group that will last no more than 1.5 hours. The focus group will take place in a private area at your hospital placement site at a mutually-convenient time for you and your manager.

- You will be asked to complete a short form giving some personal details (Appendix 1)
- The focus group will include sharing your thoughts on any ***positive*** experiences and teaching, learning and assessment activities you undertook during your degree programme that you feel really prepared you well for practice as a qualified radiographer (Appendix 2)
- You will also be invited to share your thoughts on the future of therapeutic radiography curricula, i.e. if you had three wishes about what could be done to prepare radiotherapy students for practice as a qualified radiographer, what would they be? (Appendix 2)
- A researcher (Sue Murray) will ask the group questions and present scenarios and the resulting discussions will be tape recorded

What are the risks and benefits?

You will not benefit directly from the project but by participating you will contribute to the body of knowledge in this area which potentially could inform strategies and professional guidelines that endorse positive examples of teaching, learning and educational experiences to enhance students' preparedness for practice. In addition, the research draws together academic and practice communities which will strengthen the links across the radiotherapy profession.

What happens to the data?

The data will be transcribed and analysed as part of the research. The transcript and analyses will be held securely on a password protected computer and coded to preserve anonymity. Extracts from the transcript may be quoted in the research report as part of the written analysis and will take an anonymised form. The findings of the study will also be published in reputable journals and presented at Conferences.

Will my name appear in any published works?

No. Any extracts taken from the transcripts quoted in the research report or any published works or presentations will be presented in an anonymised form so individual identity is protected at all times.

What if I change my mind?

You do not have to take part in the focus group and if you change your mind between signing the consent form and attending the focus group, you have the right to do this without prejudice or need for explanation. Once the focus group has occurred, it will not be possible to withdraw from the study.

Ethics

The research has been approved by Buckinghamshire University Ethics Panel reference number: UEP2015JUL02 on 16th July 2015.

How can I get more information?

If you have any questions about the study at any time, please contact:

Sue Murray (Researcher): **s.1.murray@herts.ac.uk**   Phone 01707 285974

What happens next?

There is no obligation to take part in the study. But if you are willing to volunteer, please complete the general information form (Appendix 1) and complete and sign the consent form (Appendix 3). You can then either post both forms to me at the address below or e-mail them directly to **s.1.murray@herts.ac.uk** .

Many thanks for reading through this information sheet.

Sue Murray
University of Hertfordshire
Room 1F251A Wright Building
School of Health and Social Work – Radiotherapy Division
University of Hertfordshire
College Lane
Hatfield
HERTS AL10 9AB

Appendix 1: General information about you

NEWLY QUALIFIED GRADUATE RADIOGRAPHERS

1. Hospital site:

2: Name (as per the information sheet, this information will not be used beyond the initial stage of contact):

3. E-mail (so I can liaise with you regarding a convenient time for the meeting and forward you the results if you would like to receive a copy)

4. Higher Education Institution where you completed your education:

5. Date of qualification:

Please indicate if you would like to receive a copy of the results when they are available: Y/ N

Appendix 2: Group Activity

The focus group will take the following form:

- Introductions; conveying ground rules. The researcher will emphasise
  - confidentiality of discussions/data;
  - open, free discussion is intended; there are no correct/incorrect answers;
  - opportunity and encouragement of all group members to observe/value stories rather than critique, analyse or judge them;
  - time-keeping;
  - the purpose of the study;
  - confidentiality/anonymity principles and use of data
  - Appreciative Inquiry approach;
  - use of voice recorders (VR)
- Short ground-breaker activity
- Vignette (scenario 1 example)
  - The HCPC standards say that radiographers should possess ‘good’ communication skills – what does ‘good’ look like to you?
  - With reference to your radiotherapy education can you give a positive example of how, where, when you learnt/exhibited that?
- Please can you give an example of a teaching, learning aspect or experience which you felt had a positive impact on your preparation for practice, saying what you valued most about this
- If you had three wishes about something that could/should be done to prepare students for placement what would they be?

Appendix 3

bucks new university

GRADUATE THERAPEUTIC RADIOGRAPHERS

Consent Form for '*Undergraduate therapeutic radiography: perceptions on curricula and preparedness for practice using an appreciative inquiry approach'*

Please tick the appropriate boxes	**Yes**	**No**
I have read and understood the project information sheet.	◻	◻
I have been given the opportunity to ask questions about the project.	◻	◻
I agree to take part in the project. Taking part in the project will involve being interviewed in a group.	◻	◻
I understand that data will be recorded using a Digital Voice Recorder.	◻	◻
I understand that my taking part is voluntary.	◻	◻
I understand my personal details (such as place of study and date of qualification) will not be revealed to people outside the project.	◻	◻
I understand that interviews will be recorded by the researcher and transcribed by an independent transcriber who will be required to sign a confidentiality agreement.	◻	◻
I agree that my anonymised words may be quoted in publications, reports, web pages, and other research outputs.	◻	◻
I understand that all data will be treated as personal under the 1998 Data Protection Act, and will be stored securely.	◻	◻
I understand that other genuine researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.	◻	◻
I understand that other researchers may use my words in publications, reports, web pages and other research outputs, only if they agree to preserve confidentiality of the information	◻	◻
I agree to assign the copyright I hold in any materials related to this project to Sue Murray.	◻	◻

On this basis I am happy to participate in the above study

Name of Participant ……………………… Signature……………………… Date: …………

Name of Researcher: Sue Murray Signature………………………… Date: ………….

If you have any queries or concerns, please contact: Sue Murray (Tel: 01707 285974; e-mail s.1.murray@herts.ac.uk)
One copy to be kept by the participant, one to be kept by the researcher

Participant Information Sheet: Student Therapeutic Radiographers

What is the research exploring?

The purpose of the research is to explore graduates and final year students' perceptions on the activities and experiences they feel best prepares them for practice as a qualified radiographer.

What is involved?

I am looking for volunteers for a group activity that will last no more than 1.5 hours. The group activity will occur on one occasion in semester B in a room close to the Student Union.

- The group activity will include sharing your thoughts on any ***positive*** experiences and teaching, learning and assessment activities you have undertaken during your degree programme that you feel will prepare you well for practice as a qualified radiographer (Appendix A)
- You will also be invited to share your thoughts on the future of therapeutic radiography curricula, i.e. if you had three wishes about what could be done to prepare radiotherapy students for practice as a qualified radiographer, what would they be? (Appendix A)
- A researcher (Sue Murray) will ask the group questions and present scenarios and the resulting discussions will be recorded

What are the risks and benefits?

You will not benefit directly from the project but by participating you will contribute to the body of knowledge in this area which potentially could inform strategies and professional guidelines that endorse positive examples of teaching, learning and educational experiences to enhance students' preparedness for practice.

What happens to the data?

The data will be transcribed and analysed as part of the research. The transcript and analyses will be held securely on a password protected computer and coded to preserve anonymity. Extracts from the transcript may be quoted in the research report as part of the written analysis and will take an anonymised form. The findings of the study will also be published in reputable journals and presented at Conferences.

Will my name appear in any published works?

No. Any extracts taken from the transcripts quoted in the research report or any published works or presentations will be presented in an anonymised form so individual identity is protected at all times.

What if I change my mind?

Participants have a right to withdraw at any time without prejudice and without providing a reason. This will not affect your progression on the programme in any way.

Should you choose to withdraw from the study, you may decide to have any existing data derived from your participation in the study destroyed or you may choose to allow it to be used. This is for you to decide at the time without prejudice and without having to provide any explanations or reasons

Ethics

The research has been approved by Buckinghamshire University Ethics Panel reference number: XXXXXX/Date

How can I get more information?

If you have any questions at any time, please contact:

Sue Murray (Researcher): **s.1.murray@herts.ac.uk** Phone 01707 285974

What happens next?

There is no obligation to take part in the study but if you are willing to volunteer, please sign up to one of the groups displayed on the 3rd year notice board. In addition, please complete and sign the consent form (Appendix B). You can then either return the form to me in person or e-mail it directly to **s.1.murray@herts.ac.uk** .

Many thanks.

Sue Murray
University of Hertfordshire
Room 1F251A Wright Building
School of Health and Social Work – Radiotherapy Division
University of Hertfordshire
College Lane
Hatfield
HERTS AL10 9AB

Date: 01.07.2015

Appendix A: Group Activity

The group activity will take the following form:

- Introductions; conveying ground rules. The researcher will emphasise
  - confidentiality of discussions/data;
  - open, free discussion is intended; there are no correct/incorrect answers;
  - opportunity and encouragement of all group members to observe/value stories rather than critique, analyse or judge them;
  - time-keeping;
  - the purpose of the study;
  - confidentiality/anonymity principles and use of data
  - Appreciative Inquiry approach;
  - use of voice recorders (VR)
- Short ground-breaker activity
- Vignette (scenario 1 example)
  - The HCPC standards say that radiographers should possess ‘good’ communication skills – what does ‘good’ look like to you?
  - With reference to your radiotherapy education can you give a positive example of how, where, when you learnt/exhibited that?
- Please can you give an example of a teaching, learning aspect or experience which you felt had a positive impact on your preparation for practice, saying what you valued most about this
- If you had three wishes about something that could/should be done to prepare students for placement what would they be?

Appendix B

STUDENT THERAPEUTIC RADIOGRAPHERS

Consent Form for '*Undergraduate therapeutic radiography: perceptions on curricula and preparedness for practice using an appreciative inquiry approach*'

Please tick the appropriate boxes	**Yes**	**No**
I have read and understood the project information sheet dated 01/07/2015.	☐	☐
I have been given the opportunity to ask questions about the project.	☐	☐
I agree to take part in the project. Taking part in the project will involve being interviewed in a group.	☐	☐
I understand that data will be recorded using a Digital Voice Recorder.	☐	☐
I understand that my taking part is voluntary; I can withdraw from the study at any time and I do not have to give any reasons for why I no longer want to take part.	☐	☐
I understand that should I leave the study, this will not affect my progression on the programme in any way.	☐	☐
I understand my personal details (such as place of study and date of qualification) will not be revealed to people outside the project.	☐	☐
I understand that interviews will be recorded by the researcher and transcribed by an independent transcriber who will be required to sign a confidentiality agreement.	☐	☐
I agree that my anonymised words may be quoted in publications, reports, web pages, and other research outputs.	☐	☐
I understand that all data will be treated as personal under the 1998 Data Protection Act, and will be stored securely.	☐	☐
I understand that other genuine researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I understand that other researchers may use my words in publications, reports, web pages and other research outputs, only if they agree to preserve confidentiality of the information	☐	☐
I agree to assign the copyright I hold in any materials related to this project to Sue Murray.	☐	☐

On this basis I am happy to participate in the above study

Name of Participant ………………………… Signature…………………………Date…………

Name of Researcher: Sue Murray Signature…………………………Date…………

If you have any queries or concerns, please contact: Sue Murray (Tel: 01707 285974; e-mail s.1.murray@herts.ac.uk)

One copy to be kept by the participant, one to be kept by the researcher

C. Question mapping

Mapping Exercise: Vignettes and Question Development on role of the therapeutic Radiographer

HCPC SOPS (2013)	**NoS (2010)**	**CoR (2013)**	**NHS KSF**
1 be able to practise safely and effectively within their scope of practice		1, 2, 11	3
2 be able to practise within the legal and ethical boundaries of their profession		1, 2	3
3 be able to maintain fitness to practise			5
4 be able to practise as an autonomous professional, exercising their own professional judgement		3.	
5 be aware of the impact of culture, equality, and diversity on practice			6
6 be able to practise in a non-discriminatory manner			
7 understand the importance of and be able to maintain confidentiality			3
8 be able to communicate effectively		8	1
9 be able to work appropriately with others		10	
10 be able to maintain records appropriately		21	
11 be able to reflect on and review practice			5, 2
12 be able to assure the quality of their practice		2	5
13 understand the key concepts of the knowledge base relevant to their profession			

HCPC SOPS (2013)	NoS (2010)	CoR (2013)	NHS KSF
Therapeutic radiographers only 13.23 understand the structure and function of the human body in health and disease, including: – regional and cross-sectional anatomy of the head, neck, thorax, pelvis and abdomen – common pathologies and mechanisms of disease with a concentration on cancer, histology, haematology and the lymphatic and immune systems 13.24 understand: – oncology, the pathophysiology of solid and systemic malignancies – epidemiology – aetiology – the management and effect of cancer 13.25 know the physiological signs and symptoms, clinical investigations and diagnostic procedures that result in referral for radiotherapy 13.26 know the biochemical science of radiation pathophysiology 13.27 understand the influence of adjuvant treatment including surgery and chemotherapy on radiotherapy dose prescription, timing of radiotherapy and post radiotherapy complications			
14 be able to draw on appropriate knowledge and skills to inform practice			
Therapeutic radiographers only 14.36 be able to plan appropriate radiotherapy procedures	SFHR4 Produce treatment parameters for standard individual patient external beam radiotherapy using a planning computer SFHR1 Acquire images, data and reference material for radiotherapy processes SFHR3 Outline clinical target volumes	22, 24	
14.37 be able to generate a treatment plan and verify treatment parameters ensuring optimal radiotherapy prescription delivery	SFHR10 Analyse and interpret treatment verification images SFHR2 Outline anatomical structure to agreed protocol SFHR3 Outline clinical target volumes SFHR8 Check parameters for innovative plans and reconcile inconsistencies in standard plan checks	22, 24	
14.38 be able to use to best effect the image processing and related technology, including computer-based imaging systems for radiotherapy purposes	SFHR10 Analyse and interpret treatment verification images	25	

3

HCPC SOPS (2013)	NoS (2010)	CoR (2013)	NHS KSF
14.39 be able to perform the full range of radiotherapy processes and techniques accurately and safely	SFHR11 Deliver external beam megavoltage radiation SFHR10 Analyse and interpret treatment verification images SFHR3 Outline clinical target volumes SFHR8 Check parameters for innovative plans and reconcile inconsistencies in standard plan checks		
14.40 be able to calculate radiation doses and exposures	SFHR6 Perform simple treatment dose calculations for external beam radiotherapy		
14.41 be able to scrutinise and interpret the radiation prescription in such a way that radiotherapy is delivered accurately and reproducibly	SFHR11 Deliver external beam megavoltage radiation SFHR8 Check parameters for innovative plans and reconcile inconsistencies in standard plan checks	24	
14.42 be able to manage and assist with fluoroscopic procedures, including those requiring the use of contrast agents	SFHR1 Acquire images, data and reference material for radiotherapy processes	18,	
14.43 be able to assist in performing standard computed tomographic (CT) planning procedures	SFHR1 Acquire images, data and reference material for radiotherapy processes	18, 19	
14.44 be able to assist in the construction of appropriate immobilisation devices, individualised to the specific needs of each patient and the treatment regime prescribed		17	
14.45 be able to undertake complex radiation dose delivery calculations involving a range of radiation types and energies			
14.46 be able to localise the target volume precisely in relation to external surface and anatomical reference markings using a range of techniques including computed tomography and magnetic resonance imaging	SFHR1 Acquire images, data and reference material for radiotherapy processes SFHR2 Outline anatomical structure to agreed protocol SFHR3 Outline clinical target volumes		

HCPC SOPS (2013)	NoS (2010)	CoR (2013)	NHS KSF
14.47 be able to manipulate exposure and image recording parameters to optimal effect and interpret and evaluate images obtained during radiotherapy planning and treatment	SFHR1 Acquire images, data and reference material for radiotherapy processes SFHR10 Analyse and interpret treatment verification images	20, 19	
14.48 be able to interpret and evaluate images obtained during radiotherapy planning and treatment	SFHR10 Analyse and interpret treatment verification images	19	
14.49 be able to identify organs at risk on images to provide information for radiotherapy treatment planning	SFHR2 Outline anatomical structure to agreed protocol	15	
14.50 be able to recognise changing signs, symptoms and progression of disease, and make appropriate decisions not to treat or to review further before proceeding with treatment		16	
15 understand the need to establish and maintain a safe practice environment		11	

National Occupational Standards NOT integrated into table above as these align to Advanced Practice:

SFHR5 Produce treatment parameters for individual standard brachytherapy patient treatment

SFHR9 Clinically authorise and prescribe radiation treatment

SFHR13 Administer sealed source brachytherapy to patients using after loading devices

NHS KSF 6 Core Dimensions

1. communication
2. personal and people development
3. health, safety and security
4. service improvement
5. quality

6. equality and diversity.

CoR Education and Career Framework for the Radiography Workforce (2013)

1. Practise safely within relevant legal, ethical, professional and managerial frameworks.

2. Demonstrate accountability, recognising and responding appropriately to strengths and limitations in own knowledge, skills and attributes and to those of others.

3. Select and justify evidence for safe, effective, professional practice

4. Engage in audit, research and continuing professional development.

5. Contribute to the development of radiographic practice for the benefit of patients.

6. Manage self and workload effectively and in a timely way.

7. Use information management systems effectively.

8. Demonstrate highly-developed interpersonal and communication skills.

9. Use and give professional supervision.

10. Mentor and teach learners, support staff and other professionals.

11. Ensure the radiation safety of all individuals in the working environment.

12. Practise within a risk-benefit framework, having regard to the biological effects of radiation.

13. When entitled to do so by the employer, undertake practitioner, operator and referrer roles within IR(ME)R 2000 and its subsequent amendments as appropriate to professional practice.

14. Participate in quality assurance and undertake equipment testing, responding appropriately.

15. Identify, evaluate and interpret normal and abnormal anatomy and pathophysiology relevant to clinical practice.

16. Assess patients and make reasoned decisions to initiate, continue, modify, suspend or cease imaging examinations or radiotherapy.

17. Employ effective positioning and immobilisation, customising devices as appropriate.

18. Manipulate exposure factors and image recording parameters to optimal effect.

19. Monitor and assess the adequacy of images.

20. Interpret results and, where necessary, carry out additional image manipulation, imaging or adaptation of treatment delivery.

21. Record imaging examinations/radiotherapy interventions and their outcomes accurately.

22. Evaluate the range of imaging or radiotherapy modalities to make informed professional judgements about their application.
23. Supply, administer and prescribe medicines within the legal framework.
24. Generate an optimal treatment plan and interpret radiotherapy prescriptions accurately, modifying these during treatment when necessary. (T)
25. Select and justify imaging and treatment modalities and operate equipment safely and effectively. (T)
26. Select and justify imaging examinations and operate equipment safely and effectively. (D)
27. Produce written preliminary evaluation of imaging examinations undertaken. (D)
28. Work individually, collaboratively and/or in partnership to deliver person-centred care and interventions.
29. Meet the care needs of individuals and their significant others sensitively and respectfully having regard to the impact of illness and trauma and to socio-cultural differences.
30. Have due regard to patients' health status and co-morbidities, promoting healthy living.
31. Demonstrate proficiency in basic life-support techniques, infection control and moving and handling.
32. Obtain informed consent or ensure that it has been given.
33. Advise other Health and Social Care professionals about patients' needs, referring them where necessary.

HCPC SETS (2014)

Generic statements not aligned to the specific role of the radiographer but to Radiotherapy Curricula

Curriculum

4.1 The learning outcomes must ensure that those who successfully complete the programme meet the standards of proficiency for their part of the Register.

4.2 The programme must reflect the philosophy, core values, skills and knowledge base as articulated in any relevant curriculum guidance.

4.3 Integration of theory and practice must be central to the curriculum.

4.4 The curriculum must remain relevant to current practice.

4.5 The curriculum must make sure that students understand the implications of the HCPC's standards of conduct, performance and ethics.

4.6 The delivery of the programme must support and develop autonomous and reflective thinking.

4.7 The delivery of the programme must encourage evidence-based practice.

4.8 The range of learning and teaching approaches used must be appropriate to the effective delivery of the curriculum.

4.9 When there is interprofessional learning the profession-specific skills and knowledge of each professional group must be adequately addressed.'

(HCPC, 2014, p.7)

Practice Placements

5.1 Practice placements must be integral to the programme.

5.2 The number, duration and range of practice placements must be appropriate to support the delivery of the programme and the achievement of the learning outcomes.

5.3 The practice placement settings must provide a safe and supportive environment.

5.4 The education provider must maintain a thorough and effective system for approving and monitoring all placements.

5.5 The placement providers must have equality and diversity policies in relation to students, together with an indication of how these will be implemented and monitored.

5.6 There must be an adequate number of appropriately qualified and experienced staff at the practice placement setting.

5.7 Practice placement educators must have relevant knowledge, skills and experience.

5.8 Practice placement educators must undertake appropriate practice placement educator training. 5.9 Practice placement educators must be appropriately registered, unless other arrangements are agreed.

5.10 There must be regular and effective collaboration between the education provider and the practice placement provider.

5.11 Students, practice placement providers and practice placement educators must be fully prepared for placement which will include information about an understanding of: – the learning outcomes to be achieved; – the timings and the duration of any placement experience and associated records to be maintained; – expectations of professional conduct; – the assessment procedures including the implications of, and any action to be taken in the case of, failure to progress; and – communication and lines of responsibility.

5.12 Learning, teaching and supervision must encourage safe and effective practice, independent learning and professional conduct.

5.13 A range of learning and teaching methods that respect the rights and needs of service users and colleagues must be in place throughout practice placements.

(HCPC, 2014, p.8-9)

Assessment

6.1 The assessment strategy and design must ensure that the student who successfully completes the programme has met the standards of proficiency for their part of the Register.

6.2 All assessments must provide a rigorous and effective process by which compliance with external-reference frameworks can be measured.

6.3 Professional aspects of practice must be integral to the assessment procedures in both the education setting and practice placement setting.

6.4 Assessment methods must be employed that measure the learning outcomes.

6.5 The measurement of student performance must be objective and ensure fitness to practise.

6.6 There must be effective monitoring and evaluation mechanisms in place to ensure appropriate standards in the assessment.

6.7 Assessment regulations must clearly specify requirements for student progression and achievement within the programme.

6.8 Assessment regulations, or other relevant policies, must clearly specify requirements for approved programmes being the only programmes which contain any reference to an HCPC protected title or part of the Register in their named award.

6.9 Assessment regulations must clearly specify requirements for an aegrotat award not to provide eligibility for admission to the Register.

6.10 Assessment regulations must clearly specify requirements for a procedure for the right of appeal for students.

6.11 Assessment regulations must clearly specify requirements for the appointment of at least one external examiner who must be appropriately experienced and qualified and, unless other arrangements are agreed, be from the relevant part of the Register.

(HCPC, 2014, p.10)

D. Focus group questions

Questions: Focus Groups

Opening question (Icebreaker / conversation starter)

The HCPC standards say that radiographers should possess 'good' communication skills – what does 'good' look like to you? How do you recognise it, say when you're working with somebody?

AI '*Discovery*' Questions

Question 1 (AI)

Thinking back on your own radiotherapy educations, describe a positive learning experience / high-point of how and where you learnt that (communication) skill.

(Prompt …. So was there any teaching/learning experience that you had, either in practice or at university, that you felt, I've really learnt from this, this is a really good positive experience?)

Question 2 (AI)

One of the key roles of the radiographer is radiotherapy planning and pre-treatment. Please describe a positive learning experience that enabled you to develop the knowledge and skills necessary for planning.

(Follow up - What were you doing that was positive?

Where did you do this?)

Clarification question

The HCPC Standards of Proficiency (2013) say that as a radiographer you should be able to practice as an autonomous professional exercising your own professional judgment – what does autonomy/ professional judgement look like to you?

Question 3 (AI)

Please describe a positive event or high point of how, where, when you learnt about using professional judgement during your undergraduate education.

Question 4 (AI)

Verification before, during and after radiotherapy procedures are key to accurate treatment. Please can you describe a positive experience that you feel positively aided your understanding and development of this skill? What did you value most about it?

Question 5 (AI)

Please can you give an example of a teaching, learning aspect or experience which you felt had a positive impact on your preparation for practice, saying what it was and what you valued most about this.

AI ‘*Dream’* Question

Finally …. If you had three wishes about something that could/should enhance teaching of radiotherapy curricula / education what would they be?

(Prompt ….. this could be anything you would like or more of something you feel really positively aided your learning)

E. Buckinghamshire New University Ethics Application and Approval

bucks new university

University Ethics Panel Application form

Section 1: Researcher details

1.1 Contact details of researcher					
Title	Mrs	Forename	Susan	Surname	Murray
Department: Society and Health			E-mail: sue@murraymints.org/ s.1.murray@herts.ac.uk Tel. No.		

Status:	Employee	Postgraduate Research X	Postgraduate Taught	Undergraduate

1.2 Co-applicants (please include everyone who will be involved in the research project, including research assistants)		
Name	Post held	Organisation

Section 2: Project details

2.1 Project title and timescale	
Title	Undergraduate therapeutic radiography: perceptions on curricula and preparedness for practice using an appreciative inquiry approach
Proposed start date:	01/09/2015
Proposed end date: (of data collection)	30/06/16

2.2 Costs and funding

Please indicate the total costs and source of funding (if applicable): N/A

2.3 Brief project description
Your summary must include a clear statement of the purpose of your research, how it will build on existing evidence where available, and its intended benefits. You must also describe how the research will be conducted and how people will be involved. Lay people may review this form. (Max 300 words) **The purpose** of the study is to capture the views of new graduates and final-year students on teaching and learning aspects that they perceive to be useful in preparing them for practice. **The intended benefit** is to contribute to the body of knowledge in this area and to inform strategies and professional guidelines that endorse positive examples of teaching, learning and educational experiences to enhance students' preparedness for practice. In addition, the research will draw together academic and practice communities thereby strengthening links across the radiotherapy profession. **Context:** The research focuses on positive teaching and learning aspects and experiences which are perceived to prepare undergraduate therapeutic radiography students for their first post. The project is positioned within statutory and professional body contexts, namely, the Health and Care Professions Council (HCPC) Standards of Education and Training (SETS) for Radiography (Health and Care Professions Council, 2014), Standards of Proficiency (SOPS) for Radiography (Health and Care Professions Council, 2013) and the Society and College of Radiographers Education and Career Framework for the Radiography Workforce (Society and College of Radiographers, 2013). The standards and frameworks have been used to create the questions and vignettes employed in semi-structured group interviews. Two groups of participants will be invited to take part in the study: 1) Final year undergraduate therapeutic radiography students from the University of Hertfordshire (the Institution in which the researcher works) 2) Therapeutic radiography graduates who have qualified in 2015 from any Higher Education in England. In the first instance six radiotherapy departments local to where the researcher is based will be approached (convenience sampling), however, should this fail to recruit a sufficient sample (proposed n = 30) then the geographical area will be widened to include London radiotherapy departments. A qualitative appreciative inquiry methodology is employed because the intention is to discover the best of what exists in radiotherapy undergraduate programmes.

Section 3: Research Design

3.1: Methodology/Methods

Please check boxes for all methodology/methods that you plan to use:		
	Methodologies	
A	Case study	
B	Ethnography	
C	Life history/narrative	
D	Action research	
E	Participatory Research	
F	Dialogic enquiry	
G	Positivistic-Statistical	
H	Other methodology: Please give details	
	Appreciative Inquiry	X
	Methods	
A	Written questionnaires	
B	Semi-structured interviews	X
C	Unstructured interviews	
D	Focus groups	
E	Observation	
F	Analysis of pre-existing data from human participants (where this data is sensitive or could be identifiable)	
G	Audio/video recording or photography in a public place	
H	Audio/video recording or photography in a private place	
I	Quantitative experiment	
J	**Other method:**	

3.2 Research design

Describe and justify the methodology/methods you intend to use. Include details of and reasons for your sample selection and size to enable robust outcomes.

Background
To become a therapeutic radiographer, students undertake a programme of study that has been deemed appropriate to meet the standards required of a therapeutic radiographer and validated by professional and statutory bodies, namely, the College of Radiographers and Health and Care Professions Council. There are 10 Higher Education Institutions (HEI) in England that offer undergraduate programmes, with each programme being comprised of academic and clinical blocks the length of which are determined by each individual HEI.

Students learn in practice in small groups; the maximum number of students at a site is determined by the number of treatment units a radiotherapy department possesses as well as the number of practice staff. The teaching and learning activities and experiences that students undertake to prepare them for practice is specific to the HEI and the clinical placement site and it is this area which the study aims to explore.

Research Methodology and Sample
A qualitative appreciative inquiry (AI) research methodology has been chosen because it is intended that new understanding will be created from a positive stance and reported in a way that will enhance professional links and values best practices. The 4D model of discovery, dream, design and destiny that AI embraces, is a process that shows symmetry with the reflective characteristics of professional learning; therefore participants should possess the skills necessary to embrace open inquiry methods and be at ease sharing positive aspects of teaching and learning elements that have positively contributed to preparing them for practice.

The sampling method is purposeful and as the sampling is homogeneous, a small, non-randomised convenience sample is acceptable; therefore the intention is to recruit:

- 30 graduate therapeutic radiographers who have qualified from one of the HEIs in England this year
- 30 final-year therapeutic radiography students from the University of Hertfordshire

Professional learning theories such as those described by Eraut, indicate that there is a time association with the development of tacit knowledge and skills development; thus the research will explore perceptions at different points in time and training:

1) pre-qualification: (undergraduate students);
2) shortly after qualification (within 3 months): (graduates);
3) 6 months post-qualification (repeat graduate interviews)

Data collection method
Data will be collected through group interviews which embrace AI methodology. The intended structure is:

- Introductions; conveying ground rules (confidentiality of discussions/data; expectations of the group: open, free discussion is intended; no correct/incorrect answers; encourage others to observe/value stories rather than critique, analyse or judge them; time-keeping); reiterating the purpose of the study; confidentiality/ anonymity principles; AI approach; dissemination of data; use of voice recorders (VR)
- Ground-breaker activity
- Questions and vignettes based on the standards and frameworks will be tabled - participants will be asked to identify what 'good' resembles and invited to give an example of how, where, when they learnt that aspect
- Participants will be invited to give an example of a teaching, learning aspect or

3.3 Ethical implications

Briefly outline any ethical implications of your research and how you propose to minimise these risks.

It is hoped that ethical issues will be minimised by the design of the research project and the adoption of an AI approach: the focus will be on collecting positive data.

The research will be carried out with the informed consent of participants prior to commencement of data collection. Full information about the nature and purpose of the research and the commitment it will involve in terms of numbers of occasions and expected time spent during interviews will be made available to participants in advance of the study (see separate Graduates and Undergraduate Student Participant Information Sheets and Informed Consent forms).

Participants will be provided with opportunities for discussing the research as part of the recruitment process and will be informed of their right to withdraw at any point without penalty or the need to give explanations.

The Participant Information Sheet and Informed Consent form for Undergraduate students will explicitly explain that if they decline involvement in the study, it will not affect their progression or have any impact on their studies.

It is unlikely that the process of revisiting positive teaching and learning experiences that prepared them for practice may be stressful for participants. However should this occur, contact details for relevant support services and one-to-one de-briefing sessions will be made available to all participants.

3.4 Dissemination

The findings of the study will form part of the researcher's professional doctorate and will be presented in the dissertation.

Findings will also be shared with participants (if requested), and communicated to the professional body (College of Radiographers) as the basis from which professional-specific guidelines can be developed.

In the wider context of the radiotherapy community the findings will be imparted via presentations at conferences and journal articles. Key conferences and journals to be targeted include but are not limited to:

- College of Radiographer Annual Radiotherapy Conference;
- Heads of Radiography Education Excellence in Radiography Research Conference; United Kingdom Radiotherapy and Oncology Conference (UKRO);
- Placement Learning Conferences and events
- *Journal of Radiotherapy Practice*
- *Radiography Journal*

Section 4: Participants and Recruitment

Section 4.1: Participants
A purposive, convenience sampling approach is taken. Criteria for inclusion and exclusion are as follows: **Inclusion criteria** • Therapeutic radiography graduates working within radiotherapy departments local to the researcher (Mount Vernon Cancer Centre; Imperial College London; Peterborough City Hospital; Royal Berkshire Hospital; Oxford Churchill Hospital; Northampton General) who have qualified in the summer of 2015 from one of the ten HEIs in England • In the event that graduate recruitment to the study is low, the researcher will extend the geographical area to include radiotherapy departments in and around London including North Middlesex Hospital; Guys and St Thomas; St Bartholomews; Royal Marsden Hospitals; UCLH; Royal Free Hospital • Final-year (level 6) undergraduate therapeutic radiography students studying at the University of Hertfordshire **Exclusion criteria** • Graduates who have qualified from an HEI outside of England are excluded because such programmes have to meet additional local standards and frameworks, e.g. Scottish Credit and Qualifications Framework which would have an impact on the design of the vignettes and questions for the semi-structured group interviews • All other students at the University of Hertfordshire

Section 4.2: Recruitment method

Provide a brief outline of how potential participants will be approached and recruited into the project (any recruitment materials should be included with the application). Please refer to the Bucks Guidelines for recruitment of participants for research.
http://bucks.ac.uk/research/research_ethics/research-ethics-guidance/

The recruitment method is completely voluntary but slightly different according to whether the prospective participant is an undergraduate student or qualified graduate.

In both cases an invitation and participant information sheet which contains the study details as well as time commitment will be forwarded to the prospective participants.

In the case of graduates, the letter of invitation and participant information sheet will be posted to a named practice educator in each department (whose agreement has been previously sought). The practice educator will pass on the information to newly-qualified graduates in their employment.

Undergraduate students will be approached by an announcement modelled on the Participant Information Sheet during the induction of the 3rd year semester B modules. Those students interested in attending will be asked to sign up to a session on a sheet posted on the 3rd year student notice board and a follow up e-mail containing a copy of the Participant Information Sheet will be sent to them via e-mail. Permission to approach the students has been gained from the 3rd Year Tutor, Lynne Gordon (see Gatekeeper permission document).

The letter and participant information sheet will include the researcher's contact details so if the prospective participant has any questions, they have the opportunity to communicate with the researcher.

Section 4.3: Vulnerability

If vulnerable people are allowed to take part in this study, give details and please indicate any necessary checks required by the researchers (eg Disclosure and Barring Service checks). Please refer to our Safeguarding Policy, *http://bucks.ac.uk/content/documents/Formal_Documents/Equality_and_Diversity/safeguarding-under-18s-and-adults-at-risk-policy-and-procedure)*

N/a

Section 4.4: Incentives

If your project will involve offering incentives of any kind, state what the incentives (financial or otherwise) will be and provide a brief justification as to why you feel this is necessary for the project.

N/a

Section 4.5: Gatekeepers / Permission

For students, the initial contact has been made with the 3rd Year Tutor to gain permission to approach the students – this is usual practice at the University of Hertfordshire as it makes sure that students are not overloaded with survey and research requests (see Appendix 2). The proposed study has been presented at a quarterly Radiotherapy Clinical Liaison meeting on 17th June 2015, group members of which include Hertfordshire programme academic staff and practice educators from the six radiotherapy departments. The researcher asked if the practice educators were willing to distribute the letters/information sheets to graduates in their employment and positive responses were received (see Appendix 3).

Section 5: Consent procedure				
This section will demonstrate how you will obtain informed consent from the participants. *Please include all supporting documents (eg Information Sheets, Consent forms and questionnaires).* Please answer YES, NO or NOT APPLICABLE (N/A) to **each** of the following:				
		Yes	No	N/A
5.1	All respondents will be given an Information Sheet and enough time to read it before being asked to agree to participate.	X		
5.2	All participants taking part in an interview, focus group, observation (or other activity which is not questionnaire-based) will be asked to sign a consent form.	X		
5.3	All participants completing a questionnaire will be informed on the Information Sheet that returning the completed questionnaire implies consent to participate.			X
5.4	All participants being asked to provide sensitive personal data will have the following statement on the consent form or on the bottom of their questionnaire "I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the UK Data Protection Act 1998''. A tick box should be included to allow participants to give explicit consent for the collection and use of such data.			X
5.5	All respondents will be told that they can withdraw at any time, ask for their interview tape to be destroyed and/or their data removed from the project until it is no longer practical to do so (e.g. when the report has been written up).	X		
5.6	Where full information cannot be given prior to participation (because it could influence outcomes) participants will be fully de-briefed after participation.			X
5.7	If you answered NO to any of the above (or think more information could be useful to the reviewer) please state why here:			

Section 6: Confidentiality, Anonymity & Data and Records Management

This section will show how participants can expect confidentiality and/or anonymity and will show how any research data collected will be managed during and after the study. *Confidential data is not disclosed to other people; Anonymous data cannot be linked to the participant's personal details.*

Please answer YES, NO or NOT APPLICABLE (N/A) to each of the following:

		Yes	No	N/A
6.1	Questionnaires will be returned anonymously and indirectly. Please note that questionnaire data cannot then be followed up/clarified.			X
6.2	Questionnaires and/or interview transcripts will only be identifiable by a unique identifier (e.g. code/pseudonym)	X		
6.3	Lists of identity number or pseudonyms linked to names and/or addresses will be stored securely and separately from research data	X		
6.4	All place names and institutions which could lead to the identification of individuals or organisations will be changed	X		
6.5	I confirm that all processing of personal information related to the study will be in full compliance with the UK Data Protection Act 1998 (DPA) (*including the Data Protection Principles)*	X		
6.6	I confirm that processing of all security sensitive information will be in full compliance with the "Oversight of security - sensitive research material in UK universities: guidance (October 2012)" (Universities UK, recommended by the Association of Chief Police Officers)			X
6.7	If you answered NO to any of the above (or think more information could be useful to the reviewer) please state why here:			

Section 7: Authorisation

For employees:

Please ask your Head of School to sign that they have read the application form and that they accept responsibility for the applicant who is undertaking the work in their School.

Signed: …………………………………………….

Date

For postgraduate researchers, postgraduate taught students and undergraduate students:

Please ask your supervisor to sign that they have read the application form and that they accept responsibility for the applicant who is undertaking the work.

Signed Elaine Arnull
Supervisor

I, as the Supervisor, recognise the benefit of attending the ethics committee meeting with the student

Signed Elaine Arnull
Elaine Arnull Supervisor

Date 02.07.2015

Section 8: Checklist for Applicant
The Ethics application form
The Participant Information Sheet
The Consent Form
Letters seeking/granting permission for access to data/participants
Materials for recruitment of participants
Questionnaire
Interview schedule
Authorisation received

Appendix 1

Transcriber Confidentiality Agreement

Title of research: Undergraduate therapeutic radiography: perceptions on curricula and preparedness for practice using an appreciative inquiry approach

This research is being undertaken by Sue Murray, a Doctoral Student at Buckinghamshire New University.

The purpose of the research is to explore the perceptions of graduate therapeutic radiographers and final year students on the activities and experiences that they believe prepare them for radiotherapy practice.

As a transcriber of this research, I understand that I will be hearing recordings of confidential interviews. The information on these recordings has been revealed by interviewees who agreed to participate in this research on the condition that their interviews would remain strictly confidential. I understand that I have a responsibility to honour this confidentially agreement.

I agree not to share any information on these recordings, about any party, with anyone except the Researcher of this project. Any violation of this and the terms detailed below would constitute a serious breach of ethical standards and I confirm that I will adhere to the agreement in full.

I, ____ agree to:

1. Keep all the research information shared with me confidential by not discussing or sharing the content of the interviews in any form or format (e.g. Digital Voice Recording files, transcripts) with anyone other than the Researcher.

2. Keep all research information in any form or format secure while it is in my possession.

3. Return all research information in any form or format to the Researcher when I have completed the transcription tasks.

4. After consulting with the Researcher, erase or destroy all research information in any form or format regarding this research project that is not returnable to the Researcher (e.g. CDs, information stored on my computer hard drive).

Transcriber:

__________________________ ______________________ ____________________
(print name) (signature) (date)

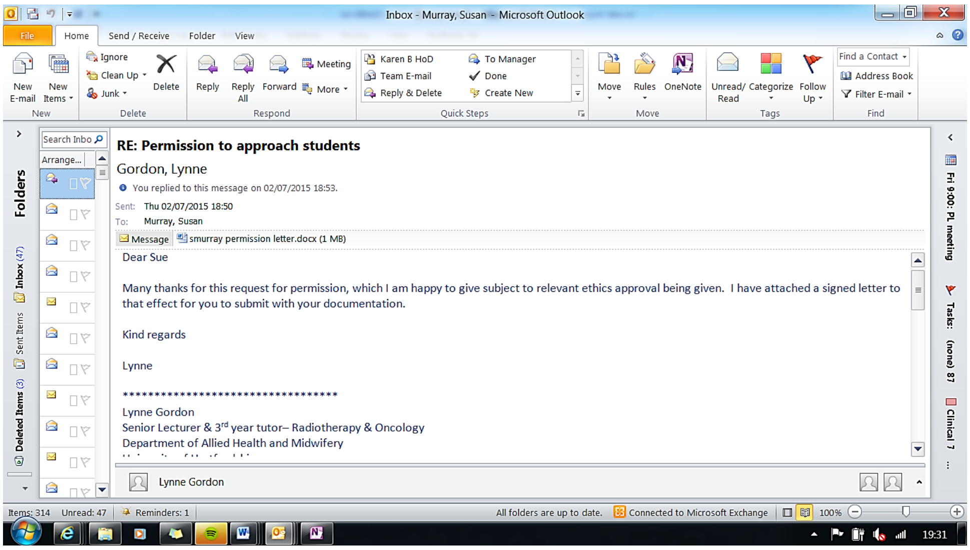
Researcher:

__________________________ ______________________ ____________________
(print name) (signature) (date)

This study has been reviewed and ethically approved by Buckinghamshire New University Ethics Committee, reference number XXXXXXX

11

Appendix 2 Gatekeeper Permission



RE: Permission to approach students

Gordon, Lynne

You replied to this message on 02/07/2015 18:53.

Sent: Thu 02/07/2015 18:50

To: Murray, Susan

Message | smurray permission letter.docx (1 MB)

Dear Sue

Many thanks for this request for permission, which I am happy to give subject to relevant ethics approval being given. I have attached a signed letter to that effect for you to submit with your documentation.

Kind regards

Lynne

****

Lynne Gordon
Senior Lecturer & 3rd year tutor– Radiotherapy & Oncology
Department of Allied Health and Midwifery

University of Hertfordshire
College Lane
Hatfield, Hertfordshire
AL10 9AB

Telephone +44 (0)1707 284000
Fax +44 (0)1707 284115
Website www.herts.ac.uk

Mrs S Murray
Department of Allied Health and Midwifery
School of Health & Social Work
University of Hertfordshire
College Lane
Hatfield, Hertfordshire
AL10 9AB

2nd July 2015

Dear Sue

Re: Permission to approach students on the BSc (Hons) Radiotherapy & Oncology Programme

Thank you for your request to approach the 3rd year radiotherapy students in order to invite them to participate in the study entitled, " Undergraduate therapeutic radiography: perceptions on curricula and preparedness for practice using an appreciative inquiry approach"

I can confirm in principle that you may approach the students when you have full written approval from the appropriate Ethics Committee.

On receipt of your approval documentation you may approach the member(s) of staff responsible for the cohort to identify dates and time that will cause least disruption to the educational programme of the students.

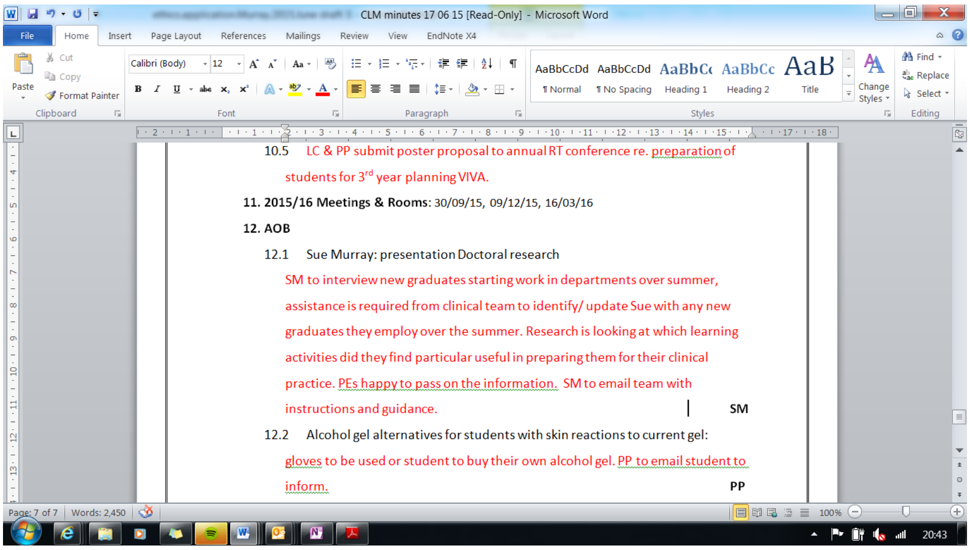
I understand that all volunteers will be supplied with all relevant information pertaining to the study prior to making their decision.

I wish you luck with your proposed research, and look forward to receipt of your ethics protocol number.

Yours sincerely

Lynne Gordon (Mrs)
Senior Lecturer & 3rd Year tutor Tutor
BSc (Hons) Radiotherapy & Oncology
Department of Allied Health Professions & Midwifery
School of Health & Social Work
University of Hertfordshire
College Lane Campus
Hatfield, Hertfordshire
AL10 9AB

Appendix 3



10.5 LC & PP submit poster proposal to annual RT conference re. preparation of students for 3rd year planning VIVA.

11. 2015/16 Meetings & Rooms: 30/09/15, 09/12/15, 16/03/16

12. AOB

12.1 Sue Murray: presentation Doctoral research

SM to interview new graduates starting work in departments over summer, assistance is required from clinical team to identify/ update Sue with any new graduates they employ over the summer. Research is looking at which learning activities did they find particular useful in preparing them for their clinical practice. PEs happy to pass on the information. SM to email team with instructions and guidance. **SM**

12.2 Alcohol gel alternatives for students with skin reactions to current gel: gloves to be used or student to buy their own alcohol gel. PP to email student to inform. **PP**

bucks
new university

22nd July 2015

Ms Sue Murray
[redacted]

Dear Sue

Ethical approval: Ref UEP2015Jul02

I am writing to confirm that Ethical approval was granted by the University Ethics Panel of Buckinghamshire New University on 16th July 2015 for your project:

"Undergraduate therapeutic radiography: perceptions on curricula and preparedness for practice using an appreciative inquiry approach "

between 1st September 2015 and 30th June 2016.

I hope that your research project goes well.

Yours sincerely,

Dr M. Nakisa
Secretary to the University Ethics Panel
Research Unit
Academic Quality Directorate

Buckinghamshire New University
High Wycombe Campus
Queen Alexandra Road
High Wycombe
Buckinghamshire HP11 2JZ

Telephone: +44 (0) 1494 522 141
Facsimile: +44 (0) 1494 524 392
Twitter: @bucksnewuni
Facebook: bucks.ac.uk/facebook
bucks.ac.uk

F. NHS ethics

Go straight to content.

NHS
Health Research Authority

MRC Medical Research Council

Do I need NHS REC approval?

To print your result with title and IRAS Project ID please enter your details below:

Title of your research:

Undergraduate therapeutic radiography: perceptions on curricula and preparedness for practice using an appreciative inquiry approach

IRAS Project ID (if available):

Your answers to the following questions indicate that **you do not need NHS REC approval for sites in England.** However, **you may need other approvals.**

You have answered ***'YES'*** to: Is your study research?

You answered ***'NO'*** to all of these questions:

Question Set 1

- Is your study a clinical trial of an investigational medicinal product?
- Is your study one or more of the following: A non-CE marked medical device, or a device which has been modified or is being used outside of its CE mark intended purpose, and the study is conducted by or with the support of the manufacturer or another commercial company (including university spin-out company) to provide data for CE marking purposes?
- Does your study involve exposure to any ionising radiation?
- Does your study involve the processing of disclosable protected information on the Register of the Human Fertilisation and Embryology Authority by researchers, without consent?
- Is your study a clinical trial involving the participation of practising midwives?

Question Set 2

- Will your study involve research participants identified from, or because of their past or present use of services (adult and children's healthcare within the NHS and adult social care), for which the UK health departments are responsible (including services provided under contract with the private or voluntary sectors), including participants recruited through these services as healthy controls?
- Will your research involve collection of tissue or information from any users of these services (adult and children's healthcare within the NHS and adult social care)? This may include users who have died within the last 100 years.
- Will your research involve the use of previously collected tissue or information from which the research team could identify individual past or present users of these services (adult and children's healthcare within the NHS and adult social care), either directly from that tissue or information, or from its combination with other tissue or information likely to come into their possession?
- Will your research involve research participants identified because of their status as relatives or carers of past or present users of these services (adult and children's healthcare within the NHS and adult social care)?

Question Set 3

- Will your research involve the storage of relevant material from the living or deceased on premises in the UK, but not Scotland, without an appropriate licence from the Human Tissue Authority (HTA)? This includes storage of imported material.
- Will your research involve storage or use of relevant material from the living, collected on or after 1st September 2006, and the research is not within the terms of consent from the donors, and the research does not come under another NHS REC approval?
- Will your research involve the analysis of DNA from bodily material, collected on or after 1st September 2006, and this analysis is not within the terms of consent for research from the donor?

Question Set 4

- Will your research involve at any stage intrusive procedures with adults who lack capacity to consent for themselves, including participants retained in study following the loss of capacity?
- Is your research health-related and involving prisoners?
- Does your research involve xenotransplantation?
- Is your research a social care project funded by the Department of Health?

If your research extends beyond **England** find out if you need NHS REC approval by selecting the *'OTHER UK COUNTRIES'* button below.

OTHER UK COUNTRIES

If, after visiting all relevant UK countries, this decision tool suggests that you do not require NHS REC approval follow this link for final confirmation and further information.

Print This Page

NOTE: If using Internet Explorer please use browser print function.

About this tool **Feedback** **Contact** **Glossary**

G. IRAS application

Welcome to the Integrated Research Application System

IRAS Project Filter

The integrated dataset required for your project will be created from the answers you give to the following questions. The system will generate only those questions and sections which (a) apply to your study type and (b) are required by the bodies reviewing your study. Please ensure you answer all the questions before proceeding with your applications.

Please complete the questions in order. If you change the response to a question, please select 'Save' and review all the questions as your change may have affected subsequent questions.

Please enter a short title for this project (maximum 70 characters)
Perspectives on undergraduate Radiotherapy curricula (V1)

1. Is your project research?

(●) Yes ( ) No

2. Select one category from the list below:

( ) Clinical trial of an investigational medicinal product

( ) Clinical investigation or other study of a medical device

( ) Combined trial of an investigational medicinal product and an investigational medical device

( ) Other clinical trial to study a novel intervention or randomised clinical trial to compare interventions in clinical practice

( ) Basic science study involving procedures with human participants

( ) Study administering questionnaires/interviews for quantitative analysis, or using mixed quantitative/qualitative methodology

(●) Study involving qualitative methods only

( ) Study limited to working with human tissue samples (or other human biological samples) and data (specific project only)

( ) Study limited to working with data (specific project only)

( ) Research tissue bank

( ) Research database

If your work does not fit any of these categories, select the option below:

( ) Other study

2a. Please answer the following question(s):

a) Does the study involve the use of any ionising radiation?	( ) Yes	(●) No
b) Will you be taking new human tissue samples (or other human biological samples)?	( ) Yes	(●) No
c) Will you be using existing human tissue samples (or other human biological samples)?	( ) Yes	(●) No

3. In which countries of the UK will the research sites be located?*(Tick all that apply)*

- [x] England
- [ ] Scotland

- [ ] Wales
- [ ] Northern Ireland

3a. In which country of the UK will the lead NHS R&D office be located:

- (•) England
- ( ) Scotland
- ( ) Wales
- ( ) Northern Ireland
- ( ) This study does not involve the NHS

4. Which review bodies are you applying to?

- [ ] HRA Approval
- [x] NHS/HSC Research and Development offices
- [ ] Social Care Research Ethics Committee
- [ ] Research Ethics Committee
- [ ] Confidentiality Advisory Group (CAG)
- [ ] National Offender Management Service (NOMS) (Prisons & Probation)

For NHS/HSC R&D offices, the CI must create Site-Specific Information Forms for each site, in addition to the study-wide forms, and transfer them to the PIs or local collaborators.

It looks like your project is research requiring NHS R&D approval but does not require review by a REC within the UK Health Departments Research Ethics Service – is that right?

(•) Yes ( ) No

4b. Please confirm the reason(s) why the project does not require review by a REC within the UK Health Departments Research Ethics Service:

- [ ] Projects limited to the use of samples/data samples provided by a Research Tissue Bank (RTB) with generic ethical approval from a REC, in accordance with the conditions of approval.
- [ ] Projects limited to the use of data provided by a Research Database with generic ethical approval from a REC, in accordance with the conditions of approval.
- [ ] Research limited to use of previously collected, non-identifiable information
- [ ] Research limited to use of previously collected, non-identifiable tissue samples within terms of donor consent
- [ ] Research limited to use of acellular material
- [x] Research limited to use of the premises or facilities of care organisations (no involvement of patients/service users as participants)
- [x] Research limited to involvement of staff as participants (no involvement of patients/service users as participants)

5. Will any research sites in this study be NHS organisations?

(•) Yes ( ) No

5a. Are all the research costs and infrastructure costs for this study provided by an NIHR Biomedical Research Centre, NIHR Biomedical Research Unit, NIHR Collaboration for Leadership in Health Research and Care (CLAHRC) or NIHR Research Centre for Patient Safety & Service Quality in all study sites?

○ Yes ◉ No

If yes and you have selected HRA Approval in question 4 above, your study will be processed through HRA Approval.

If yes, and you have not selected HRA Approval in question 4 above, NHS permission for your study will be processed through the NIHR Coordinated System for gaining NHS Permission (NIHR CSP).

5b. Do you wish to make an application for the study to be considered for NIHR Clinical Research Network (CRN) support and inclusion in the NIHR Clinical Research Network (CRN) Portfolio? Please see information button for further details.

○ Yes ◉ No

If yes, you must complete a NIHR Clinical Research Network (CRN) Portfolio Application Form immediately after completing this project filter and before submitting other applications. If you have selected HRA Approval in question 4 above your study will be processed through HRA Approval. If not, NHS permission for your study will be processed through the NIHR Coordinated System for gaining NHS Permission (NIHR CSP).

6. Do you plan to include any participants who are children?

○ Yes ◉ No

7. Do you plan at any stage of the project to undertake intrusive research involving adults lacking capacity to consent for themselves?

○ Yes ◉ No

Answer Yes if you plan to recruit living participants aged 16 or over who lack capacity, or to retain them in the study following loss of capacity. Intrusive research means any research with the living requiring consent in law. This includes use of identifiable tissue samples or personal information, except where application is being made to the Confidentiality Advisory Group to set aside the common law duty of confidentiality in England and Wales. Please consult the guidance notes for further information on the legal frameworks for research involving adults lacking capacity in the UK.

8. Do you plan to include any participants who are prisoners or young offenders in the custody of HM Prison Service or who are offenders supervised by the probation service in England or Wales?

○ Yes ◉ No

9. Is the study or any part of it being undertaken as an educational project?

◉ Yes ○ No

Please describe briefly the involvement of the student(s):
The student is an experienced academic undertaking a Professional Doctorate programme. They will act as the Principal Investigator.

9a. Is the project being undertaken in part fulfilment of a PhD or other doctorate?

◉ Yes ○ No

10. Will this research be financially supported by the United States Department of Health and Human Services or any of its divisions, agencies or programs?

○ Yes ◉ No

11. Will identifiable patient data be accessed outside the care team without prior consent at any stage of the project (including identification of potential participants)?

◯ Yes ◉ No

Integrated Research Application System
Application Form for Research involving qualitative methods only

NHS/HSC R&D Form (project information)

Please refer to the Submission and Checklist tabs for instructions on submitting R&D applications.

The Chief Investigator should complete this form. Guidance on the questions is available wherever you see this symbol displayed. We recommend reading the guidance first. The complete guidance and a glossary are available by selecting Help.

Please define any terms or acronyms that might not be familar to lay reviewers of the application.

Short title and version number: (maximum 70 characters - this will be inserted as header on all forms)
Perspectives on undergraduate Radiotherapy curricula (V1)

PART A: Core study information

1. ADMINISTRATIVE DETAILS

A1. Full title of the research:

Undergraduate therapeutic radiography: graduate perceptions on curricula and preparedness for practice using an appreciative inquiry approach.

A2-1. Educational projects

Name and contact details of student(s):

Student 1

	Title	Forename/Initials	Surname
	Mrs	Susan	Murray
Address	School of Health and Social Work		
	College Lane		
	Hatfield, Hertfordshire		
Post Code	AL109AB		
E-mail	s.1.murray@herts.ac.uk		
Telephone	01707 285974		
Fax	01707 284977		

Give details of the educational course or degree for which this research is being undertaken:

Name and level of course/ degree:
Professional Doctoral Programme: Doctor of Education (EdD)

Name of educational establishment:
Buckinghamshire New University

Name and contact details of academic supervisor(s):

Academic supervisor 1

	Title Forename/Initials Surname Dr Gulen Addis
Address	Faculty of Society & Health 106 Oxford Road Uxbridge
Post Code	UB8 1NA
E-mail	Gulen.Addis@bucks.ac.uk
Telephone	01494 522 141 ext 5125
Fax	

Please state which academic supervisor(s) has responsibility for which student(s):
Please click "Save now" before completing this table. This will ensure that all of the student and academic supervisor details are shown correctly.

Student(s)	Academic supervisor(s)
Student 1 Mrs Susan Murray	☐ Dr Gulen Addis

A copy of a current CV for the student and the academic supervisor (maximum 2 pages of A4) must be submitted with the application.

A2-2. Who will act as Chief Investigator for this study?

◉ Student
◯ Academic supervisor
◯ Other

A3-1. Chief Investigator:

	Title Forename/Initials Surname Mrs Susan Murray
Post	Professional Lead Radiotherapy
Qualifications	Diploma of the College of Radiographers (Therapeutic)(DCRT) MSc Higher Education in the Clinical Sciences
Employer	University of Hertfordshire
Work Address	School of Health and Social Work College Lane Hatfield, Hertfordshire
Post Code	AL10 9AB
Work E-mail	s.1.murray@herts.ac.uk
* Personal E-mail	
Work Telephone	01707285974
* Personal Telephone/Mobile	
Fax	01707284977

** This information is optional. It will not be placed in the public domain or disclosed to any other third party without prior consent.*
A copy of a current CV (maximum 2 pages of A4) for the Chief Investigator must be submitted with the application.

A4. Who is the contact on behalf of the sponsor for all correspondence relating to applications for this project?

This contact will receive copies of all correspondence from REC and HRA/R&D reviewers that is sent to the CI.

	Title	Forename/Initials	Surname
	Dr	Melanie	Nakisa
Address	Academic Quality Directorate		
	Buckinghamshire New University		
	Queen Alexandra Road, High Wycombe		
Post Code	HP11 2JZ		
E-mail	ResearchUnit@bucks.ac.uk		
Telephone	01494522141		
Fax			

A5-1. Research reference numbers. *Please give any relevant references for your study:*

Applicant's/organisation's own reference number, e.g. R & D (if available):	N/A
Sponsor's/protocol number:	UEP2015JUL02
Protocol Version:	1
Protocol Date:	16/07/2015
Funder's reference number:	N/A
Project website:	N/A

Additional reference number(s):

Ref.Number Description	Reference Number

Registration of research studies is encouraged wherever possible. You may be able to register your study through your NHS organisation or a register run by a medical research charity, or publish your protocol through an open access publisher. If you have registered your study please give details in the "Additional reference number(s)" section.

A5-2. Is this application linked to a previous study or another current application?

○ Yes ● No

Please give brief details and reference numbers.

2. OVERVIEW OF THE RESEARCH

To provide all the information required by review bodies and research information systems, we ask a number of specific questions. This section invites you to give an overview using language comprehensible to lay reviewers and members of the public. Please read the guidance notes for advice on this section.

A6-1. Summary of the study. *Please provide a brief summary of the research (maximum 300 words) using language easily understood by lay reviewers and members of the public. Where the research is reviewed by a REC within the UK Health Departments' Research Ethics Service, this summary will be published on the Health Research Authority (HRA) website following the ethical review. Please refer to the question specific guidance for this question.*

The purpose of the study is to capture the views of newly-qualified Therapeutic Radiography graduates on teaching and learning aspects that they perceive to be useful in preparing them for professional practice.

The intended benefit is to contribute to the body of knowledge in this area and to inform therapeutic radiography professional-body educational strategies and guidelines.

The project is positioned within statutory and professional-body contexts, namely, the Health and Care Professions Council (HCPC) Standards of Education and Training (SETS) for Radiography (Health and Care Professions Council, 2014), Standards of Proficiency (SOPS) for Radiography (Health and Care Professions Council, 2013), the Society and College of Radiographers Education and Career Framework for the Radiography Workforce (Society and College of Radiographers, 2013) and National Occupational Standards for Radiotherapy (2010). These have been used to create the questions and vignettes employed in the group interviews.

The focus groups will take place at NHS sites, specifically within radiotherapy departments that are associated with the University of Hertfordshire where the Chief Investigator (CI) is employed. Sites include: Mount Vernon Cancer Centre; Imperial College London; Peterborough City Hospital; Royal Berkshire Hospital; Oxford Churchill Hospital; Northampton General. It is envisaged that the qualitative study will produce information rich in data and therefore a small purposive sample is intended. Also because there are limited resources available for the study, the sample size and the scope of the study is restricted to these areas geographically accessible to the researcher.

The study population is homogeneous in that it includes Therapeutic Radiography graduates who have qualified in 2015 from any Higher Education Institution in England and are now working in one of the NHS sites identified above. No-one will be unfairly excluded from or coerced into the study.

A6-2. Summary of main issues. *Please summarise the main ethical, legal, or management issues arising from your study and say how you have addressed them.*

Not all studies raise significant issues. Some studies may have straightforward ethical or other issues that can be identified and managed routinely. Others may present significant issues requiring further consideration by a REC, R&D office or other review body (as appropriate to the issue). Studies that present a minimal risk to participants may raise complex organisational or legal issues. You should try to consider all the types of issues that the different reviewers may need to consider.

To become a therapeutic radiographer, students undertake a programme of study that has been deemed appropriate to meet the standards required of a therapeutic radiographer and validated by professional and statutory bodies, namely, the College of Radiographers and Health and Care Professions Council. There are 10 Higher Education Institutions (HEI) in England that offer a 3-year, honours-degree, undergraduate programmes, with each programme being comprised of academic and clinical blocks the length of which and activities associated with are determined by each individual HEI. Students learn in practice in small groups and are usually placed at an individual hospital Trust for the duration of their undergraduate education. The maximum number of students at a site is determined by the number of treatment units a radiotherapy department possesses as well as the number of practice staff. The teaching and learning activities and experiences that students undertake to prepare them for practice is specific to the HEI as well as the Trust placement site and it is these areas which the study aims to explore. At present there is no research study that has explored the variation in undergraduate therapeutic radiography curricula across England, neither has there been an investigation into those aspects of the curriculum and learning activities that students find particularly useful in preparing them for practice on graduation.

The criteria for the inclusion and exclusion of participants in the study are as follows:

Inclusion criteria

• Therapeutic radiography graduates who have qualified in the summer of 2015 from one of the ten HEIs in England
• Therapeutic radiography graduates who are working within radiotherapy departments local to the researcher (Mount Vernon Cancer Centre; Imperial College London; Peterborough City Hospital; Royal Berkshire Hospital; Oxford Churchill Hospital; Northampton General)
• Participants will have completed a programme of study in English
• In the event that graduate recruitment to the study is low, the researcher will extend the geographical area to include radiotherapy departments in and around London including North Middlesex Hospital; Guys and St Thomas; St Bartholomews; Royal Marsden Hospitals; UCLH; Royal Free Hospital

Exclusion criteria

• Graduates who have qualified from an HEI outside of England. This is because such programmes have to meet additional local standards and frameworks, e.g. Scottish Credit and Qualifications Framework which would have an impact on the design of the vignettes and questions for the focus groups

Recruitment to the study will be via senior practice staff managers who will be asked to pass on a letter of introduction and a participant information sheet to eligible staff in their department. Each participant will be asked to attend a focus group which will be held at the NHS site where they are working at a time convenient for the department and the staff member. This will be negotiated with the senior practice staff manager, the individual members of staff and the

Chief Investigator (CI).

A qualitative appreciative inquiry (AI) research methodology has been chosen because it is intended that new understanding will be created from a positive stance and reported in a way that will enhance professional links and values best practices. The 4D model of discovery, dream, design and destiny that AI embraces, is a process that shows symmetry with the reflective characteristics of professional learning; therefore participants are likely to possess the skills necessary to embrace open inquiry methods and be at ease sharing positive aspects of teaching and learning elements that have positively contributed to preparing them for practice.

Using focus groups, participants will be asked their views about a number of key professional and technical skills, the questions for which have been modelled on aspects of relevant frameworks, e.g.

Vignette (scenario 1 example)
• The HCPC standards say that radiographers should possess 'good' communication skills – what does 'good' look like to you?
• With reference to your radiotherapy education please give a positive example of how, where, when you learnt/exhibited that?
• If you had three wishes about something that could/should be done to develop good communication skills what would they be?

Ethical issues will be minimised by the design of the research project and the adoption of an AI approach: the focus will be on collecting positive data.

The research will be carried out with the informed consent of participants which will be confirmed prior to commencement of data collection. Full information about the nature and purpose of the research and the commitment it will involve in terms of numbers of occasions and expected time spent at the focus group will be made available to participants in advance of the study (see Site Specific Graduates Participant Information Sheets and Informed Consent forms). The participant sheet also indicates how the data will be used and explains the risks and benefits of participation.

Participants will be provided with opportunities for discussing the research as part of the recruitment process. The personal data to be collected is limited to:
1. Hospital site
2. Name (this information will not be used beyond the initial stage of contact)
3. E-mail (so the Principal Investigator (PI) can liaise regarding a convenient time for the meeting and forward the results if the participant would like to receive a copy)
4. Higher Education Institution where the participant completed their education (to ensure eligibility)
5. Date of qualification (also relevant to ensure that the participant is eligible to enter the study)

Only the Chief Investigator (CI) will have access to the above personal data which will be stored securely on a password-protected database known only to the CI.

It is unlikely that the process of revisiting positive teaching and learning experiences that prepared them for practice may be stressful for participants. However should this occur, contact details for relevant support services and one-to-one de-briefing sessions will be made available to all participants.

The anonymised findings of the study will form part of the researcher's professional doctorate and will be presented in the dissertation. Findings will also be shared with participants (if requested), and communicated to the professional body (College of Radiographers) as the basis from which professional-specific guidelines can be developed.

In the wider context of the radiotherapy community the anonymised findings will be imparted via presentations at conferences and journal articles. Key conferences and journals to be targeted include but are not limited to:
• College of Radiographers Annual Radiotherapy Conference;
• Heads of Radiography Education Excellence in Radiography Research Conference
• United Kingdom Radiotherapy and Oncology Conference (UKRO);
• Trust Placement Learning Conferences and events
• Journal of Radiotherapy Practice

3. PURPOSE AND DESIGN OF THE RESEARCH

A7. Select the appropriate methodology description for this research. *Please tick all that apply*:

☐ Case series/ case note review

- [ ] Case control
- [ ] Cohort observation
- [ ] Controlled trial without randomisation
- [ ] Cross-sectional study
- [ ] Database analysis
- [ ] Epidemiology
- [ ] Feasibility/ pilot study
- [ ] Laboratory study
- [ ] Metanalysis
- [x] Qualitative research
- [ ] Questionnaire, interview or observation study
- [ ] Randomised controlled trial
- [ ] Other (please specify)

A10. What is the principal research question/objective? *Please put this in language comprehensible to a lay person.*

The purpose of the research is to explore the perceptions of graduate Therapeutic Radiographers on the activities and experiences they feel best prepared them for practice as a qualified radiographer.

A11. What are the secondary research questions/objectives if applicable? *Please put this in language comprehensible to a lay person.*

Secondary objectives are to contribute to the body of knowledge in this area and to inform therapeutic radiography professional-body educational strategies and guidelines.

A12. What is the scientific justification for the research? *Please put this in language comprehensible to a lay person.*

Therapeutic Radiography education necessarily reflects the Health and Care Professions Council (HCPC) Standards of Education and Training (SETS) for Radiography (Health and Care Professions Council, 2014), Standards of Proficiency (SOPS) for Radiography (Health and Care Professions Council, 2013) and the Society and College of Radiographers Education and Career Framework for the Radiography Workforce (Society and College of Radiographers, 2013). However, the design and delivery of academic and practice-based components of individual programmes is the sole responsibility of each individual Higher Education Institution that offers a programme of study that confers eligibility to register as a Therapeutic Radiographer on successful completion of the programme.

This research is necessary so that best practice guidelines can be developed to inform HEIs of those teaching and learning activities and experiences that will best prepare future generations of the therapeutic radiography workforce.

A13. Please summarise your design and methodology. *It should be clear exactly what will happen to the research participant, how many times and in what order. Please complete this section in language comprehensible to the lay person. Do not simply reproduce or refer to the protocol. Further guidance is available in the guidance notes.*

Each participant will be invited to attend one focus group which will take no longer than 90 minutes. The focus group will take place at the NHS Trust at which the participant works.

An Appreciative Inquiry (AI) approach will be used and participants will be invited to share their positive experiences of teaching, learning and assessment activities that they believed prepared them for practice as a Therapeutic Radiographer which occurred during their undergraduate programme of study.

The vignettes and questions that have been developed are related to aspects of Therapeutic Radiography professional practice, all of which have been informed by the professional-body regulatory body documentation, namely, the Society and College of Radiographers Education and Career Framework for the Radiography Workforce (Society and College of Radiographers, 2013) and the Health and Care Professions Council (HCPC) Standards of Education and Training (SETS) for Radiography (Health and Care Professions Council, 2014), Standards of Proficiency (SOPS) for Radiography (Health and Care Professions Council, 2013) and National Occupational

Standards for Radiotherapy (2010).

The intended structure of the focus group is:
• Introductions; conveying ground rules (confidentiality of discussions/data; expectations of the group: open, free discussion is intended; no correct/incorrect answers; encourage others to observe/value stories rather than critique, analyse or judge them; time-keeping); reiterating the purpose of the study; confidentiality/anonymity principles; AI approach; dissemination of data; use of voice recorders (VR)
• Ground-breaker activity
• Questions and vignettes based on the standards and frameworks will be tabled - participants will be asked to identify what 'good' resembles and invited to give an example of how, where, when they learnt that aspect
• Participants will be invited to give an example of a teaching, learning aspect or experience which they felt had a positive impact on their preparation for practice, saying what they valued most about this
• Participants will be asked what three wishes they have regarding the future of therapeutic radiography curricula with particular reference to preparation for practice

The Chief Investigator will facilitate all focus groups (one held in each of the 6 Trusts) to minimise variance in the approach employed. As extenuating circumstances can also influence the data collected, the CI will keep a reflective diary which will be scrutinised at the same time the focus group data is analysed.

A digital voice recorder will be used to record the group interviews.

The broad timetable for the study is as follows:

December 2015 - gaining NHS Management Permission from NHS sites; recruiting to the study; organising dates/times of interviews

Dec 2015 to June 2016 - Focus groups at NHS Sites

A14-1. In which aspects of the research process have you actively involved, or will you involve, patients, service users, and/or their carers, or members of the public?

- [ ] Design of the research
- [ ] Management of the research
- [ ] Undertaking the research
- [ ] Analysis of results
- [ ] Dissemination of findings
- [x] None of the above

Give details of involvement, or if none please justify the absence of involvement.

4. RISKS AND ETHICAL ISSUES

RESEARCH PARTICIPANTS

A15. What is the sample group or cohort to be studied in this research?

Select all that apply:

- [ ] Blood
- [ ] Cancer
- [ ] Cardiovascular
- [ ] Congenital Disorders
- [ ] Dementias and Neurodegenerative Diseases
- [ ] Diabetes

- [ ] Ear
- [ ] Eye
- [ ] Generic Health Relevance
- [ ] Infection
- [ ] Inflammatory and Immune System
- [ ] Injuries and Accidents
- [ ] Mental Health
- [ ] Metabolic and Endocrine
- [ ] Musculoskeletal
- [ ] Neurological
- [ ] Oral and Gastrointestinal
- [ ] Paediatrics
- [ ] Renal and Urogenital
- [ ] Reproductive Health and Childbirth
- [ ] Respiratory
- [ ] Skin
- [ ] Stroke

Gender:	Male and female participants
Lower age limit: 20	Years
Upper age limit: 65	Years

A17-1. Please list the principal inclusion criteria (list the most important, max 5000 characters).

Therapeutic radiographers who have graduated from an HEI in England in the year 2015

Therapeutic radiographers working in one of the following Radiotherapy departments:
- Mount Vernon Cancer Centre;
- Imperial College London;
- Peterborough City Hospital;
- Royal Berkshire Hospital;
- Oxford Churchill Hospital;
- Northampton General Hospital.

Participants will all have completed a programme of study in English.

A17-2. Please list the principal exclusion criteria (list the most important, max 5000 characters).

Therapeutic radiographers who have graduated from an HEI located in an area other than England.

Therapeutic radiographers who have qualified before 2015.

RESEARCH PROCEDURES, RISKS AND BENEFITS

A18. Give details of all non-clinical intervention(s) or procedure(s) that will be received by participants as part of the research protocol. *These include seeking consent, interviews, non-clinical observations and use of questionnaires.*

Please complete the columns for each intervention/procedure as follows:

1. Total number of interventions/procedures to be received by each participant as part of the research protocol.
2. If this intervention/procedure would be routinely given to participants as part of their care outside the research,

how many of the total would be routine?
3. Average time taken per intervention/procedure (minutes, hours or days)
4. Details of who will conduct the intervention/procedure, and where it will take place.

Intervention or procedure	1	2	3	4
Seeking consent for the study	1	0	5 minutes	The nominated departmental contact with whom the researcher has links will pass on the introductory letter and participant information sheet to prospective participants who are members of the Trust staff.
Focus group	1	0	90 minutes	The focus group will be facilitated by the CI and will take place in a room of sufficient size, comfort and privacy on NHS Trust sites.

A21. How long do you expect each participant to be in the study in total?

The expectation is that each participant will undertake one focus group lasting no more than 90 minutes.

A22. What are the potential risks and burdens for research participants and how will you minimise them?

For all studies, describe any potential adverse effects, pain, discomfort, distress, intrusion, inconvenience or changes to lifestyle. Only describe risks or burdens that could occur as a result of participation in the research. Say what steps would be taken to minimise risks and burdens as far as possible.

There is a time commitment for each participant which could be perceived as an inconvenience and burden.

Intrusion into personal experiences may also be perceived as a negative but the research will be of value to the therapeutic radiography community and will create new knowledge that will inform therapeutic radiography education.

It is hoped that by adopting an Appreciative Inquiry evaluation approach, undue burden placed on participants will be minimised. Also as the vignettes are based on professional-body regulatory frameworks, the questions will be limited to necessary and relevant aspects, i.e. it will explore the areas which will enable the aims and objectives of the study to be fulfilled.

Because participants are fully informed about the study and are self-selecting it is thought that this, combined with the Appreciative Inquiry approach will minimise any potential adverse effects.

A23. Will interviews/ questionnaires or group discussions include topics that might be sensitive, embarrassing or upsetting, or is it possible that criminal or other disclosures requiring action could occur during the study?

○ Yes ◉ No

A24. What is the potential for benefit to research participants?

Participants will be using their positive teaching and learning experiences to provide examples of activities that would benefit future therapeutic radiography students.

They will be providing evidence on which professional-body guidelines may be based and will be contributing to the development of education and curricula of future therapeutic radiographers.

A26. What are the potential risks for the researchers themselves? *(if any)*

None.

RECRUITMENT AND INFORMED CONSENT

In this section we ask you to describe the recruitment procedures for the study. Please give separate details for different study groups where appropriate.

A27-1. How will potential participants, records or samples be identified? Who will carry this out and what resources will be used?*For example, identification may involve a disease register, computerised search of GP records, or review of medical records. Indicate whether this will be done by the direct healthcare team or by researchers acting under arrangements with the responsible care organisation(s).*

The proposed study was presented at a quarterly Radiotherapy Clinical Liaison meeting on 17th June 2015, group members of which include Hertfordshire programme academic staff and senior practice staff from the six radiotherapy departments.

The researcher (CI) established whether each department had employed new graduates; also if the senior practice staff would be willing to distribute the letters/information sheets to graduate NHS staff in their employment and positive responses were received.

Once ethical approval was gained from Bucks New University (July 2015), individual Trust's Research and Development departments were approached to check on local procedures which resulted in further correspondence with senior managers.

A27-2. Will the identification of potential participants involve reviewing or screening the identifiable personal information of patients, service users or any other person?

○ Yes ◉ No

Please give details below:

A28. Will any participants be recruited by publicity through posters, leaflets, adverts or websites?

○ Yes ◉ No

A29. How and by whom will potential participants first be approached?

By the senior practice staff working at the NHS Trust radiotherapy sites.

A30-1. Will you obtain informed consent from or on behalf of research participants?

◉ Yes ○ No

If you will be obtaining consent from adult participants, please give details of who will take consent and how it will be done, with details of any steps to provide information (a written information sheet, videos, or interactive material). Arrangements for adults unable to consent for themselves should be described separately in Part B Section 6, and for children in Part B Section 7.

If you plan to seek informed consent from vulnerable groups, say how you will ensure that consent is voluntary and fully informed.

A letter of introduction together with a participant information sheet which contains a consent form, will be given to each potential participant by the senior practice staff at the Trust so the potential participant can choose whether or not to participate in the study.

All participants will be required to complete the consent form before undertaking the focus group.

If you are not obtaining consent, please explain why not.

Please enclose a copy of the information sheet(s) and consent form(s).

A30-2. Will you record informed consent (or advice from consultees) in writing?

(•) Yes ( ) No

A31. How long will you allow potential participants to decide whether or not to take part?

A minimum of 24 hours will be allowed.

A33-1. What arrangements have been made for persons who might not adequately understand verbal explanations or written information given in English, or who have special communication needs?*(e.g. translation, use of interpreters)*

Participants will all have completed a programme of study in English.

A35. What steps would you take if a participant, who has given informed consent, loses capacity to consent during the study? *Tick one option only.*

( ) The participant and all identifiable data or tissue collected would be withdrawn from the study. Data or tissue which is not identifiable to the research team may be retained.

( ) The participant would be withdrawn from the study. Identifiable data or tissue already collected with consent would be retained and used in the study. No further data or tissue would be collected or any other research procedures carried out on or in relation to the participant.

( ) The participant would continue to be included in the study.

( ) Not applicable – informed consent will not be sought from any participants in this research.

(•) Not applicable – it is not practicable for the research team to monitor capacity and continued capacity will be assumed.

Further details:

It is unlikely that the NHS staff member would lose the capacity to consent during the focus group.

CONFIDENTIALITY

In this section, personal data means any data relating to a participant who could potentially be identified. It includes pseudonymised data capable of being linked to a participant through a unique code number.

Storage and use of personal data during the study

A36. Will you be undertaking any of the following activities at any stage (including in the identification of potential participants)?*(Tick as appropriate)*

- [ ] Access to medical records by those outside the direct healthcare team
- [ ] Access to social care records by those outside the direct social care team
- [ ] Electronic transfer by magnetic or optical media, email or computer networks
- [ ] Sharing of personal data with other organisations
- [ ] Export of personal data outside the EEA
- [x] Use of personal addresses, postcodes, faxes, emails or telephone numbers
- [x] Publication of direct quotations from respondents
- [ ] Publication of data that might allow identification of individuals
- [x] Use of audio/visual recording devices
- [ ] Storage of personal data on any of the following:
  - [ ] Manual files (includes paper or film)

- [ ] NHS computers
- [ ] Social Care Service computers
- [ ] Home or other personal computers
- [x] University computers
- [ ] Private company computers
- [x] Laptop computers

Further details:
E-mails are collected to enable the researcher to contact the participant so a time for the focus group can be arranged. Also an e-mail address is collected should the participant wish to receive a copy of the final research report.

Data will be recorded, transcribed and analysed as part of the research. A transcriber who will be fully briefed regarding the Data Protection Act (1998) will not have access to the personal data and they will be required to sign a Transcriber Confidentiality Agreement respecting the views and confidentiality of the data prior to transcribing the interviews.

Extracts from the transcript may be quoted in the research report as part of the written analysis and will take an anonymised form, however, individual identity will be protected at all times.

A37. Please describe the physical security arrangements for storage of personal data during the study?

The recorded data will be downloaded onto a laptop computer which is password-protected. The audio data will be named according to the date of the interview; no individual names or placement site will be used.

Transcribing of the recorded data will be done on a laptop computer in a private room to preserve confidentiality. The data will be coded to ensure anonymity. The coded transcript and analyses will also be held securely on a password protected University computer as this is where the NVivo programme which will be used for the analysis is housed.

Hard copies of the consent form and personal contact details will be kept in a lockable filing cabinet, the key to which is only held by the CI.

A38. How will you ensure the confidentiality of personal data?*Please provide a general statement of the policy and procedures for ensuring confidentiality, e.g. anonymisation or pseudonymisation of data.*

The amount of personal data collected is limited and known only to the CI who will be analysing the data.

The transcriber will not have access to the personal data and they will be required to sign a Transcriber Confidentiality Agreement respecting the views and confidentiality of the data.

A40. Who will have access to participants' personal data during the study? *Where access is by individuals outside the direct care team, please justify and say whether consent will be sought.*

Only the CI.

Storage and use of data after the end of the study

A41. Where will the data generated by the study be analysed and by whom?

By the CI in a private office at the University of Hertfordshire. Also this will be analysed in a private room at the home of the CI.

A42. Who will have control of and act as the custodian for the data generated by the study?

	Title Forename/Initials Surname Mrs Sue Murray
Post	Principal Lecturer
Qualifications	MSc Higher Education in the Clinical Sciences (University of Hertfordshire) 1987 The Diploma of the College of Radiographers (Therapeutic)
Work Address	University of Hertfordshire College Lane, Hatfield Hertfordshire
Post Code	AL109AB
Work Email	s.1.murray@herts.ac.uk
Work Telephone	01707285974
Fax	01707284977

A43. How long will personal data be stored or accessed after the study has ended?

- ○ Less than 3 months
- ○ 3 – 6 months
- ○ 6 – 12 months
- ○ 12 months – 3 years
- ◉ Over 3 years

If longer than 12 months, please justify:
The CI will keep the details for around 5 years as this is a realistic timeframe in which final reports and data will be collated, presented as part of the CI's dissertation and used to generate professional-body good practice guidelines.

A44. For how long will you store research data generated by the study?

Years: 5
Months:

A45. Please give details of the long term arrangements for storage of research data after the study has ended.*Say where data will be stored, who will have access and the arrangements to ensure security.*

Only the CI will maintain access to the data after the study has ended.

The transcripts will be shredded and the audio tapes destroyed after 5 years, however in the meantime the data will be coded and then stored securely on a password-protected computer. Hard copies of data will be kept in a lockable filing cabinet, access to which is limited to the CI.

Personal data will be destroyed after 5 years.

INCENTIVES AND PAYMENTS

A46. Will research participants receive any payments, reimbursement of expenses or any other benefits or incentives for taking part in this research?

○ Yes ◉ No

A47. Will individual researchers receive any personal payment over and above normal salary, or any other benefits or incentives, for taking part in this research?

○ Yes ◉ No

A48. Does the Chief Investigator or any other investigator/collaborator have any direct personal involvement (e.g. financial, share holding, personal relationship etc.) in the organisations sponsoring or funding the research that may give rise to a possible conflict of interest?

○ Yes ◉ No

NOTIFICATION OF OTHER PROFESSIONALS

A49-1. Will you inform the participants' General Practitioners (and/or any other health or care professional responsible for their care) that they are taking part in the study?

○ Yes ◉ No

If Yes, please enclose a copy of the information sheet/letter for the GP/health professional with a version number and date.

PUBLICATION AND DISSEMINATION

A50. Will the research be registered on a public database?

○ Yes ◉ No

Please give details, or justify if not registering the research.
The research is being undertaken for educational purposes and is using a non-clinical, qualitative methods approach.

Registration of research studies is encouraged wherever possible.
You may be able to register your study through your NHS organisation or a register run by a medical research charity, or publish your protocol through an open access publisher. If you are aware of a suitable register or other method of publication, please give details. If not, you may indicate that no suitable register exists. Please ensure that you have entered registry reference number(s) in question A5-1.

A51. How do you intend to report and disseminate the results of the study? *Tick as appropriate:*

- ☐ Peer reviewed scientific journals
- ☐ Internal report
- ☑ Conference presentation
- ☐ Publication on website
- ☑ Other publication
- ☐ Submission to regulatory authorities
- ☐ Access to raw data and right to publish freely by all investigators in study or by Independent Steering Committee on behalf of all investigators
- ☐ No plans to report or disseminate the results
- ☑ Other (please specify)

Doctoral thesis
Non-scientific, peer-reviewed professional journals
Professional-body publication: College of Radiographers

A52. If you will be using identifiable personal data, how will you ensure that anonymity will be maintained when publishing the results?

Not applicable.

A53. Will you inform participants of the results?

(•) Yes ( ) No

Please give details of how you will inform participants or justify if not doing so.
Participants are asked to indicate on the personal data collection form if they would like to receive a copy of the report when it is available.

5. Scientific and Statistical Review

A54. How has the scientific quality of the research been assessed? *Tick as appropriate:*

- [ ] Independent external review
- [ ] Review within a company
- [ ] Review within a multi−centre research group
- [ ] Review within the Chief Investigator's institution or host organisation
- [ ] Review within the research team
- [x] Review by educational supervisor
- [ ] Other

Justify and describe the review process and outcome. If the review has been undertaken but not seen by the researcher, give details of the body which has undertaken the review:
The research proposal has been discussed with and submitted to the educational supervisor for approval.

Ethical approval was also sought from Buckinghamshire New University ethics committee (ref. UEP2015Jul02). Ethical approval was gained from this committee on 16th July (with no amendments necessary) and confirmed in writing 22nd July 2015.

The methodology has been informed by study of quantitative and qualitative research methods successfully studied within the last 2 years and has been shaped by collaborative working with fellow therapeutic radiography educators.

For all studies except non-doctoral student research, please enclose a copy of any available scientific critique reports, together with any related correspondence.

For non-doctoral student research, please enclose a copy of the assessment from your educational supervisor/ institution.

A59. What is the sample size for the research? *How many participants/samples/data records do you plan to study in total? If there is more than one group, please give further details below.*

Total UK sample size:	30
Total international sample size (including UK):	
Total in European Economic Area:	

Further details:
A maximum number of 30 across the 6 NHS Trusts is envisaged as it is believed that this will be sufficient to collect meaningful data that will meet the aims and outcomes of the study.

Because the Trusts vary in size and staffing numbers as well as number of new graduates employed, it is likely that the range of participant numbers in each focus group may vary, but the intention is not to exceed more than 6-8 as recommended by Ritchie et al. (2014).

A60. How was the sample size decided upon? *If a formal sample size calculation was used, indicate how this was done, giving sufficient information to justify and reproduce the calculation.*

The relative number of therapeutic radiographers graduating has influenced the sample size as has the accessibility to graduates and resources available for the study.

Other considerations have included resources such as the time available to conduct the study, the cost of travel to the NHS sites and the methodological approach: the study employs a qualitative approach which is likely to produce data that is rich in breadth and depth.

A62. Please describe the methods of analysis (statistical or other appropriate methods, e.g. for qualitative research) by which the data will be evaluated to meet the study objectives.

The analytic strategy will include reviewing the data in the context of the research question, aims and outcomes. Data processing and analysis will include thematic analysis using NVivo computer programming and coding. The grid matrix framework of thematic analysis will help to order the themes which will have been identified through careful reading and re-reading of the transcripts.

So that the abstraction and interpretation of data reflects the original 'voices', it is intended that the research findings will be supplemented with quotations from research participants; this should help avoid the findings being too impressionistic and subjective.

6. MANAGEMENT OF THE RESEARCH

A63. Other key investigators/collaborators. *Please include all grant co−applicants, protocol co−authors and other key members of the Chief Investigator’s team, including non-doctoral student researchers.*

	Title	Forename/Initials	Surname
	Dr	Gulen	Addis
Post	Senior Lecturer		
Qualifications	BSc, MSc, PhD, RN		
Employer	Buckinghamshire New University		
Work Address	Faculty of Society & Health		
	106 Oxford Road		
	Uxbridge		
Post Code	UB8 1NA		
Telephone	01494 522 141 ext 5125		
Fax			
Mobile			
Work Email	Gulen.Addis@bucks.ac.uk		

A64. Details of research sponsor(s)

A64-1. Sponsor

Lead Sponsor

Status:
- ○ NHS or HSC care organisation
- ◉ Academic
- ○ Pharmaceutical industry
- ○ Medical device industry
- ○ Local Authority

Commercial status: Non-Commercial

- ◯ Other social care provider (including voluntary sector or private organisation)
- ◯ Other

If Other, please specify:

Contact person

Name of organisation	Buckinghamshire New University
Given name	Melanie
Family name	Nakisa
Address	Academic Quality Directorate
Town/city	Queen Alexandra Road
Post code	HP11 2JZ
Country	
Telephone	01494 522141 ext 4008
Fax	
E-mail	Research.Unit@bucks.ac.uk

Is the sponsor based outside the UK?

◯ Yes ◉ No

Under the Research Governance Framework for Health and Social Care, a sponsor outside the UK must appoint a legal representative established in the UK. Please consult the guidance notes.

A65. Has external funding for the research been secured?

- ☐ Funding secured from one or more funders
- ☐ External funding application to one or more funders in progress
- ☑ No application for external funding will be made

What type of research project is this?

- ◉ Standalone project
- ◯ Project that is part of a programme grant
- ◯ Project that is part of a Centre grant
- ◯ Project that is part of a fellowship/ personal award/ research training award
- ◯ Other

Other – please state:

A66. Has responsibility for any specific research activities or procedures been delegated to a subcontractor (other than a co-sponsor listed in A64-1) ? *Please give details of subcontractors if applicable.*

◯ Yes ◉ No

A67. Has this or a similar application been previously rejected by a Research Ethics Committee in the UK or another

country?

◯ Yes ◉ No

Please provide a copy of the unfavourable opinion letter(s). You should explain in your answer to question A6-2 how the reasons for the unfavourable opinion have been addressed in this application.

A68-1. Give details of the lead NHS R&D contact for this research:

	Title	Forename/Initials	Surname	
		Camarie	Welgemoed	
Organisation	Imperial College Healthcare NHS Trust			
Address	Radiotherapy Department			
	Charing Cross Hospital			
	Fulham Palace Road, London			
Post Code	W6 8RF			
Work Email	Camarie.Welgemoed@imperial.nhs.uk			
Telephone	020 331 30804			
Fax				
Mobile				

Details can be obtained from the NHS R&D Forum website: http://www.rdforum.nhs.uk

A69-1. How long do you expect the study to last in the UK?

Planned start date: 04/01/2016
Planned end date: 30/06/2016
Total duration:
Years: 0 Months: 5 Days: 27

A71-1. Is this study?

◯ Single centre
◉ Multicentre

A71-2. Where will the research take place? *(Tick as appropriate)*

☑ England
☐ Scotland
☐ Wales
☐ Northern Ireland
☐ Other countries in European Economic Area

Total UK sites in study

Does this trial involve countries outside the EU?
◯ Yes ◉ No

A72. Which organisations in the UK will host the research?*Please indicate the type of organisation by ticking the box and give approximate numbers if known:*

- [x] NHS organisations in England 6
- [ ] NHS organisations in Wales
- [ ] NHS organisations in Scotland
- [ ] HSC organisations in Northern Ireland
- [ ] GP practices in England
- [ ] GP practices in Wales
- [ ] GP practices in Scotland
- [ ] GP practices in Northern Ireland
- [ ] Joint health and social care agencies (eg community mental health teams)
- [ ] Local authorities
- [ ] Phase 1 trial units
- [ ] Prison establishments
- [ ] Probation areas
- [ ] Independent (private or voluntary sector) organisations
- [ ] Educational establishments
- [ ] Independent research units
- [ ] Other (give details)

Total UK sites in study: 6

A73-1. Will potential participants be identified through any organisations other than the research sites listed above?

( ) Yes (•) No

A74. What arrangements are in place for monitoring and auditing the conduct of the research?

The study will be conducted according to the arrangements specified in the protocol. Regular monitoring will be undertaken by the research supervisor who maintains close contact with the CI. Monitoring will include ensuring data collection methods are in line with the proposals and that the procedures for ensuring integrity and confidentiality of data are applied.

Reports on the progress and outcomes of the work required by the educational establishment at which the CI is undertaking the doctoral programme will also ensure that proper procedures are being followed.

A76. Insurance/ indemnity to meet potential legal liabilities

Note: ***in this question to NHS indemnity schemes include equivalent schemes provided by Health and Social Care (HSC) in Northern Ireland***

A76-1. What arrangements will be made for insurance and/or indemnity to meet the potential legal liability of the sponsor(s) for harm to participants arising from the management of the research? *Please tick box(es) as applicable.*

Note: Where a NHS organisation has agreed to act as sponsor or co-sponsor, indemnity is provided through NHS schemes. Indicate if this applies (there is no need to provide documentary evidence). For all other sponsors, please describe the arrangements and provide evidence.

☐ NHS indemnity scheme will apply (NHS sponsors only)

☑ Other insurance or indemnity arrangements will apply (give details below)

Because of the type of research being completed (non-clinical) and the design of the study (Appreciative Inquiry Qualitative methods), it is envisaged that the potential for harm or damage caused as a result of participating in the study is minimal. However, the study is covered by Indemnity Insurance of Buckinghamshire New University, Policy Number NHE-18CA03-0013.

Please enclose a copy of relevant documents.

A76-2. What arrangements will be made for insurance and/ or indemnity to meet the potential legal liability of the sponsor(s) or employer(s) for harm to participants arising from the design of the research? *Please tick box(es) as applicable.*

Note: Where researchers with substantive NHS employment contracts have designed the research, indemnity is provided through NHS schemes. Indicate if this applies (there is no need to provide documentary evidence). For other protocol authors (e.g. company employees, university members), please describe the arrangements and provide evidence.

☐ NHS indemnity scheme will apply (protocol authors with NHS contracts only)

☑ Other insurance or indemnity arrangements will apply (give details below)

Indemnity Insurance of Buckinghamshire New University, Policy Number NHE-18CA03-0013 will apply.

Please enclose a copy of relevant documents.

A76-3. What arrangements will be made for insurance and/ or indemnity to meet the potential legal liability of investigators/collaborators arising from harm to participants in the conduct of the research?

Note: Where the participants are NHS patients, indemnity is provided through the NHS schemes or through professional indemnity. Indicate if this applies to the whole study (there is no need to provide documentary evidence). Where non-NHS sites are to be included in the research, including private practices, please describe the arrangements which will be made at these sites and provide evidence.

☐ NHS indemnity scheme or professional indemnity will apply (participants recruited at NHS sites only)

☑ Research includes non-NHS sites (give details of insurance/ indemnity arrangements for these sites below)

The study is covered by Indemnity Insurance of Buckinghamshire New University, Policy Number NHE-18CA03-0013.

Please enclose a copy of relevant documents.

A78. Could the research lead to the development of a new product/process or the generation of intellectual property?

○ Yes ○ No ◉ Not sure

PART C: Overview of research sites

Please enter details of the host organisations (Local Authority, NHS or other) in the UK that will be responsible for the research sites. *For NHS sites, the host organisation is the Trust or Health Board. Where the research site is a primary care site, e.g. GP practice, please insert the host organisation (PCT or Health Board) in the Institution row and insert the research site (e.g. GP practice) in the Department row.*

Research site		Investigator/ Collaborator/ Contact	
Institution name	Imperial College Healthcare NHS Trust	Title	
Department name		First name/ Initials	Amanda
Street address	ICHT Divisional Research Office, S308 3rd Floor Administration Block South	Surname	Bidle
Town/city	Hammersmith Hospital		
Post Code	W12 0HS		
Institution name	Mount Vernon Cancer Centre, Clinical R&D	Title	
Department name		First name/ Initials	Rishma
Street address	The Clock Tower, Mount Vernon Hospital	Surname	Bhatti
Town/city	Rickmansworth Road		
Post Code	HA6 2RN		
Institution name	Northampton General Hospital NHS Trust	Title	
Department name		First name/ Initials	Michelle
Street address	Cliftonville	Surname	Spinks
Town/city	Northampton		
Post Code	NN1 5BD		
Institution name	Oxford University Hospitals Foundation Trust	Title	
Department name		First name/ Initials	Foteini
Street address	Joint Research Office, Block 60	Surname	Mavrommati
Town/city	Churchill Hospital		
Post Code	OX3 7LE		
Institution name	Royal Berkshire NHS Foundation Trust	Title	
Department name		First name/ Initials	Edith M
Street address	Level 2, North Block	Surname	Hawkins
Town/city	London Road		
Post Code	RG1 5AN		

PART D: Declarations

D1. Declaration by Chief Investigator

1. The information in this form is accurate to the best of my knowledge and belief and I take full responsibility for it.

2. I undertake to abide by the ethical principles underlying the Declaration of Helsinki and good practice guidelines on the proper conduct of research.

3. If the research is approved I undertake to adhere to the study protocol, the terms of the full application as approved and any conditions set out by review bodies in giving approval.

4. I undertake to notify review bodies of substantial amendments to the protocol or the terms of the approved application, and to seek a favourable opinion from the main REC before implementing the amendment.

5. I undertake to submit annual progress reports setting out the progress of the research, as required by review bodies.

6. I am aware of my responsibility to be up to date and comply with the requirements of the law and relevant guidelines relating to security and confidentiality of patient or other personal data, including the need to register when necessary with the appropriate Data Protection Officer. I understand that I am not permitted to disclose identifiable data to third parties unless the disclosure has the consent of the data subject or, in the case of patient data in England and Wales, the disclosure is covered by the terms of an approval under Section 251 of the NHS Act 2006.

7. I understand that research records/data may be subject to inspection by review bodies for audit purposes if required.

8. I understand that any personal data in this application will be held by review bodies and their operational managers and that this will be managed according to the principles established in the Data Protection Act 1998.

9. I understand that the information contained in this application, any supporting documentation and all correspondence with review bodies or their operational managers relating to the application:

    - Will be held by the REC (where applicable) until at least 3 years after the end of the study; and by NHS R&D offices (where the research requires NHS management permission) in accordance with the NHS Code of Practice on Records Management.
    - May be disclosed to the operational managers of review bodies, or the appointing authority for the REC (where applicable), in order to check that the application has been processed correctly or to investigate any complaint.
    - May be seen by auditors appointed to undertake accreditation of RECs (where applicable).
    - Will be subject to the provisions of the Freedom of Information Acts and may be disclosed in response to requests made under the Acts except where statutory exemptions apply.
    - May be sent by email to REC members.

10. I understand that information relating to this research, including the contact details on this application, may be held on national research information systems, and that this will be managed according to the principles established in the Data Protection Act 1998.

11. Where the research is reviewed by a REC within the UK Health Departments Research Ethics Service, I understand that the summary of this study will be published on the website of the National Research Ethics Service (NRES), together with the contact point for enquiries named below. Publication will take place no earlier than 3 months after issue of the ethics committee’s final opinion or the withdrawal of the application.

Contact point for publication*(Not applicable for R&D Forms)*

NRES would like to include a contact point with the published summary of the study for those wishing to seek further information. We would be grateful if you would indicate one of the contact points below.

◉ Chief Investigator

- ◯ Sponsor
- ◯ Study co-ordinator
- ◯ Student
- ◯ Other – please give details
- ◯ None

Access to application for training purposes *(Not applicable for R&D Forms)*
Optional – please tick as appropriate:

☐ I would be content for members of other RECs to have access to the information in the application in confidence for training purposes. All personal identifiers and references to sponsors, funders and research units would be removed.

This section was signed electronically by Mrs Susan Murray on 24/02/2016 16:25.

Job Title/Post:	Principal Lecturer
Organisation:	University of Hertfordshire
Email:	s.1.murray@herts.ac.uk

D2. Declaration by the sponsor's representative

If there is more than one sponsor, this declaration should be signed on behalf of the co−sponsors by a representative of the lead sponsor named at A64-1.

I confirm that:

1. This research proposal has been discussed with the Chief Investigator and agreement in principle to sponsor the research is in place.

2. An appropriate process of scientific critique has demonstrated that this research proposal is worthwhile and of high scientific quality.

3. Any necessary indemnity or insurance arrangements, as described in question A76, will be in place before this research starts. Insurance or indemnity policies will be renewed for the duration of the study where necessary.

4. Arrangements will be in place before the study starts for the research team to access resources and support to deliver the research as proposed.

5. Arrangements to allocate responsibilities for the management, monitoring and reporting of the research will be in place before the research starts.

6. The duties of sponsors set out in the Research Governance Framework for Health and Social Care will be undertaken in relation to this research.

   Please note: *The declarations below do not form part of the application for approval above. They will not be considered by the Research Ethics Committee.*

7. Where the research is reviewed by a REC within the UK Health Departments Research Ethics Service, I understand that the summary of this study will be published on the website of the National Research Ethics Service (NRES), together with the contact point for enquiries named in this application. Publication will take place no earlier than 3 months after issue of the ethics committee's final opinion or the withdrawal of the application.

8. Specifically, for submissions to the Research Ethics Committees (RECs) I declare that any and all clinical trials approved by the HRA since 30th September 2013 (as defined on IRAS categories as clinical trials of medicines, devices, combination of medicines and devices or other clinical trials) have been registered on a publically accessible register in compliance with the HRA registration requirements for the UK, or that any deferral granted by the HRA still applies.

This section was signed electronically by Professor Susan Procter on 17/03/2016 19:19.

Job Title/Post:	Professor of Clinical Nursing
Organisation:	Buckinghamshire New University
Email:	susan.procter@bucks.ac.uk

D3. Declaration for student projects by academic supervisor(s)

1. I have read and approved both the research proposal and this application. I am satisfied that the scientific content of the research is satisfactory for an educational qualification at this level.

2. I undertake to fulfil the responsibilities of the supervisor for this study as set out in the Research Governance Framework for Health and Social Care.

3. I take responsibility for ensuring that this study is conducted in accordance with the ethical principles underlying the Declaration of Helsinki and good practice guidelines on the proper conduct of research, in conjunction with clinical supervisors as appropriate.

4. I take responsibility for ensuring that the applicant is up to date and complies with the requirements of the law and relevant guidelines relating to security and confidentiality of patient and other personal data, in conjunction with clinical supervisors as appropriate.

Academic supervisor 1

This section was signed electronically by Dr Gulen Addis on 24/02/2016 16:26.

Job Title/Post:	Senior lecturer
Organisation:	Bucks New University
Email:	

H. Data sheet example

Communication Findings Matrix January 2019

Communication: Learning Activities

Activity	**Significant features and learning consequences (professional learning theory) e.g., task performance, personal development, working with others, coping with unexpected, use of evidence**	**Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time**	***Text examples***	***ID***
Receiving written & verbal feedback on performance	Empowering	University	*I thought the feedback forms in Year 2, for the first day chats, they were really useful.*	*SG2*
	Gaining feedback; being encouraged / learning enabled		*the staff that I had with me at the time, they're really good at giving, like, constructive criticism, so you're able to, like, take what they've said, and it's not in a harsh way, they meant it as in how to improve yourself, and as long as you can take that on board, and you're able to adapt and apply that to yourself, then you're able to get better communication.*	*SG2*
	Ability to respond & adapt Response		*I had a lot of feedback about my communication, so I kind of got obsessed with it. I'm now happy-ish.*	*SG2*
			They would always have a radiographer with us from first year to third year and then every time after they'd give you some sort of feedback so you, like how you could say something differently or what they would have done differently or if it was just okay, if it was alright like.	*QS3*
Reflecting on performance / situation	Empowering	Anywhere	*Sometimes you just know, as well, just by reflecting on things, you know if you've done a decent chat or not a very good chat, just by how the patient responds, things like that.*	*SG2*
	Active purposeful event helps recognise development of tacit knowledge; developing self-awareness		*Like I had a situation where a radiographer told me to get like a patient drinking so I did, not even looking at the card I realised later it was a head and neck patient so in terms of communication, that communication where I was telling them to do something that they had no idea that was necessary for them to do and then I looked confused and they were confused but I reflected on that saying like, you know, to look for things myself or, you know, so in terms of reflecting, yeah, I think when we do our reflection cycle and stuff, a lot of it is probably based on our communication.*	*QS1*

Activity	Significant features and learning consequences (professional learning theory) e.g., task performance, personal development, working with others, coping with unexpected, use of evidence	Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time	*Text examples*	*ID*
Creating check lists	Provide clarity, support Empowering / Conducive to learning	In clinical	*the radiographers were quite supportive in terms of they would provide us with a checklist, or make us do a checklist, and they said we're more than happy for you to use that in the chat*	*QS4*
Being supervised / monitored	Empowering / supportive Working with others Performance development Socialisation	In clinical with a radiographer	*I didn't always feel ready but I just did it anyway, the chats because you know, it felt like you'd a safety blanket as well because the radiographer was with you and if you did say anything stupid or, God forbid, you did say anything wrong, they would step in you know, when it was just actually kind of the more you do it just the more comfortable you are in doing it because like I was listening to loads and I still didn't feel ready but I was just like, ….. okay, just do it.* *every time you did a first day chat they'd always, because the way we used, in my department we trained, they would always have a radiographer with us from first year to third year*	*SG1* *QS3*
Doing research to determine approach to specific situations	Gathering information		*good communication, you see again on placements you tend to see, like you see a range but I think there's been a few examples like when patients have like been really upset or something like that and you see people actively go out of their way to either... even when it's not to do with radiotherapy but to do research on certain things. And, for example, we had somebody who had a wife at home who, I can't remember the syndrome now, but she wouldn't leave the house so something like that, personally it's totally out of my remit, I don't know a whole lot about it, but we went and did research up on it just so we could talk to him and find out what kind of is available and things like that.*	*SG4*

Communication Findings Matrix

Activity	Significant features and learning consequences (professional learning theory) e.g., task performance, personal development, working with others, coping with unexpected, use of evidence	Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time	*Text examples*	*ID*
Listening / observing / work-shadowing	Personal development; socialisation; self-awareness	In clinical with a radiographer; in clinical being with another student on a treatment unit	*my communication's, like, always needed improving, and so at the last placement I was sharing a machine with a student who was, like, really good at communication, so I was, like, watching how he spoke, and how he spoke to patients, and that helped, and my communication's got better… and, so, because they were on the machine for two weeks and I was on it for three, so in my last week, I sort of, started doing what they were doing, and yes, got better.*	*SG2*
	Empowering		*I think like kind of just shadowing like radiographers like when they go and talk to patients for chats or go and get them from the waiting room or anything like that, then just going with them and then when you know, when you feel ready doing it with them, following you, ….. that helped me.*	*SG1*
			or me it was observing the staff as well, like from the beginning of the first year, just seeing because when I first started the school it was just like I don't know how to talk to these patients, what do you say to them because when you say to them, how are you, most of them say I'm not well, well you can't say, oh don't worry, so at first I was even afraid to speak to them but just seeing the radiographers just talk to them, like how are you getting on with it, like using certain words, so just observing others helped me to kind of make a way for myself to speak to them.	*QS1*
			I think as well observing, like throughout all the years you have to sit and observe 1st day chats and things like that and like big points, like where you see patients at the start of their journey, almost from, what the treatment kind of entails anyway, you see radiographers talking to them, explaining and it kind of is a time where the patients have that time to speak and you're able to kind of observe communication in a kind of closed environment, so in terms of when you pick up these things, I think when we observe that all throughout our three years and then we have to deliver the chats at the end of it, I think you can really gauge what good communication is from those experiences.	*QS1*

Activity	**Significant features and learning consequences (professional learning theory) e.g., task performance, personal development, working with others, coping with unexpected, use of evidence**	**Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time**	***Text examples***	***ID***
Role modelling	Learning from others: peers; radiographers	In clinical	*There's one radiographer at, where I work, he's really good at reading the situation, so first day chats, if there's someone who's really nervous he can, like, settle them down and just, like, makes himself, like, nice and slow, and makes sure they're really calm about everything, but he can also assess when they're, like, quite happy to have a chat, he makes them laugh and joke and he's, everybody loves him, so it's brilliant.*	*SG2*
			during last placement, because my communication's, like, always needed improving, and so at the last placement I was sharing a machine with a student who was, like, really good at communication, so I was, like, watching how he spoke, and how he spoke to patients, and that helped, and my communication's got better.	*SG2*
			I think it's experience, the more I'm seeing the radiographers talk, you know, and like all that experience with different patients and how they're like, and then you start to develop, you know, your own sort of communication style, and getting along with the patients, you know how they respond as well and talk to them in their way, yeah	*QS2*

Communication Findings Matrix January 2019

Activity	Significant features and learning consequences (professional learning theory) e.g., task performance, personal development, working with others, coping with unexpected, use of evidence	Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time	*Text examples*	*ID*
Role play simulation in academic	Empowering / control Empowering / being given opportunity to develop the tools before going on placement	Classroom; safe setting	*in 1st year we did something where one person pretended to be a radiographer and the other person pretended to be a patient and that was quite good because it was quite nice being able to like give your ideas across in a controlled environment where you're not potentially saying the wrong thing to a patient and freaking them out, so it's quite nice to get any mistakes out in a classroom [.....] as long as you took it seriously in the classroom it was quite easy to then translate that into practice.*	*SG1*
	Relationships with peers / working with others / authentic		*[Role play] was actually really good because that was before we went out [into placement] and it prepared you a bit for going out and it wasn't so daunting when you were first told to […] get the patient from the waiting area.*	*SG1*
			She was doing an acting part and she was giving us sort of scenarios and she was playing this upset patient and she had tears rolling down her face and we were all like, okay [laughs] and that really helped because it kind of, it showed you how different people reacted to the same situation, she'd get some of us up to the front of the classroom and she'd act out this scenario and we'd have to sort of respond as best you could there and then with all these eyes on you so I thought that was really useful, yeah.	*QS2*
Role play simulation in clinical	Working with others/ empowering Relationships with radiographers Cultural knowledge Socialisation Authentic Feedback	In clinical with a radiographer Being supervised / coached	*I don't know if other departments had this but at our department [..] the radiographer would take us aside and we would do like a pretend first day chat with the radiographer so then that was quite nice in that because they're qualified and they do it all the time every single day, they could pick-up on little things like say if your mannerism was wrong or if you're not really sitting in an open engaging way then it was quite nice to have someone who's not a lecturer being like, "no, don't do that,. do this instead".*	*SG1*
			first day chats with the radiographers. I was in like my first and second year, they'd like do role-play with me so they'd pretend to be like a patient and their relative and then that was quite good because then you can make sure that you said everything right and they pretend to be like a deaf patient so…	*QS3*

Activity	Significant features and learning consequences (professional learning theory) e.g., task performance, personal development, working with others, coping with unexpected, use of evidence	Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time	*Text examples*	*ID*
Having a tutorial on placement	Teaching activity in placement Feedback on performance / supportive / empowering	In clinical with a radiographer	*we also did a first day chat tutorial type thing, as well, at my placement, so that was really useful, as well, to be able to get feedback. So any kind of opportunity to get feedback was really useful.*	*SG2*
Reflecting on mistakes	Reflecting		*I feel I've learnt more from like, kind of like mistakes that I've made in terms of communication, in terms, not finding out exactly what I needed to, so I think that helped, like, me develop more.*	*SG3*
Interacting with patients	Empowering - job satisfaction Relationships with others Feeling valued	In clinical	*I spent about an hour with a patient in a side room and again it wasn't really radiotherapy, she was just upset because her son had gone abroad and she's not heard from him yet and she broke down into tears and it's one of these things that the small, little things all get on top of you but to have that time was lovely and to be able to do something like that, you know, you do feel, you got home and you think "That was a good day almost ….. it's the reason you're there really isn't it?*	*SG4*
	Empowering - control		*I had a patient that only communicated to me that he was having problems with diarrhoea, and I just gave him feedback on what medicine he should take, what lifestyle changes he could make, or what medication he could take, so I felt that was like, a good communication experience.*	*SG3*
			Just being on placement in general I think, having to be with patients every day it makes you, your communication is just being practised.	*QS2*
	Empowering - support		*in the first year our mentors would be like, they would collect the patient from the reception and they'll make you wait around while they're sitting so you can talk to them, just have a chance, just so you can speak to them a little bit longer in the first year.*	*QS2*
			It helps to, when you introduce yourself to the patient, to tell them that you are a student, because then, obviously, they know actually, you know, they know that, obviously, maybe the flow, or you might not be as great, so yeah, that was that, yeah.	*QS4*

Communication Findings Matrix January 2019

Activity	Significant features and learning consequences (professional learning theory) e.g., task performance, personal development, working with others, coping with unexpected, use of evidence	Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time	*Text examples*	*ID*
Repeating specific tasks / building on previous experience	Continuum of learning / Task performance; self-awareness; Development of tacit knowledge; moving through novice to expert spectrum	In clinical	*"At the beginning of the third year you feel that you need to step up. It's like you're in at the deep end, you need to [….] be professional now. Stop being like a first year"*	*SG2*
			Just doing chats as much as possible, it gets you in that, sort of, professional mindset that you need to be in….	*SG2*
			a lot of is almost learning by rote, so you've got certain sentences you say to certain scenarios, like if you're asking people about their skin and then you sort of just give out advice without really thinking about what you're saying,	*QS2*
			you need to actually practice doing it and put it into like a picture sort of thing so it actually makes it relevant, otherwise it's a bit of a waste of time.	*QS3*
			the fact that they started to do it [Vivas] from the second year was good because it wasn't a shock when we got to the third year,	*QS4*
Developing 'routine' answers	Automatic, learned behaviour Novice to expert	In clinical	*But a lot of is almost learning by rote, so you've got certain sentences you say to certain scenarios, like if you're asking people about their skin and then you sort of just give out advice without really thinking about what you're saying,*	*QS2*
			you do still occasionally get like the tough questions [from patients] that make you sit there and think a little bit, but for the most part a lot of it is sort of like, almost like a learned response.	*QS2*

Activity	Significant features and learning consequences (professional learning theory) e.g., task performance, personal development, working with others, coping with unexpected, use of evidence	Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time	*Text examples*	*ID*
Being 'on the job' in clinical / Learning to adapt practice / problem-solving	Coping with unexpected	In clinical	*during my second year I had an assessment but we had like an unexpected change so we had to have an inpatient and she was in a lot of pain, she couldn't talk and I was quite worried that, okay, I'm not being able to like communicate with her, I'm going to fail on my communication so the only thing I could do was reassure the patient everything was going to be alright, I didn't say anything, checking the things with the patient so I was just talking to the patient about how she was feeling at that moment or even just like offering emotional support and I thought, it was just like oh my gosh, I'm going to fail, there was nothing, I didn't do anything checking more with the patient but surprisingly enough I done really well on my communication so I realise, oh it's not just... It's just catering to each individual patient so it's not one way fits all.*	*QS1*
	Developing new insights / empowering		*For me it was I met a lady who had dementia, so obviously she had really severe dementia and she couldn't even remember her husband who used to come with her and like she would have moments when she was like okay, like she would be asking the same thing again and again and again and it was just like [NAME REMOVED] said earlier, not... It was just about learning... Not just asking about how her treatment's going and it was just talking to her about what she remembers so even if she was saying, you know, I'm having this for lunch and just continuing on with that conversation, like oh right, so who are you going with, so I found that with her, that was it, like you could only communicate like that with her, there was nothing technical and even if you asked her how's your treatment going she was like, what treatment, so talking to her in general again could help to talk to them.*	*QS1*
Asking questions	Empowering Self-awareness; desire to improve;	In clinical	*I make sure I always go up and be like, "What can I do better next time?" because that way you always know what you need to do.*	*SG2*
Being asked questions	Negative emotions becoming an empowering experience	In clinical	*so there was a senior radiographer from [SITE NAME REMOVED], where I trained at, there was a senior from [SITE NAME REMOVED] and they asked us questions, so that was horrible, but it was beneficial.*	*QS2*

Communication Findings Matrix January 2019

Activity	Significant features and learning consequences (professional learning theory) e.g., task performance, personal development, working with others, coping with unexpected, use of evidence	Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time	*Text examples*	*ID*
Preparing for assessment / doing assessment / competencies	Empowering: awareness Empowering: enforcing Gathering information Explicit criteria for managing expectation		*I think when I did my mock assessment ……using that [assessment grid] helped me ….. because I was aware of what it actually involved or what it was about really.*	*QS1*
			In your assessment as well you're assessed on communication, it's always in the back of your mind like how I should be talking to a patient and things like that, so yeah that kind of pushes you to communicate with a patient as well rather than having your assessment and not really saying anything 'cos obviously we knew we were getting marked on communication with the patient.	*QS2*
	Clarity of expectation Connecting activity to career core skill Empowerment: developing key skills for assessment		*In the second and third years all our exams were vivas, so they were oral exams. And the reason behind that was partly because, to enable us to communicate the information. I thought that was really good. It was so hard, oh my god, because it's like, you know, a written exam I used to complain about but then doing a viva was, I was like, I would go back to a written exam any day, to be honest, because you have to remember the information, and you have to put it into context, and the way you communicate it as well, it's not like just jotting it down on a piece of paper, you know, and having someone, you know, stare at you for the answer it's quite pressurising so I think that really helped me prepare.*	*QS4*
			the fact that they started to do it from the second year was good because it wasn't a shock when we got to the third year, you know we, okay, second year, okay, vivas let's just get into it now and then, you know, if we were a bit weak we had that whole year, and then, come third year, which was worth a lot more, you could really nail it, because we had experience, yeah.	*QS4*
	Empowerment - control / learning forced		*[communication was] competency-based and we just had to do a, like there wasn't a set number but which machine you were on, whoever your mentor was, they said do as many as you can on this placement and if we think that you are competent enough at the end we'll sign you off, basically, yeah …. and it was really nerve-racking because you've got, not only the patient but also the radiographer as well but, you know, the sooner you do it the better, I guess.*	*QS4*

Other themes

Other themes	*Significant features / Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time*	*Text examples*	*ID*
Requirements for being a 'good' communicator	*Behaviour*	*Good use of body language as well as like not communicating badly.*	*QS1*
	Role performance	*Eye contact.*	*QS2*
Body language		*Smiling and using their facial expressions.*	*QS2*
		It's always showing a good body language and, around all the patients, even if someone else is talking to the patient, as well, so they look interested even though they're not directly involved in the conversation	*SG2*
		non-verbal aspects of communication so it's someone who can actually get to the level whose personal space is, you know, just right, not too far away that they're distant, not too close that the person might feel uncomfortable but I think, so if the patient is sat down, just crouch a touch sort of near	*SG4*

Other themes	*Significant features / Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time*	*Text examples*	*ID*
Requirements for being a 'good' communicator cont.	*Role performance*	*Being able to adapt yourself to each patient, so for example, if a patient, either their English isn't that great and you know what appropriate words to use or stuff like that.*	*QS1*
	personalising care / viewing patients holistically /	*It's just catering to each individual patient so it's not one way fits all.*	*QS1*
Adapting practice to patients' needs		*[good communication] was I met a lady who had dementia, …… found that with her, that was it, like you could only communicate like that with her, there was nothing technical and even if you asked her how's your treatment going she was like, what treatment, so talking to her in general again could help to talk to themThe people that are the best at it you know, they're more adaptive I guess.*	*QS1*
		having that adaptability to be able to assess, like, assess the situation you're in, and changing your communication to be able to communicate most effectively as you can with that person.	*SG1*
		Adapting to, like, change, like, you've got different patients, age, if they're older you might need to talk to them a bit different to if they're young, like, some might be hard of hearing, and learning disabilities, as well, so you know, you've just got to talk to everyone, communicate with everyone differently.	*SG2*
		adapt to those people. Verbally wise as well, good communication, you see again on placements you tend to see, like you see a range but I think there's been a few examples like when patients have like been really upset or something like that and you see people actively go out of their way	*SG4*
Requirements for being a 'good' communicator cont.	*Role performance*	*Being clear in what you're saying*	*QS1*
	Accuracy	*being able to make sure that the information you've given is clear*	*SG1*
Clarity		*Making sure you're passing on the entire message rather than snippets of it because sometimes that can lead to you missing out crucial information.*	*QS1*

Other themes	***Significant features / Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time***	***Text examples***	***ID***
Cont. *Rapport / approachable*	*Behaviour* *Non-judgemental* *Task performance*	*Being able to put the patients at ease because some of them do say that they feel like when they do come here you ask just about their wellbeing in general, not just radiotherapy, how they're getting on with their everyday life and so then it just makes it a bit different, so it's just someone to talk, oh someone's picking up my kids for me or I'm going to lunch after here, so just a little bit of diversion that's not constantly focusing on what's happening to them in the room.* *[a good communicator is] someone who can build really good rapport with the patients.* *Being open in the sense where like patients feel like they're able to ask you things, that you're not judgemental and things like that, like the way you ask something it's not as if you're judging the answer that's coming, so being aware of your tone and how you're speaking as a whole.*	*QS1* *SG2* *QS1*
Cont. *Listening / paying attention*		*I've found that kind of the people with the best communication actually listened to what the patient said and they responded to that, or like listened to what you said and responded to that.* *it's … active listening*	*SG1* *SG4*
Cont.	*Handling difficult situations* *Checking understanding*	*I think knowing what to say in really difficult situations as well, so if you get a patient come through and they're upset or concerned about something, being able to sort of live in that moment and be able to respond appropriately is really good communication.* *Being able to check their understanding, because you get a lot of people who just sort of sit there and nod at you and you're like you're not really taking in what I'm saying, so yeah, like I think it's not even just like staff-to-patient though, staff-to-staff just making sure that whoever you've said information to, being able to check their understanding is just as important as giving them the information*	*QS2* *SG1*
Cont. *Values*	*Behaviour - negative role modelling*	*Being honest with them,[patients] like sometimes you see radiographers that try and sugar coat the information or not tell the patient exactly why they're delayed or anything like that, and the best ones I've seen just tell them the truth*	*SG1*

Other themes	*Significant features / Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time*	*Text examples*	*ID*
Emotions in learning	*Worried about task performance* *fear of failure during clinical-based assessment / stressful situation* *Ability to learn from experience*	*During my second year I had an assessment but we had like an unexpected change so we had to have an inpatient and she was in a lot of pain, she couldn't talk and I was quite worried that, okay, I'm not being able to like communicate with her, I'm going to fail on my communication so the only thing I could do was reassure the patient everything was going to be alright, I didn't say anything, checking the things with the patient so I was just talking to the patient about how she was feeling at that moment or even just like offering emotional support and I thought, it was just like oh my gosh, I'm going to fail, there was nothing, I didn't do anything checking more with the patient but surprisingly enough I done really well on my communication so I realise, oh it's not just... It's just catering to each individual patient so it's not one way fits all.*	*QS1*
	Pressure of assessment *Effects of being judged / self-judgement*	*In your assessment as well you're assessed on communication, it's always in the back of your mind like how I should be talking to a patient and things like that, so yeah that kind of pushes you to communicate with a patient*	*QS2*
	Performing in front of peers	*it [first day chat competency assessment] was really nerve-racking because you've got, not only the patient but also the radiographer as well but, you know, the sooner you do it the better, I guess.*	*QS4*
		I couldn't do any (first day chats) in the first year because I was too nervous,	*QS4*
		I had a lot of feedback about my communication, so I kind of got obsessed with it. I'm now happy-ish	*SG2*
		because it [role-play] kind of, everyone is kind of, not fearful, but they're getting to that state that "Oh no, it's role playing",	*SG4*
		she'd get some of us up to the front of the classroom and she'd act out this scenario and we'd have to sort of respond as best you could there and then with all these eyes on you so I thought that was really useful,	*QS2*

Other themes	Significant features / Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time	Text examples	ID
Emotions in learning	Novice & insecurity No control over situation	*when I first started the school it was just like I don't know how to talk to these patients, what do you say to them because when you say to them, how are you, most of them say I'm not well, well you can't say, oh don't worry, so at first I was even afraid to speak to them*	QS1
	Transitions	*it sounds silly now, but go out and actually ask the patient to come in and sit down you know, get the patient from the waiting area, that was so scary when they first asked me…*	SG1
		I think at the start of third year, you feel that you need to step up. It's like you're in at the deep end, you need to, sort of, be professional now. Stop being, like, a first year, really	SG2
Emotions in learning	Empowering / being supported	*it felt like you'd a safety blanket as well because the radiographer was with you*	SG1
Emotions in learning	Worries related to different assessment methods, e.g. memory recall Pressure caused by assessor behaviour	*It was so hard, oh my god, because it's like, you know, a written exam I used to complain about but then doing a viva was, I was like, I would go back to a written exam any day, to be honest, because you have to remember the information, and you have to put it into context, and the way you communicate it as well, it's not like just jotting it down on a piece of paper, you know, and having someone, you know, stare at you for the answer it's quite pressurising so I think that really helped me prepare.*	QS4
	No control over situation Pros / cons	*so there was a senior radiographer from [SITE NAME REMOVED], where I trained at, there was a senior from [SITE NAME REMOVED] and they asked us questions, so that was horrible, but it was beneficial.*	QS4
		I had an assessment but we had like an unexpected change so we had to have an inpatient and she was in a lot of pain, she couldn't talk and I was quite worried that, okay, I'm not being able to like communicate with her, I'm going to fail	QS1

Communication Findings Matrix January 2019

Other themes	***Significant features / Setting and/or conditions surrounding experience, (where and how) e.g. supervision, resources, time***	***Text examples***	***ID***
Emotions in learning	*Sense of achievement / satisfaction*	*had a patient that only communicated to me that he was having problems with diarrhoea, and I just gave him feedback on what medicine he should take, what lifestyle changes he could make, or what medication he could take, so I felt that was like, a good communication experience.*	*QS3*
		It's when you go home and you think I've actually, not necessarily helped, but I did the best I can and to me that's kind of good communication, those are the times that you think "I've done well".	*QS4*
		it's one of these things that the small, little things all get on top of you but to have that time was lovely and to be able to do something like that, [chat with a patient who was upset] you know, you do feel, you got home and you think "That was a good day almost"……… It's like one of those, it's the reason you're there really isn't it?	*QS4*
		So it's those little things that... it's when you go home and you think I've actually, not necessarily helped, but I did the best I can and to me that's kind of good communication, those are the times that you think "I've done well".	*SG4*
Views on teaching activity / criticism	*Pros / cons of different delivery methods* *Value & relevance*	*We did have lectures on communication I remember in first year but they were very sort of airy-fairy so there wasn't much substance to them like. It was like so-and-so, like so-and-so said this and so-and-so said that but it doesn't really actually help you because you need, I don't think that's the way that you should learn it, it should be more like scenario based and like actually ask you. Because learning about, like yes we need to like, you need to ask open-ended questions, closed-ended questions and all that sort of thing but it's, you need to actually practice doing it and put it into like a picture sort of thing so it actually makes it relevant, otherwise it's a bit of a waste of time.*	*QS3*
Identifying the 'studentness'	*Anticipating* *Self awareness* *Behaviour*	*and it helps to, when you introduce yourself to the patient, to tell them that you are a student, because then, obviously, they know actually, you know, they know that, obviously, maybe the flow, or you might not be as great, so yeah, that was that, yeah.*	*QS4*
Barriers to learning	*Disempowering \ Lack of staff*	*I don't think they do it anymore because they're really busy now*	*SG1*
	Time	*it's a time issue as well isn't it, and a staffing issue as well because I think we're understaffed as well so they probably don't have half-an-hour free for a person to go away and do stuff with the students.*	*SG1*