AN EXPLORATION OF ENTREPRENEURIAL KNOWLEDGE AND SKILLS ACQUIRED BY RADIOGRAPHERS DURING RADIOGRAPHY TRAINING AT A UNIVERSITY OF TECHNOLOGY IN KWAZULU-NATAL

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Declaration

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Durban University of Technology or to any other institution for assessment or for any other purpose.

4 October 2024

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Abstract

Background

South African tertiary institutions offering experiential learning for training of radiographers have yet to incorporate skills that align with the needs of the radiography industry. During the COVID-19 pandemic, existing medical imaging services fell short of meeting public demand, and the need for radiography services was expected to increase. Promoting the establishment of private radiography enterprises could be a key solution to supplement current services and tertiary institutions play a crucial role in this by incorporating entrepreneurial training into their radiography curricula.

Aim of the study

The aim of the study was to explore the entrepreneurial knowledge of radiographers (diagnostic radiographers and ultra-sonographers) and make recommendations on how to improve entrepreneurship in radiography education.

Methodology

A qualitative exploratory research design was adopted, ensuring that the phenomenon was thoroughly investigated. The target population was diagnostic radiographers and ultra-sonographers employed in public and private practices within the eThekwini district of KwaZulu-Natal. Primary data was obtained from the participants using a semi-structured interview schedule that had open-ended questions directly derived from the research objectives. The study had a sample size of 16 radiographers, however only 15 responses were received. The primary data was thematically analysed and compared with secondary sources that were relevant to the study. Ethical considerations including maintaining anonymity, confidentiality, ensuring informed consent, objectivity and acquisition of permission were observed.

Findings

The participants consisted of 1 ultra-sonographer and 14 diagnostic radiographers who came from two public hospitals and six private hospitals. Three main themes that were uncovered in the study include: (a) Incorporation of skills (b) Entrepreneurial knowledge and skills acquisition and (c) Proposed changes to the curriculum. The themes were aligned with Kolb's experiential learning cycle which served as the study's theoretical framework.

Conclusion

The findings of this study revealed that some of the modules essential for entrepreneurship are present within the curriculum, however, the gap between theoretical and clinical elements pertaining to entrepreneurial training does not support the students and graduates' transition from classroom to the real world. It is for this reason that the university offering radiography training in this study will need to amend their current curriculum, in order to include the modules suggested in the findings and impart skills that are presently absent. There is also a need to shift teaching approaches from the traditional lecture-centred approach toward a more action-oriented and student-centred method that will inspire confidence in graduates who wish to pursue the entrepreneurial route.

Key words: Entrepreneurial knowledge, Curriculum development, Radiography curriculum

Dedication

This dissertation is dedicated to my late grandmother, Somamma Kuppen. Your years of unconditional love and unwavering support are the sole reason that this dissertation is possible.

and

This dissertation is dedicated to my sister, Seina, who is a constant reminder of everything that is pure in this world.

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Glossary of terms

Constructivism: is defined as the notion that people build their own new insights or knowledge by interacting with what they already know and believe, as well as with the theories, occurrences, and acts with which they come into touch (Hein 2007: 1).

Curriculum: is often defined as a set of subjects or performance objectives (Mulenga 2018: 5).

Entrepreneur: The person at the centre of the entrepreneurial process, the manager who propels the entire process forwards (Jorgensen 2020: 5). Entrepreneurs frequently function alone, yet in other cases, entrepreneurial teams are critical.

Entrepreneurship: is defined as the discovery, evaluation, and exploitation of previously unorganised opportunities to introduce new goods and services, ways of organising, markets, processes, and raw materials (Mbhele 2012: 94).

Healthcare institutions: service providers focused on enhancing health through the prevention, diagnosis, and treatment of diseases. These institutions encompass hospitals, clinics, nursing homes, and other similar facilities (Sapra and Dhaliwal 2021: 327).

Medical imaging: is described as a process and technique of imaging the various body parts for diagnostic and medical intervention (Brush 2024 para. 1 line 1-3).

Module: a self-contained unit of study within a course, designed to build skills and knowledge in distinct segments. Each module represents a structured portion of a broader learning experience that contributes to a specific qualification (Dejene 2019: 2).

Radiologic Technologists: often referred to as radiographers. These professionals perform x-rays as well as other diagnostic imaging procedures on patients (Bureau of Labor Statistics 2024: 1).

Work-integrated learning: provides students with the opportunity to apply their university acquired knowledge in a working environment (Sunnemark *et al*. 2023: 4).

Acronyms

Acronym	Full word/sentence
AC	Abstract Conceptualisation
AE	Active Experimentation
BHSc	Bachelor of Health Science
BSc	Bachelor of Science
CE	Concrete Experience
CPUT	Cape Peninsula University of Technology
CUT	Central University of Technology
DHET	Department of Higher Education and Training
DOH	Department of Health
DUT	Durban University of Technology
EDHE	Entrepreneurship Development in Higher Education
EE	Entrepreneurship Education
HPCSA	Health Professions Council of South Africa
HEQF	Higher Education Qualifications Framework
HEQSF	Higher Education Qualifications Sub-Framework
HEI	Higher Education Institution
ISSRT	International Society of Radiographers and Radiologic Technologists
KZN	KwaZulu-Natal
POPIA	Protection of Personal Information Act
RO	Reflective Observation
UJ	University of Johannesburg
UoT	University of Technology
WIL	Work-Integrated Learning

CHAPTER 1: OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND TO STUDY

It has been argued that South African radiography education and training currently does not adequately address the need for enhanced skills and knowledge in diagnostic radiography (Du Plessis and Friedrich-Nel 2012: 1). This has an impact not only on graduate employability, but also on graduates' ability to start and maintain successful private enterprises. The current research was carried out at a time when there was a high demand for medical imaging services in South Africa, which far outweighed the number of private radiography practices in the country (Ngoya, Muhogora and Pitcher 2016: 2).

This increase in demand is expected to continue in the future unless steps are taken to address the failure to expand private radiography practices. As a result, there is a gap in the field of radiography that can be filled if radiography education encourages entrepreneurship. Incorporating entrepreneurship into radiography education addresses the current shortfall in private practices by creating a new generation of radiographers who are not only skilled in medical imaging but also capable of running successful businesses. This holistic approach to education can significantly contribute to meeting the rising demand for medical imaging services, ultimately improving healthcare outcomes and accessibility for the population.

According to Kalitanyi and Bbenkele (2018: 442), by being more entrepreneurial in their academic and administrative practices, tertiary institutions can help students become independent and innovative risk-takers. The realization of potential behaviour is attributed to educational significance and stems from an appropriate curriculum structure (Daim, Dabic and Bayraktaroglu 2016: 3). The proliferation of technology transfer offices suggests that universities are increasingly recognising the economic benefit of entrepreneurship. The more basic issue is how

entrepreneurial values can become broadly integrated into a university's culture (Ilgov, Grebennikov and Kurochkina 2019: 202).

Furthermore, teaching entrepreneurial and business skills in tertiary institutions assists graduates in creating their own employment opportunities. Furthermore, it fosters creativity and innovation which may in turn revolutionize technology as entrepreneurs generally desire to do things differently (Boldureanu *et al*. 2020: 13).

Entrepreneurship involves the conception and implementation of new ideas and practices, as well as the improvement of old ones (Garcia and Alvarez 2017: 2991). In an increasingly technological, scientific, and interconnected world, the quality of innovation is increasingly dependent on advanced learning (Brooks *et al*. 2009: 14). A solid educational foundation helps to ensure that new ideas are both effective and substantive. Entrepreneurship encourages, implements, and rewards innovation, therefore, it is inextricably linked to education. In this respect, one of the most important tasks of radiography training institutions is to emphasise and reward innovation and its implementation as a core educational goal.

Entrepreneurship education (EE) has been promoted as the primary means of enhancing and developing a variety of sectors amongst developed countries in Europe and North America, as well as fast-developing countries like Brazil, China, and India (Fayolle 2018: 128; Guzmán and Liñán 2005: 2). Radiography education through business and entrepreneurship learning related to marketing, production, operations, and finance is expected to make radiography graduates au fait with the demands of business and entrepreneurship (Okpaleke, Nwokorie and Sani 2023: 181). The ultimate result of such initiatives would be successfully established and maintained radiographer-owned private enterprises. To this end, the ability to use knowledge, identify problems, and draw evidence-based conclusions in order to understand and make decisions about business and entrepreneurship, as well as

to effect economic change in each individual's life, is referred to as business and entrepreneurial literacy (Supatminingsih 2023: 8).

Entrepreneurship is essential in radiography because it is characterised by innovative behaviour which enables prospective entrepreneurs to venture into areas such as technology (Ugwu 2018: 27). When one considers that service delivery in the South African healthcare system is unbalanced (Rensburg 2021 para. 1 line 1) and that there is a high demand for health services, particularly in South Africa's rural areas, one realises that entrepreneurship is beneficial to society.

Against this backdrop, the importance of entrepreneurial skills as well as business skills cannot be overstated. Entrepreneurship should be encouraged to ensure radiography graduates' post-qualification employability and competitiveness in the market. Furthermore, it should be promoted to improve the quality of available healthcare services and meet the demand for these services.

Universities play a crucial role in promoting entrepreneurship, as they advance scientific knowledge and disseminate it for societal benefit (Itri *et al*. 2015: 14). Notably, South African tertiary institutions offer Work-Integrated Learning (WIL) placements (Du Plessis and Bezuidenhout 2019: 101). However, these WIL programs have yet to incorporate entrepreneurial skills that align with the needs of the radiography industry.

The central theme of this study is the exploration of entrepreneurial knowledge and skills acquired by radiographers during their undergraduate training. In doing so, the study will provide discussions in relation to the inclusion of entrepreneurship in the curriculum, module content, teaching and learning, as well as skills development. Within the province, studies have been conducted on factors impacting the retention of radiographers in KZN (Thambura, Swindon and Amusa

2014: 1202), radiographers' perceptions of professional development (Zulu 2022: iv) and the core competencies of radiographers employed within rural hospitals in KZN (Mung'omba and Botha 2017: 1). However, the researcher could not find any recent literature on the success of radiography graduates in establishing and maintaining their private enterprises. This deficiency or dearth of research within this domain is considered a cogent concern as there is no clear indicator of the effectiveness of modern teaching methods and curricula in promoting entrepreneurship (Olutuase, Brijlal and Yan 2020: 269).

Arguably, tertiary institutions' initiatives to encourage entrepreneurship among university students as an alternative to traditional employment have not been successful (Netshilinganedza, Mudau and Francis 2022: 271). This is a missed opportunity, as the promotion of entrepreneurship within the radiography industry may potentially alleviate the high demand of radiography services in South Africa. Invariably, with the current trend, the demand for radiography services is anticipated to continue escalating.

1.2 PROBLEM STATEMENT

This study investigated whether the contemporary radiography education curriculum in KZN provides graduates with the knowledge and skills needed to be successful entrepreneurs. If the study's findings proved otherwise, the task was to determine how the radiography education curriculum should be developed to address this need. Such development could include the need to revisit the modules and training offered to establish whether they have become redundant and determine the stage where entrepreneurial and business skills should be taught in the course. The study also sought to fill the entrepreneurial knowledge gap in relation to radiography training in KZN's tertiary institution. A qualitative research design was undertaken to interview radiographers who graduated from the University of Technology (UoT) in 2019 and 2020.

1.3 AIM OF THE STUDY

The aim of the study was to explore the entrepreneurial knowledge of radiographers (diagnostic radiographers and ultra-sonographers) in order to make recommendations on how to improve entrepreneurship in radiography education.

1.4 OBJECTIVES OF THE STUDY

The objectives of the proposed study were to:

- Determine entrepreneurial and business skills incorporated into the modules offered by a University of Technology in the eThekwini district's current radiography curriculum.
- Explore the entrepreneurial knowledge and skills acquired by radiographers during radiography training.
- Explore the changes that should be made to the radiography curriculum in order to develop successful entrepreneurs.

1.5 RESEARCH QUESTIONS

This study sought to investigate and provide answers to the following guiding research questions:

- What entrepreneurial and business skills are incorporated into modules offered by a University of Technology in the eThekwini district?
- What entrepreneurial knowledge and skills are acquired by graduates during radiography training?
- What changes are necessary to the radiography curriculum for the development of entrepreneurs?

1.6 SIGNIFICANCE OF THE STUDY

Radiography is an essential tool used in the medical field to diagnose both infectious and non-infectious diseases. In South Africa, the state is the main

provider of radiography services. As indicated in previous sections, the demand for radiography services is much higher than the available resources. Therefore, innovations in the provision of radiography services would be instrumental in assisting physicians to deal with increasing and complex healthcare challenges. The findings of the current study could highlight the need for radiography educators and tertiary institutions offering radiography education to develop and incorporate practical entrepreneurial and business skills into the radiography curriculum. Such measures will ensure that graduates receive the training they need in order to increase their chances of being successful should they run a private practice. Furthermore, the findings may enable higher education institutions (HEI) to plan interventions, provide training, and develop a curriculum that responds to the demands of today's globalised economy. The curriculum will prepare graduates to succeed in private practice and equip them with the skills to adapt and use new technologies in their practices (du Plessis 2015: 35).

At the time this study was conducted, studies conducted within KZN mainly focused on aspects of formal employment within the radiography sector (Thambura, Swindon and Amusa 2014: 1202; Zulu 2022: iv; Mung'omba and Botha 2017: 1) leaving a gap in literature regarding entrepreneurship. As a result, it is unclear whether the current radiography curriculum is prepared to promote and facilitate the establishment and maintenance of successful private enterprises. The success of private enterprises in radiography is critical for the attainment and provision of widespread access to quality healthcare services across the country, and it is essential that any impediments to that success, insofar as they are rooted in education and skills acquired during radiography training, are addressed. It is with this purpose in mind, that research into KZN's contemporary radiography curriculum is necessitated.

1.7 STRUCTURE OF THE STUDY

CHAPTER 1: OVERVIEW OF THE STUDY: This chapter provides an outline of the study's context, significance, and major objectives.

CHAPTER 2: LITERATURE REVIEW: This chapter provides a comprehensive review of the literature on and related to the topic under study. This literature will be examined and linked to the current study.

CHAPTER 3: THEORETICAL FRAMEWORK: This chapter outlines the theoretical framework that underpinned this study.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY: This chapter outlines the type and design of the research as well as the methods that guided the data collection process.

CHAPTER 5: PRESENTATION OF FINDINGS: The researcher presents findings in relation to the available literature and accrued data.

CHAPTER 6: DISCUSSION OF FINDINGS: The researcher discusses and evaluates the findings of the study considering relevant literature.

CHAPTER 7: SUMMARY, LIMITATIONS, CONCLUSION AND RECOMMENDATIONS: This is the final chapter of the study, and it summarises the findings of the study, offers recommendations for radiography curriculum development and provides concluding remarks.

1.8 SUMMARY OF THE CHAPTER

There are significant advantages to including practical entrepreneurial and business skills in standard post-secondary education programmes. This inclusion

will benefit the advancement of radiography, as well as other fields. As the world's natural resources deplete and technology develops, humanity will rely more and more on its intellect to survive. Understanding, inventiveness, and ingenuity of humans will become increasingly crucial in the creation of a sustainable future. Innovation alone is insufficient; graduates must also be able to implement new ideas and make them accessible to large populations.

This chapter examined the concept of entrepreneurship and identified the increasing demand for imaging services in South Africa as a crucial factor necessitating an investigation into why there are so few privately owned radiography businesses. The chapter outlined the study's objectives and the research questions that guided the investigations conducted in this study. In the final event, this chapter justified the significance of the study. Chapter 2 reviews existing literature on entrepreneurship education.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Fundamentally, qualitative methods are valuable for uncovering and understanding the underlying aspects of phenomena that are not well known (O'Gorman and MacIntosh 2015: 66). This process of investigating what is known and unknown on a particular topic is known as reviewing literature in academic circles and it allows the researcher to grasp the current state of knowledge in a subject area, relate it to ongoing research, and identify gaps in this knowledge. O'Gorman and MacIntosh (2015: 31) have observed that a literature review in academic research can resolve debates, highlight the necessity for further study, and clarify a research topic. The review of literature is significant because it prepares the researcher to form an argument or justification about the topic at hand.

Section 27(1)(a) of the Republic of South Africa's Constitution of 1996 (the South African Constitution) states that "everyone has the right to healthcare services". The formulation of the right is fairly limited in that it only provides for the right to have access to healthcare services and not the general resources required to preserve and maintain public health (Bilchitz 2013: 55). The availability of such resources is a critical component of achieving the right to healthcare.

Unfortunately, the public healthcare system, is facing challenges such as the unequal distribution of resources, management and leadership crises, and slow progress in restructuring the healthcare system, despite the government's efforts (Maphumulo and Bhengu 2019: 3). As a result, sometimes people turn to the private sector and pay out-of-pocket expenses due to the growing demand for quality healthcare services which the public sector appear unable to fulfil

(Maphumulo and Bhengu 2019: 4). In this context, the chapter describes how literature was utilised to develop study constructs.

A desktop review was conducted using a variety of electronic databases such as MEDLINE, Science Direct, ResearchGate, HeinOnline, ProQuest health medical complete, and ProQuest health management. Some sources were obtained with the help of supervisors, colleagues, and the Durban University of Technology's (DUT) library. In addition, search engines such as Google scholar were also used. Manual searches were completed by using reference lists from selected articles to obtain additional papers relevant to the topic. Thus, the search was conducted in line with the study's aim and objectives. Some of the terms used in searching for literature included "entrepreneurial or business and knowledge or skills and radiography training or radiography education".

This chapter will define what entrepreneurship is by exploring its key concepts and characteristics. It will also examine the role of entrepreneurship in society and highlight its contributions to economic growth, job creation, innovation, and addressing social challenges. Secondly, the stages involved in the entrepreneurial journey are broken down. Thirdly, the chapter examines how experiential learning plays a crucial role in developing entrepreneurial capabilities.

2.2 CONCEPTUALISING ENTREPRENEURSHIP AND ITS IMPORTANCE IN SOCIETY

Many policymakers and scholars agree that entrepreneurship is essential to societal growth and well-being (Wiklund *et al*. 2019: 5). Entrepreneurs generate employment and they drive and shape innovation, thereby hastening economic structural changes. Thus, entrepreneurship serves as a driver of economic growth and national competitiveness.

Entrepreneurship involves taking action to create new organizations, introduce new goods and services and ways of organising, which generates job opportunities and drives economic development (Diandra and Azmy 2020: 238). Another definition highlights that entrepreneurship is a facet of the intricate management processes involved in operating and running a company, and encompasses management decision-making in highly uncertain situations and applies to both large and small organizations within dynamic and complex business environments (Omolade and Tony 2014: 59). Entrepreneurship is essential in radiography because entrepreneurial radiographers are able to drive innovation in imaging technologies and services (Ugwu 2018: 16).

Universities have a huge role to play in the promotion of entrepreneurship because academic institutions serve two main purposes: first, to advance scientific knowledge and second, to share this knowledge for the benefit of the society (Itri *et al*. 2015: 14). When one considers that service delivery in the healthcare system is underdeveloped and that there is a high demand for health services, particularly in South Africa's rural areas, entrepreneurship becomes beneficial to society.

A number of opportunities are available for radiographers to develop professionally because the Department of Health in South Africa does not prohibit radiographers from opening their own practices, as long as they register with the Health Professions Council of South Africa (HPCSA) (Lewis, Downing and Hayre 2023: 210). The ability to start their own medical imaging practices provides radiographers with a different career path in entrepreneurship.

According to a study conducted by Matseke (2023: 68), out of 7 309 registered radiographers in the country, only 3 448 were employed in the public sector, with 763 of those radiographers employed in KwaZulu-Natal (KZN) (Matseke 2023: 69). The exact number of radiographers that have established their own practices is not clear from Matseke's study. Nevertheless, the present study focused on

diagnostic radiographers and ultra-sonographers because nuclear medicine and therapy radiographers rarely venture into entrepreneurship due to the nature of their respective disciplines. To further this discourse, the next proceeding section provides a discussion on entrepreneurial processes.

2.3 UNDERSTANDING THE ENTREPRENEURIAL PROCESS

Considering the process of entrepreneurship in a broad sense provides the necessary framework for understanding how entrepreneurship generates new income and opportunities in a variety of ways and making sense of the details of specific endeavours. It also serves as a guide for decision making while embarking on new ventures. Figure 2.1 below depicts the complete entrepreneurial process:

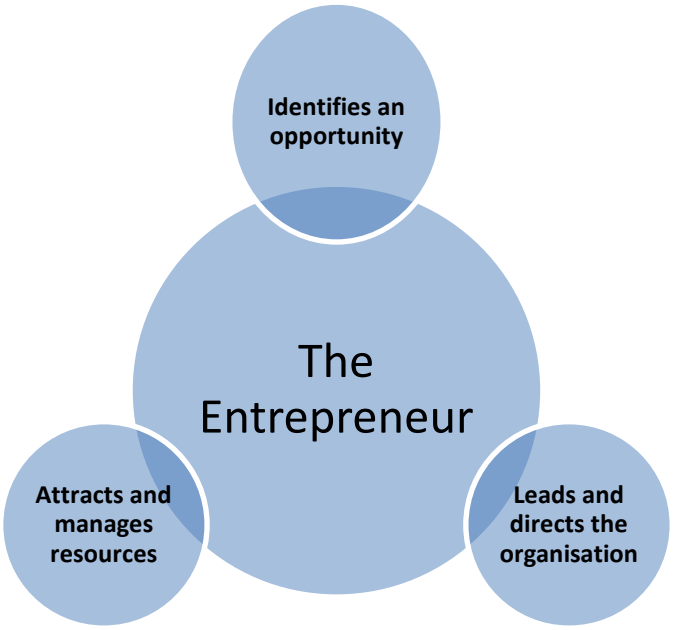

Figure 2.1: Illustration of the Entrepreneurial Process (Adapted by the researcher from Kuratko, Morris and Schindehutte [2015: 8])

The typical entrepreneurial journey starts when the entrepreneur identifies an opportunity, then progresses to developing a product concept, gathering necessary resources, and concludes with devising an entry strategy (Jorgensen

2020: 35). As seen in Figure 2.1, an entrepreneur initially identifies a business opportunity, or service that is needed in society (Wasdani and Mathew 2014: 1). This necessitates the pulling of resources to promote the identified business opportunity or service. The figure thereafter highlights the need for leadership and direction to establish and maintain the organisation (business). These four contingencies are outlined briefly below:

2.3.1 The entrepreneur

The entrepreneur is a person at the centre of the entrepreneurial process; the manager who propels the entire process ahead (Jorgensen 2020: 5). Entrepreneurs frequently function alone, yet in other cases, entrepreneurial teams are critical. An entrepreneurial team is made up of two or more individuals who hold a substantial financial stake and are actively involved in the development of the business (Gregori and Parastuty 2021: 848).

Initially, scholars identified four distinct types of entrepreneurs based on their primary motivations and approaches: those driven by boldness and achievement, those who build ventures through salesmanship and networking, those focused on innovation and invention, and those motivated by power and leadership (Kuratko, Morris and Schindehutte 2015: 6). However, more recent research has shifted from classifying entrepreneurs into these categories to exploring the cognitive processes behind entrepreneurial behaviour.

Using cognitive science, entrepreneurial cognition is defined as the knowledge structures entrepreneurs use to make assessments, judgments, and decisions related to opportunity evaluation, venture creation, and business growth. Essentially, entrepreneurial cognition seeks to understand how entrepreneurs use mental shortcuts or models to connect previously unrelated information, enabling them to identify and create new products or services, and to gather the resources

necessary to launch and expand their businesses (Kuratko, Morris and Schindehutte 2015: 6).

2.3.2 The market opportunity

A market opportunity is the void left by society's current providers. It represents an opportunity to better serve clients than they are currently served. The entrepreneur is responsible for examining the business environment for unrealised opportunities or possibilities to do something substantial differently and, more importantly, in a manner better than it is currently (Wasdani and Mathew 2014: 1). This improved method is the innovation that the entrepreneur introduces to the market. Customers must agree with the entrepreneur that the innovation is superior to what was previously available, and there must market acceptance of the entrepreneur’s products or services and competition from existing products (Wasdani and Mathew 2014: 17). Throughout their training, radiographers should be inculcated with this innovative mindset. Recent research has shown that women in sub-Saharan Africa are more motivated than men in any region of the world, and that the opportunity factor is the primary reason for this (Muzata 2022: 1).

2.3.3 The business organisation

The efforts of several different persons must be coordinated in order to offer the innovation to the market. This is the function of the business organisation that the entrepreneur establishes. Business organisations can take on a variety of shapes. Organizational structure refers to the framework that defines the relationships between jobs, systems, processes, people, and groups working together to achieve the organization's goals (Ahmady, Mehrpour and Nikooravesh 2016: 457). Entrepreneurial organisations are distinguished by strong, often charismatic, leadership from the entrepreneur. According to van Hemmen, Urbano and Alvarez (2013: 53), “charisma” is the ability of a leader to foresee business opportunities

and motivate others to work towards the realisation of the corresponding dreams. Leaders may have fewer formal structures and systems than their more bureaucratic, established competitors, but still achieve greater success.

2.3.4 The resources to be invested

The ultimate contingency in the entrepreneurial process is the allocation of resources. This encompasses capital and other complementary assets (Teece 2014: 22). Intangible assets such as brand names, company reputation, and consumer goodwill are other examples of resources that should be invested. Entrepreneurs cannot simply rely on the market to align and develop specific assets and integrate them into an efficient global invention or production, instead they are the instruments that ensure markets function effectively, with one of the entrepreneur's major roles being to seek investment and use it to build a set of assets that enable the company to deliver its innovation competitively and profitably (Teece 2014: 22).

Based on the preceding discussion, the entrepreneurial process is the creation of new value by the entrepreneur by identifying new opportunities then attracting the resources required to pursue those opportunities and establishing an organisation to manage those resources. This is a dynamic process in which both the entrepreneur and the entrepreneurial organisation learn from success and failure. Having provided some insights into entrepreneurial processes, the study is further advanced by providing a brief discussion on entrepreneurial learning.

2.4 ENTREPRENEURIAL LEARNING

Various theories have been developed to explain the process of learning, each offering unique insights into how individuals acquire and apply knowledge. This section will focus on Kolb and Kolb's Experiential Learning Cycle, as it provides one of the most effective frameworks for understanding how entrepreneurial

learning occurs. The Experiential Learning Cycle emphasises the importance of learning through direct experience and reflection, which is particularly relevant to entrepreneurship, where practical engagement and iterative learning are essential for success. By exploring the stages of this model, this section will demonstrate how entrepreneurs can develop critical skills, adapt to challenges, and continuously improve through hands-on learning and reflection.

2.4.1 Teaching and Learning

Entrepreneurs learn from experience. Would-be and nascent entrepreneurs must develop entrepreneurial and business skills in order to launch and grow new ventures (Moreira, Dantas and Valente 2018: 59). Kolb and Kolb's (2018: 8) Experiential Learning Cycle sheds some light on the experiential learning process. According to Kolb and Kolb (2005: 194), "learning is best conceived as a process, not in terms of outcomes". The learning process is divided into four distinct stages: concrete experience, reflective observation, abstract conceptualisation, and active experimentation.

2.4.2 Entrepreneurship Curriculum

Concrete experience is gained through active participation in doing something. One can watch or read about something, but it is the act of "doing" that provides individuals with concrete experience to learn and develop (Fewster-Thuente and Batteson 2018: 4). As early as the first year of training, students in the radiography programme at eThekwini's UoT are exposed to clinical training, which contributes significantly to the development of their practical skills and concrete experience. With regards to developing radiographers as entrepreneurs, the curriculum entails a number of business and leadership modules. However, these modules lack allowance for concrete experience which would produce graduates that are confident in starting their own businesses as they are with regards to performing clinical duties.

Reflective observation is conscious reflection on a specific experience. Individuals must take a step back and reflect on what has occurred, and ground their comprehension (Cheng, Hwang and Chen 2019: 5). This concept is developed in radiography with the intention of cultivating radiographers as excellent clinical practitioners as opposed to entrepreneurs.

Abstract conceptualisation is the process by which people make sense of what has happened, compare actual outcomes to desired goals, question what they already know, and develop new knowledge or theories to explain their observations (Lee and Kumar 2023: 437). This concept is relevant to the current study because the researcher intends to ask pertinent questions to close the gaps in practice.

Active experimentation entails the application of what students have learned in an exercise situation (Wijnen-Meijer *et al*. 2022: 4). This begins a new cycle of concrete experience. The researcher is adamant that universities need guidelines or a conceptual framework to ensure a balance between the development of good radiographers and the entrepreneurial spirit. This level of experiential learning theory may be pursued as a doctoral study.

2.4.3 Skills Development

The lack of appropriate skills and experiences limits the ability of graduates to start their own enterprises (Musariwa and Tinonetsana 2023: 1). Many of them want to get experience by working for established corporations, whereas a far smaller proportion may opt to work for smaller organisations. EE in HEI’s can be customized to address local market needs and opportunities, offering a structured program that progressively develops students' entrepreneurial skills and capacities (Aransyah, Fourqoniah and Riani 2023: 197). Formal education can effectively “cover the gap” for those whose lives have lacked more informal entrepreneurial learning opportunities. A well-rounded education can also assist those who do not consider themselves to be “entrepreneurs” to think and conduct themselves more

entrepreneurially and eventually explore business ownership as a career option (Mzimela 2023: 3).

2.4.4 Module Content

Shambare (2013: 452) argues that course content in education is most beneficial when it aligns with the country's economic realities. Therefore, the curriculum should significantly contribute to the development and training of entrepreneurs since South Africa has an unemployment problem. Ideally, students should acquire enough knowledge and skills to create a solid business plan by graduation.

Unfortunately, the curricula in HEI's often fall short in substance and effectiveness, failing to achieve desired outcomes. Many entrepreneurship graduates end up seeking employment rather than creating jobs (Naong 2019: 9).

2.5 THE IMPACT OF RADIOGRAPHY EDUCATION ON ENTREPRENEURSHIP: AN INTERNATIONAL PERSPECTIVE

It is posited that the content and quality of radiography training and education provided at the tertiary level influences the level of entrepreneurial radiography practice. This study aimed to determine whether valuable entrepreneurial skills were adequately covered in the current curriculum offered by a UoT in the eThekwini district of KZN. The ultimate goal was to provide graduates with the opportunity to reflect on whether they had received relevant skills and knowledge to enhance their future entrepreneurial potential.

Gwaambuka (2019 para. 1 line 2) reports that the African continent has the highest entrepreneurship rate but also the highest discontinuance rate (Gwaambuka 2019 para. 3 line 1-2). In terms of entrepreneurial opportunities, Europe ranks first, with countries such as Sweden, Germany, and Estonia ranking highly. Cowling (2013: 90), on the other hand, conducted a study on behalf of the International Society of

Radiographers and Radiologic Technologists (ISRRT), and found that radiographers were educated at Bachelor's level among 94% of responding institutions based in Europe, Africa, America and Asia.

The importance of entrepreneurship varied greatly between institutions. McNulty, England, and Shanahan (2021: 1050) conducted a study to provide a more global perspective on trends in radiography education. According to one of the study's findings, the European model of radiography education generally provides a qualification with multiple areas of specialisation, namely diagnostic radiography, radiation therapy, and/or nuclear medicine. However, from an international perspective, the most common model of radiography education is to provide a qualification with a single area of specialisation, with diagnostic radiography being the most common specialisation area (McNulty, England and Shanahan 2021: 1050). It is noted that not all combined programmes of study provided graduates with the ability to begin independent practice in their area or areas of expertise right away. This factor may adversely impact on entrepreneurship.

This study targeted recent graduates with the aim of establishing whether they felt equipped to take on entrepreneurial ventures. Having provided some international context, the next sub-section further narrows the discussion to a South African perspective.

2.6 THE IMPACT OF SOUTH AFRICAN RADIOGRAPHY EDUCATION ON ENTREPRENEURSHIP

In South Africa, radiographers generally find employment in public and private healthcare institutions. As a developing country, the state faces tremendous developmental issues, particularly in terms of job creation for its youth, who have the greatest unemployment rate of any age group (South Africa, Department of Statistics 2021: 14; Cloete 2015: 513). As a result, both the private and public sectors view the approach of developing and sustaining a strong group of

entrepreneurs as a prospect to reviving South Africa's economic challenges. In this regard, EE in higher education is critical. Nonetheless, preparing students or graduates to become entrepreneurs remains a challenge (Price and Ronnie 2021: 1).

This raises concerns regarding the capacity of radiography education to provide students with the skills they need for entrepreneurial projects in the twenty-first century. Pedagogies, as well as teaching and learning methodologies, are needed to ensure that graduates are properly inducted into the profession and if needed, entrepreneurship (Thambura, Swindon and Amusa 2014: 1202).

EE for radiography students necessitates a thoughtful modification of module content, with the intent of promoting skills development (Okpaleke *et al*. 2022: 44). The deliberate act of incorporation of EE into the curriculum by HEI's (Farny *et al*. 2016: 514) may possibly serve as a means to drive the entrepreneurial culture among radiography graduates.

2.6.1 The history of radiography education in South Africa

Radiography education in South Africa is based on a western knowledge framework. This framework stems from the early years where the British Society of Radiographers was the first examining body. As a result, the education system was based on the British model (van de Venter and Engel-Hills 2022: 16). The South African Department of National Education took over training in 1963. The inaugural programme was a two-year national diploma in diagnostic radiography. In 1978, it became a three-year diploma. In several training centres in South Africa, radiotherapy and nuclear medicine were established as three-year diplomas (Dludla 2015: 9).

In the early years of radiography training and education in South Africa, specifically from 1945 to 1985 in KZN, the training was hospital-based (Dludla 2015: 2). This approach facilitated the alignment of theoretical knowledge with practical application as students divided their time between classroom instruction and hands-on skills development at clinical sites.

In 1987, radiography teaching and examinations were transferred to HEI's (Technikons), which later became UoT's in 1994 (Dludla 2015: 9). Diagnostic radiography was the primary focus of early education, followed by radiotherapy, nuclear medicine, and eventually ultrasound. The framework of the education programme has undergone major changes to be in its present form.

In 2014, radiography education and training in South Africa entered a new era when the Higher Education Qualifications Framework (HEQF) was replaced with the Higher Education Qualifications Sub-Framework (HEQSF) (van de Venter and Engel-Hills 2022: 17). The introduction of the HEQSF led to the replacement of the national diploma and BTech degree with four-year professional bachelor's degrees. Furthermore, the standardised national curriculum for all institutions did not align with the new HEQSF, therefore each HEI offering radiography related programmes is now responsible for the development of its own curriculum (van de Venter and Engel-Hills 2022: 17). In driving an entrepreneurial culture amongst radiographers, it may be imperative for respective HEI's to modify their module content in line with that which emphasises EE.

The first four-year professional Bachelor's degrees were offered by the Cape Peninsula University of Technology (CPUT) and the Central University of Technology (CUT) (Friedrich-Nel and Isaacs 2018: 5). CUT provided a Bachelor of Radiography in Diagnostics degree, while CPUT offered a Bachelor of Science (BSc) degree in diagnostic radiography, ultrasound, nuclear medicine, and radiation therapy (Friedrich-Nel and Isaacs 2018: 5). The fourth-year students'

maturity, as well as their graduate traits and additional skills, were noted by the lecturers at CUT (Friedrich-Nel and Isaacs 2018: 5). The extra year of study provided opportunities for them to get experience in a variety of teaching and learning settings, allowing them to demonstrate their professional knowledge and skills such as research, entrepreneurship, and community engagement.

The South African Department of Higher Education and Training (DHET) introduced the Entrepreneurship Development in Higher Education (EDHE) Programme 2018-2020, which has allowed it to work with educational institutions to develop EE nationally in recent years (South Africa, Department of Higher Education and Training 2024 para. 2 line 1-3). The EDHE has three goals: mobilise students to start businesses, support educators in transferring entrepreneurial skills, and establish entrepreneurial institutions at universities so that they can start their own businesses (South Africa, Department of Higher Education and Training 2024 para. 2 line 1-3). As a result, the role of tertiary institutions in EE in South Africa is both acknowledged and under consideration.

2.6.2 The current state of radiography education in South Africa

In comparison to prior qualifications, the new degree programme features more theoretical and research-oriented components (van de Venter and Engel-Hills 2022: 17). Literature suggests the need to reform current pedagogies and teaching strategies to bridge the gap between traditional and modern practices. Such reforms aim to improve the integration and application of theoretical knowledge in practical settings, encourage critical reflection, and implement innovative teaching methods (Dludla 2015: 4).

Part of the curriculum reform needed includes the inclusion of skills that students need to establish businesses. This is more so in developing countries such as South Africa where unemployment is rife. As a result, most universities include entrepreneurship/business studies as part of the required modules for a

radiography degree (Neck and Corbett 2018: 10). However, this course is often offered as an elective module.

If the decision is left to the students to take entrepreneurial courses, the success of entrepreneurship modules is constrained as not every student may be interested since their core discipline is radiography (Tengeh, Iwu and Nchu 2015: 114). The very nature of an elective module is that it is an optional course, typically brief, and chosen based on the student's personal interests (Khilnani and Thaddanee 2022: 1). This means if a small number of students have an interest in entrepreneurship, then only a fraction of graduates will possess the skills necessary to operate their own practices.

It is understood that institutions are confined by the number of credits when designing their curricular as credit values for each module relate to the time it will take to complete the module and this in turn relates to how long a student can take to complete a qualification (South Africa, Department of Higher Education and Training 2014: 6). Academic departments also have to comply with other requirements of the HEQSF and universities, such as the inclusion of research and general education modules. Each academic department must balance these requirements with its desire to develop entrepreneurship among its graduates. This can be done in a number of innovative ways including the offering of other postgraduate qualifications such as the Advanced Diploma or Postgraduate diploma as prescribed by the HEQSF (van de Venter and Engel-Hills 2022: 17).

Mbambo (2012: 18) conducted a study on the “Perceptions and Experiences of Radiographers regarding Professional Development through Entrepreneurship in Gauteng”. Although this study investigated why radiographers are reluctant to open private practices, it sought to determine whether radiographers’ reluctance to establish private enterprises is a result of their perceived or acknowledged lack of education and training in entrepreneurship and business management.

Consequently, despite the similarities between the two studies, it was anticipated that the current study would produce different results as the impact of the curriculum may differ between KZN and Gauteng. More so, the current qualification is slightly different in comparison to the qualification attainable when Mbambo's study was conducted.

In Mbambo's study (2012: 48), he found that the students who studied at the University of Johannesburg (UJ) felt inadequately trained for entrepreneurship. Participants in the study stated that they lacked management skills and business knowledge. The study also found that the radiography curriculum failed to prepare radiographers to oversee and run their own private practices. There was a general consensus that radiography education equips graduates for a clinical and not a business environment which requires knowledge of business principles.

While the results of Mbambo's study may not apply to the present curriculum which has seen changes since 2012, they highlighted that clinical education on its own cannot prepare graduates to be entrepreneurs. At present, graduates are taught to exhibit technical, clinical, and professional abilities in a clinical setting and to apply theoretical knowledge and perform as professional radiographers (Ismail, Hazell and Bhyat 2024: 46). However, graduates are not taught how to run clinical practices. Although clinical education in radiography education is important because radiography is a hands-on profession, it is equally important to equip graduates with entrepreneurial skills.

It is unsurprising then that EE in South Africa is regarded as an uncultivated subject (Price and Ronnie 2021: 2). A thorough literature evaluation of EE curriculum content and methodology in Africa indicated that EE courses in this region are similar to normal business courses, with content geared towards teaching students how to be effective workers rather than entrepreneurs (Zegeye and Singh 2019: 31). This is also the case in South Africa as a result of educators using antiquated,

teacher-centred methodologies and a lack of practical learning activities in the courses (Radipere 2012: 11015).

In Mbambo's study (2012: 48), participants expressed dissatisfaction with both undergraduate and postgraduate education. Both were found to be insufficient in equipping with business and entrepreneurial skills. Most of the modules offered were not "radiography specific" but simply based on the general pillars of management principles: planning, organising, leading and control.

Invariably, technology has a strong influence on radiography and advancements in the field are occurring at a rapid pace. As a result, technical advancements fluctuate at various rates between private and public organisations, as well as between rural and urban areas. Therefore, graduates must be equipped with adequate problem-solving and critical thinking skills if they are to succeed as entrepreneurs.

Entrepreneurship education presents a valuable solution by addressing this gap. Beyond merely teaching business theory, it emphasises the cultivation of practical abilities and soft skills, such as leadership and innovative problem-solving, which are increasingly vital in today's evolving workforce (Mahmudin 2023: 188). By focusing on these areas, entrepreneurship education equips students with a strong foundation to become adaptable, creative, and capable leaders.

Pieterse, Lawrence, and Friedrich-Nel (2014: 33) looked into the problem-solving ability of third year radiography students at a South African university. Their findings revealed that students had relatively limited problem-solving abilities. Price and Ronnie (2021: 2) focused on EE in a South African context and found that lecturers face difficulties and obstacles in two areas: pedagogy and assessment. Pedagogies were used by the educators with two goals in mind: practical application and student involvement. The instructors were adamant that

the classes should give students hands-on experience with the day-to-day tasks that go into running a business. They sought to emphasise the "how" of entrepreneurship rather than the "what" in the EE classes.

Traditional exams were discovered to be inadequate for evaluating students by educators. Assessments needed to evaluate both the students' comprehension of theoretical concepts and their practical use of skills and tools in order to accomplish the objectives of their EE courses. It was difficult for the educators to assess the latter while balancing departmental evaluation criteria and their own academic ambitions. Similarly, a study conducted in Botswana on entrepreneurial development by Themba and Josiah (2015: 17) revealed that designing EE courses around the student profile can be as much about acknowledging their own formal education and training as it is about identifying and supporting individuals with entrepreneurial characteristics. Therefore, learning activities and course content at South African universities should also reflect the local entrepreneurship environment as well as students' shared experiences and backgrounds.

2.7 THE ADVANTAGES OF ENTREPRENEURSHIP

Every successful entrepreneur benefits not only himself or herself, but the entire district, region, or country. According to Ugwu (2018: 32), the following are some of the advantages of entrepreneurial activities:

- The potential for massive personal financial gain;
- Self-employment (which provides greater job satisfaction and workforce flexibility);
- It offers employment for others, often in higher-paying positions;
- Growth of more privately-owned businesses, particularly in rural areas or regions vulnerable to economic changes such as globalisation effects;
- Increased economic growth and income generation;
- Increased availability of goods and services;

- It promotes healthy competition among entrepreneurs, resulting in higher quality service delivery;
- It encourages the use of modern technology in small-scale manufacturing to increase productivity;
- It encourages more research or studies into and the development of modern machines and equipment for domestic use;
- It fosters entrepreneurial qualities and attitudes among potential entrepreneurs in order to effect significant change in rural areas;
- Emancipation from reliance on job offers from others;
- The ability to “achieve great things” – it is thought that the possibilities of entrepreneurship are near limitless as values and objectives are more flexibly determined;
- It facilitates the decrease in the informal economy; and
- A better domestic entrepreneurship climate may deter talent emigration.

2.8 THE FACTORS INFLUENCING RADIOGRAPHERS’ ATTITUDES TOWARDS ENTREPRENEURSHIP

2.8.1 Individual characteristics

The individual characteristics of an entrepreneur concentrate on the impact of resources on entrepreneurial firm performance, specifically the level of education, occupation of parents, age, managerial skills, previous entrepreneurial experience, and industry experience levels. van der Zwan *et al*. (2016: 289) submit that the age and years of formal education has been shown to correlate positively with entrepreneurs’ business performance. Therefore, radiographers with less education might encounter limitations that hinder their business efforts. This is because there is a clear correlation between EE and the enhancement of self-efficacy and the cultivation of entrepreneurial ambitions (Osman, Emole and Onu 2023: 93).

From an environmental standpoint, family influence, particularly parental influence, has been identified as a predictor of small business career interest. Family members, particularly parents, play an important role in establishing an individual's desirability and credibility for entrepreneurial action. The presence of a parent entrepreneurial role model (Chlosta *et al*. 2012: 122) correlates positively to an individual's business performance. Individuals with an entrepreneurial role model are perceived to be high performers, as opposed to those without entrepreneurial role models.

2.8.2 Goals and motivations

A growing number of academics opine that the motivation of the entrepreneur influences the growth of a business, at least to a significant degree (Cooney 2012: 5; Nyang'au, Mukulu and Mung'atu 2014: 123). Achievement, independence, and locus of control (pull factors) have received significant research attention for their influence on business start-ups, but less attention has been paid to their relationship to business performance. Much has also been written on the identifying characteristics and personality traits of prospective entrepreneurs (Morgan *et al*. 2015: 1). Often prospective entrepreneurs who are drawn into establishing their businesses are more profitable and have a higher profit margin than those that simply "take a chance" at entrepreneurship.

Furthermore, Ugwu (2018: 19) discovered that individual motivations and founder goals are related to performance in entrepreneurial-owned businesses, where opportunity motivation was associated with survival and independence was associated with "no growth". As a result, motivation is strongly related to performance and has the potential to be a significant explanatory variable for firm performance.

2.8.3 Entrepreneurial orientation

In terms of acquiring the resources an entrepreneur needs to build and grow his or her business, the term “entrepreneurial” is frequently associated with being venturesome or creative. The entrepreneur is characterized primarily by his or her innovative behaviour and creativity (Dogan 2015: 1289). Entrepreneurial orientation, such as innovativeness and risk taking, has been found to determine an aspiring radiography entrepreneur’s success in his or her business. Innovativeness enables prospective entrepreneurs to venture into new things, such as technology, products, and markets, whereas risk taking is required if an entrepreneur wishes to enter relatively large-scale businesses. According to Dogan (2015: 1292), taking risks is actually encouraged by entrepreneurship culture.

2.8.4 Prior knowledge

Prior knowledge is an important aspect in recognising and developing an entrepreneurial opportunity. Prior knowledge of the market, industry, and potential customers, or in general, the possession of the prior information required to identify and value an opportunity, is important to stimulate pattern recognition and the ability to convert information into opportunities (Shepherd and Patzelt 2018: 8). Because of information obscurity, some people can identify opportunities while others cannot. Depending on one’s knowledge, any given entrepreneurial opportunity may not be obvious to all potential entrepreneurs. In addition, there are potential risks of litigations associated with radiography as a clinical career thus gaining some level of clinical experience prior to starting one’s own business would serve as an advantage.

There are three types of prior knowledge that have been accepted as relevant backgrounds for an aspiring entrepreneur (Shepherd and Patzelt 2018: 11). The first type of prior knowledge is fascination and fun, which describes an

entrepreneur's area or domain of special interest. The entrepreneur devotes a significant amount of time and effort to learning about this "hobby," which advances and deepens the entrepreneur's capability in this specific area, resulting in extensive knowledge about this topic of interest.

The second type of prior knowledge is varied business and work experience, which is knowledge gained over time while working in a specific position. This is classified as general business experience, functional experience, industry experience, and start-up experience (Shepherd and Patzelt 2018: 13). The job is generally not associated with fascination and fun, but rather as a result of rational choices. Age also plays a role, because the older a person is, the more changes he or she has experienced in varied business and work situations. Shepherd and Patzelt (2018: 13) argue that business and work experience is one of the most important background variables for the aspiring entrepreneur in establishing a new venture. The third type of 'prior knowledge' are the educational activities an entrepreneur has undertaken. Here, the education and training received by an entrepreneur is seen as the basis for enhancing his or her knowledge on varied business and work experience (Shepherd and Patzelt 2018: 14).

2.8.5 Persistence and perseverance

A study by Fong *et al*. (2019: 223) revealed that despite numerous incidents of failure, most entrepreneurs exhibit a high level of tenacity. The entrepreneur faces numerous challenges and obstacles that he/she must overcome, and as such, he or she must be consistent and persistent. The entrepreneur is required to take the necessary action to overcome an obstacle, make extra sacrifices to complete a task or job, and confront problems or difficult situations head on. According to Fong *et al*. (2019: 226), entrepreneurs should use their mistakes as learning opportunities to avoid experiencing failure again. Similarly, aspiring radiographers who anticipate operating their private practice will require attributes such as persistence and perseverance.

2.8.6 Opportunity seeking

A vast majority of people are uncomfortable with change and tend to avoid it. Entrepreneurs, on the other hand, display “alertness” by being able to identify and exploit new opportunities (Teece 2014: 22). To that end, the entrepreneur seeks, sees, and acts on business opportunities within the context of change and opportunity. The entrepreneur also takes advantage of opportunities to obtain finance, equipment, land, work, space, assistance, and human resources for the benefit of his or her enterprise. For diagnostic radiography, these resources are quite difficult to obtain due to the government legislation in place to reduce radiation exposure to the staff, patients and the public. In addition, huge capital is required to secure the highly expensive pieces of radiography equipment.

2.8.7 Tolerance and risk taking

An entrepreneur’s life is unstructured; there are no schedules or step-by-step processes to follow. This is because the entrepreneur, by nature, seeks out changes to exploit (Teece 2014: 22). It is stated that the best ways to invest resources are to embrace change and experiment with new things. It is important to note, however, that entrepreneurs do not take risks blindly, as the general public believes. This is because most of them are knowledgeable about what they do and make informed decisions based on their experience (Ugwu 2018: 23). Invariably, these two key features, tolerance and risk taking are critical facets that may influence a radiographer’s success after establishing a private practice.

2.8.8 Self-efficacy

According to Mookkiah and Prabu (2019: 1), self-efficacy refers to confidence in one’s own ability to complete a task. Individuals with a sense of personal efficacy initiate and persistently sustain performance in all aspects of human development. Thus, a person who believes he or she can succeed in business is more likely to

pursue a business career. Likewise, self-efficacy may be considered as a feature that may influence a radiographer's attitude towards running their private practice.

2.8.9 Creativity and innovation

Entrepreneurs need to ensure that they are inventive and creative (Finlay 2021 para. 1 line 1-2). Their success is usually due to their imaginative abilities which enable them to envision alternatives to the way others do things. Nonetheless, in entrepreneurship, creativity is combined with the ability to innovate; to take an idea and make it work in practice. Once an entrepreneurship project is completed, entrepreneurs seek new challenges because creativity and innovation are continuous processes requiring the constant improvement of ideas and solutions (Shah Bin Mazla *et al.* 2019: 213). Similarly, the extent of a radiographers' creativity and innovativeness may shape their attitude towards entrepreneurship.

2.9 BARRIERS TO ENTREPRENEURSHIP

A significant number of entrepreneurs, particularly those in small businesses, fail owing to a variety of issues and barriers. The failure to succeed is arguably the most significant barrier to entrepreneurship. According to Bushe (2019: 11), the following entrepreneurship impediments exist:

- Lack of people management skills;
- Lack of enterprise competitiveness;
- Lack of understanding business needs;
- Lack of a business strategy;
- Inadequate business planning;
- An inadequate business model;
- Ignoring competition;
- Unrealistic goals;
- Poor infrastructure.

Though the aforementioned entrepreneurial challenges may seem generic, they may be barriers to radiographers' who intend to run private practices. This highlights the importance of equipping radiography graduates with entrepreneurial educational training and skills.

2.10 SUMMARY OF THE CHAPTER

In this chapter, the researcher presented literature pertaining to various aspects of radiography and entrepreneurship. While studies on entrepreneurship have been conducted, a review of the literature revealed a dearth of studies on entrepreneurship in South African radiography education. This lack of literature is one of the reasons why the primary researcher decided to conduct the current study. In addition, although efforts were made to consider the most recent (five years) literature, insufficient information regarding this topic necessitated a limited consideration of older literature.

In addition, the primary researcher discussed the work of other researchers guided by subtopics such as the conceptualisation of entrepreneurship and its significance to society, understanding entrepreneurial processes, entrepreneurial learning, local and international perspectives of radiography education on entrepreneurship, advantages of entrepreneurship, and factors influencing radiographers' attitudes toward entrepreneurship. Chapter 3 explains the theoretical framework underlying the current study.

CHAPTER 3: THEORETICAL FRAMEWORK

3.1 INTRODUCTION

The theoretical framework is the foundation upon which research is built. If selected carefully, it sets the course of a research study and firmly entrenches the research in theoretical constructs. The theoretical framework's function has been compared to that of a map or navigator (Garvey and Jones 2021: 1). Indeed, the framework directs the researcher so that he or she does not veer away from the theoretical constructs. A theoretical framework's overarching goal is to "support the data, interpret the findings, and underlie the recommendations" (Grant and Osanloo 2014: 20). The framework also makes it simple for readers to determine the researcher's academic position and the underlying factors for the submissions and contentions made in a study.

The theoretical framework consists of a specific theory or theories about elements of human endeavour that can be useful in the analysis of events (Grant and Osanloo 2014: 13). Thus, it includes conceptual frameworks, structures and principles. Through the use of a theoretical framework, the researcher is able to contextualise formal theories into their study (van der Waldt 2017: 189). After obtaining permission (Appendix 8), Kolb's experiential learning cycle served as the theoretical framework for the current study. This theory was selected because it provides a comprehensive and versatile framework for understanding how individuals learn through experience, reflection, conceptualization, and experimentation. Since the overall aim of this study was to explore the entrepreneurial knowledge and skills acquired by radiographers during their training, Kolb's framework allowed the researcher to examine whether the participants have engaged in active experimentation with entrepreneurial concepts and whether they have had opportunities to reflect on and conceptualize these experiences.

The experiential learning cycle will be outlined briefly below. Furthermore, the researcher will explain how the framework influenced the choice for an appropriate research design and approach used in the current study.

3.2 KOLB'S EXPERIENTIAL LEARNING CYCLE

Kolb defines learning as a process that involves the transformation of experience into knowledge. Concrete experience (CE), reflective observation (RO), abstract conceptualisation (AC), and active experimentation (AE) are the four stages of this learning experience (Kolb and Kolb 2018: 9). This cycle is particularly relevant in educational contexts where practical skills and reflective practice are critical, such as in radiography.

The first stage consists of direct CE. Concrete experience involves highly contextualized, first-hand engagement where students participate directly in genuine, real-world scenarios (Morris 2020: 12). Since Kolb's theory emphasizes the importance of integrating real-world experiences into the learning process, the researcher was able to explore whether the curriculum provides students with concrete experiences and opportunities for reflective observation regarding entrepreneurship and business skills. This is in line with the first objective of this study to determine the extent to which entrepreneurial and business skills have been incorporated into the modules offered by a UoT in the eThekwini district's current radiography curriculum.

The researcher's role at this stage in his or her work with participants is to introduce participants to the problem in an appropriate manner, establish goals and principles of work regarding the task, and assist them in identifying their roles (Wach-Kakolewicz 2016: 16). Participants should draw on their prior knowledge, skills, and experiences when faced with a problem situation. Educators can also play an important role in guiding learners through the process by structuring it, encouraging them to think deeply, and guiding them through the questioning process (Bell 2019: 4).

Since they were previously exposed to the curriculum, the participants are in a position to reflect on the skills that they received during their studies. Furthermore, as former students, they are in the best position to share their experiences.

During the RO phase, participants examine concrete experiences from their past learning experiences or those that occurred during class. The key component of this stage is reflection on action (Wach-Kakolewicz 2016: 17). Participants examine what happened, interpret it in light of prior knowledge, and try to understand it. The researcher's role during this stage is to encourage participants to reflect deeply by asking questions that prompt them to share their observations, insights, and opinions (Wach-Kakolewicz 2016: 17).

This reflection stage is critical because it supports learning and higher-order thinking abilities, professional practise growth, and the facilitation of structured learning through experience (Bell 2019: 4). In this study, participants will be asked open-ended questions designed to elicit their perspectives on the adequacy of modern radiography training for entrepreneurial success and to provide insight into the learning they received during their studies. The questions are designed to determine if the curriculum sufficiently prepared students for entrepreneurship. At this stage, participants will be invited to discuss their entrepreneurial experiences in order to determine the variety of factors that influence the success or failure of entrepreneurial ventures and the relationship between these factors and the radiography training received at tertiary institutions.

The third stage is AC. Participants make generalisations, draw conclusions, formulate general directives, and discover mechanisms during this phase (Wach-Kakolewicz 2016: 17). The final stage is AE, which entails putting theory and specific skills into practise. While there is no direct implementation phase in the current study, it leverages the reflective and planning aspects of AE to gain critical insights. This approach ensured that the study effectively addressed its aim of exploring and improving the radiography curriculum to better prepare students for entrepreneurial success. It should be noted that AE also refers to testing drawn conclusions in new pedagogical situations (Močinić, Tatković and Tatković 2020:

6). The interview schedule employed in this study will consist of items that explore the application of knowledge acquired during radiography training in a new pedagogical situation – formal employment.

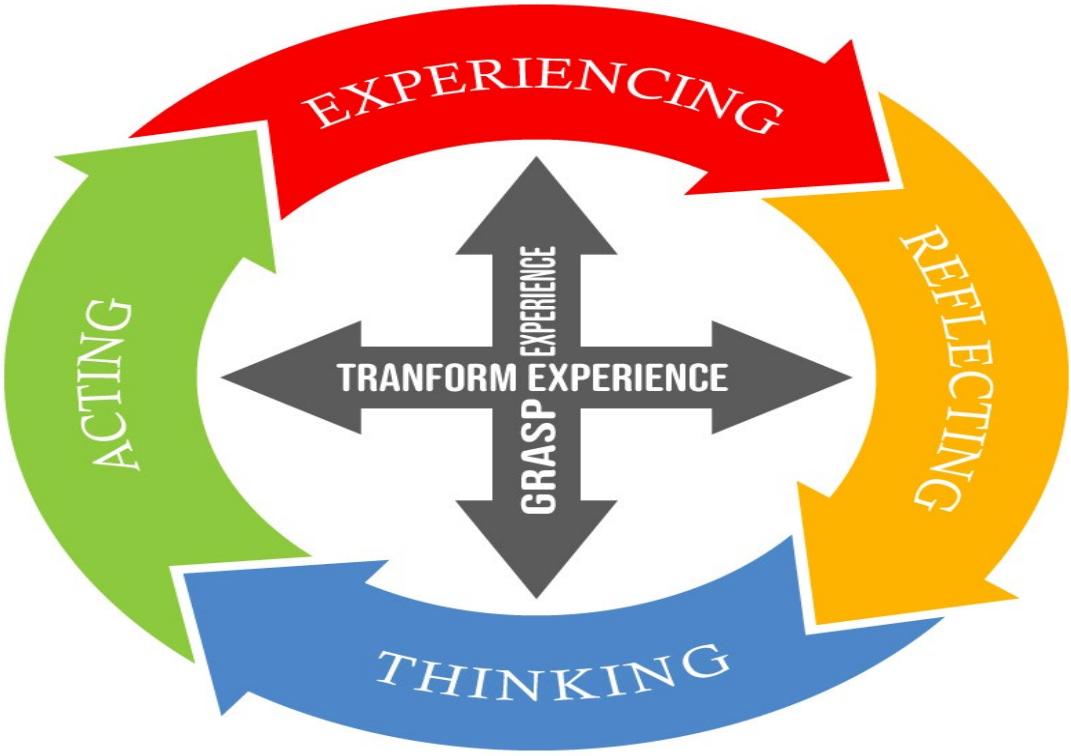

Figure 3.1: Kolb's experiential learning cycle, adopted from Kolb and Kolb (2021: 7)

Figure 3.1 displays the various forms of experience acquisition as well as two dialectical processes of experience transformation, RO and AE. Concrete experiences, in a nutshell, serve as the foundation for observations and reflections. These are taken in and reduced into abstract concepts from which new action implications can be created (Kolb and Kolb 2018: 11). These implications can be evaluated actively and utilised to guide the creation of new experiences. Hence, learning is described as a constant process of reacting to a wide range of personal and environmental demands generated by the interaction of experience, concepts, reflection, and action.

Since the opinions of the participants are an important component of this study, the researcher will rely on the constructivism theory (Mogashoa 2014: 51). This is a knowledge theory which claims that humans construct knowledge and meaning through interactions between their experiences and ideas. Assudani and Kilbourne (2015: 65) argue that “constructivist learning is one of the stepping stones to developing an entrepreneurial mind”. Hein (2007: 1) defines constructivism as the notion that people build their own new insights or knowledge by interacting with what they already know and believe, as well as the theories, occurrences, and acts with which they come into touch. This hypothesis is best suited for the current study since it will help determine what graduates are taught about entrepreneurship, their experiences and how they feel about entrepreneurship as a potential career path.

Furthermore, constructivism is relevant to this study since the researcher intends to discover how students learn about entrepreneurship and how lecturers convey this knowledge (Mogashoa 2014: 52). Constructivism views the learner as an active agent in the process of acquiring knowledge (Olusegun 2015: 66). This factor distinguishes constructivism from the other theories of learning as it stems from the assumption that knowledge cannot exist independent of the learner, rather it is constructed in the learner’s mind depending on his various experiences (Kouicem and Nachoua 2016: 65).

Various theorists have shaped constructivism over the years. The two most eminent are Piaget who advances “cognitive constructivism” and Vygotsky, a proponent of “sociocultural constructivism”. The distinction between these two forms of constructivism lies in their justification for the way that knowledge is constructed. On the one hand, Piaget argues that knowledge is produced in the learner’s mind through the organisation of experiences and cognitive structures while the basis of Vygotsky’s theory is that the development of the individual’s cognition is based first on social interaction (Kouicem and Nachoua 2016: 68).

Although both theorists posit valid arguments, the researcher had to make an appropriate selection while considering the guiding principles of the study and, situating the problem in relation to the theoretical framework. Furthermore, the aim

and purpose of the study had to be consistent with the assertions promulgated by the theorists of the selected theory (Kouicem and Nachoua 2016: 70). Since Piaget's Constructivist Learning Theory has had a significant impact on learning theories and teaching practises (Olusegun 2015: 67), the recommendations for changing radiography education will be made through the lens of this theory.

Piaget's theory also aligns with the problem statement because the current curriculum on radiography education is primarily content driven. Although lecture-based education is a vital component of the entrepreneurship curriculum, the training of future entrepreneurs requires interactive and action-orientated approaches (Bell 2019: 5). To grasp the essence of constructivism, one must understand the importance of allowing learners to connect their own experiences to new knowledge (Brau 2020: 20). In this learning process, learners are encouraged to contemplate the information presented and build their own interpretations. After constructing their interpretations, learners are expected to reflect on the new knowledge. Given the principles of constructivism, instructors should adopt a more interactive, hands-on approach rather than relying on traditional lecture methods (Brau 2020: 20). Furthermore, the classroom environment should support individual thinking and continually challenge learners.

If the curriculum is to promote entrepreneurship amongst graduates, then it needs to consider a process driven pedagogy with an open learning process (Lobler 2006: 20). In other words, tertiary institutions need to create a practical learning environment as entrepreneurs cannot always rely on 'roadmaps' from theories and entrepreneurship textbooks. This is precisely what is advanced by the constructivism theory; knowledge is best acquired through experience. Similarly, entrepreneurial skills such as good decision making, leadership and management come from experience.

The entrepreneurial environment is constantly changing; therefore, graduates need to create their own "roadmaps" as they explore unfamiliar territory. Many questions concerning where and how to lead the venture can only be answered by past experiences (Lobler 2006: 20).

3.3 SUMMARY OF THE CHAPTER

This chapter has emphasised the significance of theoretical frameworks as directing instruments in research studies. In the absence of a theoretical framework, the researcher will struggle to produce effective research results and direction for the research inquiry. This study's theoretical framework will aid the reader in comprehending the researcher's academic stance and the factors underlying the claims made in this study. The experiential learning cycle developed by Kolb has been chosen as the theoretical foundation for the proposed study. This chapter elaborated on the four stages of this framework: concrete experience (CE), reflective observation (RO), abstract conceptualisation (AC), and active experimentation (AE).

Since the researcher wishes to determine how students learn about entrepreneurship and how lecturers impart this knowledge, the constructivism theory will guide the research methodology and data collection in this study. This chapter highlighted how constructivism is especially applicable to the study of entrepreneurship. Because constructivism emphasises learning through experience, it can guide an investigation into the experiences of radiography graduates who are pursuing or contemplating entrepreneurship based on their post-secondary education. Due to its impact on learning theories and teaching practises, it was argued that Piaget's Constructivist Learning Theory stands out as more appropriate than other constructivism theories. This theory will enable the researcher to highlight the experiences of graduates, which will ultimately inform the findings and recommendations made at the conclusion of this study by placing the learner as an active agent in the process. Chapter 4 describes the research methodology and design of the study.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

In the previous chapter, the theoretical framework guiding this study was laid out in more detail. This chapter provides a discussion of the research design and methodology that was employed in this study. Novikov and Novikov (2013: 13) state that a methodology is "the theory of organisation of an activity". For the purpose of this organisation, a number of aspects such as design, setting, sample, data collection and analysis techniques are seen as interrelated and not just a stepwise approach (Busetto, Wick and Gumbinger 2020: 2). Essentially, the research methodology involves a logical collection of methods that complement each other to deliver data and findings that reflect the research questions and research purpose.

The aim of the study was to explore the entrepreneurial knowledge of radiographers (diagnostic radiographers and ultra-sonographers) and make recommendations on how to improve entrepreneurship in radiography education. Therefore, the researcher chose to employ a qualitative approach using semi-structured interviews. The results of this study were then derived using an interpretivist research design in alignment with the objectives set out in Chapter 1.

4.2 RESEARCH PARADIGM

The term 'paradigm' is used to describe a conceptual framework shared by a community of scientists to provide them with a convenient model for investigating challenges and finding solutions (Antwi and Hamza 2015: 218). Kivunja and Kuyini (2017: 29) describe a paradigm as a fundamental set of values or worldview that governs research action or an investigation. It incorporates basic assumptions, major issues, and models. Similarly, Rehman and Alharthi (2016: 51) defined a paradigm as a "basic belief system and theoretical framework with assumptions about ontology, epistemology,

methodology and methods". In other words, a research paradigm offers logical frameworks for the development of theories (Kankam 2019: 85).

The present study was interpretive, with the researcher's opinions and sentiments about the world and how it should be investigated guiding the research. Therefore, this study relied on the interpretivist paradigm. The motivation for employing this research paradigm is that the core goal of interpretivism is to comprehend the subjective realm of human experience (Kivunja and Kuyini 2017: 33). The central assumption here is that reality is socially produced. This method attempted to "get inside the heads of the subjects being studied", in order to comprehend and interpret what the subject was thinking or the interpretation he/she was making of the situation (Kivunja and Kuyini 2017: 34).

According to Patel (2015 para. 1 line 1-3), research paradigms are characterised by their ontology, epistemology, methodology and axiology. All these factors influenced the selection of the paradigm in the current study. Dudovskiy (2019 para. 1 line 2) defines ontology as the nature of reality and a belief system that reflects a person's understanding about what establishes a fact. Using the interpretivism paradigm, the researcher's approach was informed by the belief that the world is complex and constructed, interpreted, and experienced by people in their interactions with each other and with a wider social system. The present study was premised on the belief that radiography graduates from a UoT in the eThekwini district are not equipped to establish themselves as entrepreneurs.

4.2.1 Epistemology

Epistemology focuses on the basic belief about knowledge (Aliyu *et al*. 2015: 3). An interpretivist approach requires us to view knowledge as stemming not only from observable phenomena, but also subjective beliefs, values, reasons, and understandings. In other words, knowledge is constructed. Therefore, the

researcher examined various factors in order to understand a phenomenon because theory is shaped by social and cultural contexts.

4.2.2 Research Methodology

Research methodology refers to the systematic way the researcher goes about finding out whatever he/she believes can be known (Aliyu *et al*. 2015: 3). It consists of the approach and instruments used to select a research technique. When the interpretivist approach is employed, the researcher tries to capture "insider" knowledge through unstructured observation and open interviewing. Generally, field research would be conducted in natural settings to collect substantial situational information (Aliyu *et al*. 2015: 5). As indicated in the previous section, the qualitative approach was selected for the collection of data while interpretivism guided the results analysis.

4.2.3 Axiology

Finally, Dudovskiy (2019 para. 2 line 1) defines axiology as the general aim of the research and the assessment of the role of the researcher's own value of the research process. The overall objective or aim of this study was to explore radiographers' entrepreneurial knowledge and make recommendations on how to improve entrepreneurship in radiography education and the role of the researcher was to guide the whole study in a transparent and ethical manner.

4.3 RESEARCH DESIGN

Researchers use the phrase "research design" in a variety of contexts. It is also known as a masterplan, a blueprint, or a structure for the implementation of research tasks and activities (Dannels 2018: 1). In simple terms, the research design is a strategy of the methods and procedures that researchers will use to collect and analyse the data required. The research design also includes specific objectives developed from the research, defines the information sources from which data will be gathered, the type of data, and design techniques.

4.3.1 Qualitative research design

Qualitative data enables our understanding and shapes our inquiry into what is acceptable and unacceptable on a primary level (Wolff *et al*. 2018 para. 1 line 1-3). Qualitative researchers have an interest in understanding how people make sense of their world and the experiences they have in the world (Merriam and Grenier 2018: 13). Furthermore, qualitative research yields organic results by gathering a plethora of data in a natural setting free of manipulation. Because the nature of knowledge is characterised and classified by purpose and design, the benefits of employing qualitative data can best be appreciated by looking at the underlying philosophical perspectives, particularly from an epistemological perspective.

From an epistemological perspective, qualitative research aligns with the goal of understanding the nature of knowledge as it is experienced by individuals. By focusing on how knowledge is constructed and interpreted by the graduates, this study will reveal how well the curriculum serves its purpose from their point of view. The emphasis on qualitative inquiry thus provides a richer, more nuanced understanding of the effectiveness of entrepreneurship education in the radiography field, allowing the researcher to make informed recommendations for future curriculum development.

4.3.2 Exploratory research design

Most academics divide research designs into two categories: exploratory and conclusive. The term "exploratory research design" refers to the process of investigating a phenomenon rather than simply observing and recording incidents of the phenomenon (Nattrass 2020: 4). The exploratory research design focuses on obtaining secondary or primary data in an unstructured format and interpreting it using informal processes. In-depth interviews, focus groups, and projective approaches are examples of exploratory research designs (Roller and Lavrakas 2015: vii).

4.3.3 Descriptive and contextual research design

A descriptive research design is used to highlight the characteristics of relevant phenomena (Bradshaw, Atkinson and Doody 2017: 1). Often the descriptive design is used together with contextual research. Contextual research is defined as findings that are valid within the time, space and value context of the investigation. This study concentrated on the experiences of radiography graduates in the eThekwini region and is limited to one district of KZN.
The data was collected from eight hospitals, all involved with diagnostic imaging: two public hospitals and six private hospitals within the eThekwini district of KZN.

For these reasons, the selected qualitative research design was exploratory and contextual, allowing the researcher to use open-ended interview questions (Mudavanhu 2016: 211). Finally, this design was chosen for the study because it carried out the study in an inductive fashion which is necessary when an area of research has been mostly or unexamined by the scientific community (Rendle *et al*. 2019: 3).

4.4 STUDY SETTING

A research setting is an environment in which research is conducted and data is collected, thus it could be a hospital, clinic or community (Goyal 2013: 248). Qualitative researchers typically investigate subjects in their natural environments to understand or interpret phenomena based on the meanings that people attribute to them (Aspers and Corte 2019: 142). Participants may be in different areas or the same area, as long as they are able to provide contextual information about the aspect being studied. According to Creswell and Poth (2016: 299) researchers intentionally select sites for the purpose of obtaining the necessary and required information. Thus, it was the role of the researcher to select the setting or site of the study.

This research was carried out on diagnostic radiographers and ultra-sonographers who graduated in 2019 and 2020 and work in the eThekwini district of KZN. The eThekwini district was chosen based on its proximity to the UoT in which the graduates studied. A significant number of radiographers that trained at this institution are employed by provincial public and private institutions within the eThekwini district. The eThekwini district is the hub of radiography facilities in the KZN province, serving patients from the entire province as well as neighbouring provinces. The eThekwini district has five regional hospitals, two district hospitals, and two tertiary hospitals in the public sector. In addition, three community health centres in the district offer radiography services. On the other hand, there are approximately five private centres that offer radiography services. This means that the data was derived from real-world situations, such as natural, unaltered settings (Haradhan 2018: 7).

4.5 STUDY POPULATION

McLeod (2023 para. 1 line 2) states that a target population is the number of people from whom a sample could be drawn. Diagnostic radiographers and ultra-sonographers in public and private practices who graduated from the UoT of interest and were employed within the eThekwini district of KZN were this study's target group.

4.6 SAMPLING STRATEGY AND SAMPLE SIZE

A sampling plan or strategy is a formal outline that details the sampling method, sample size, and procedures for recruiting participants (Moser and Korstjens 2018: 10). This study relied on non-probability sampling and more specifically, purposive sampling. When a purposive sampling technique is employed, the researcher sets out to identify individuals of a population who possess or who are likely to possess certain characteristics or experiences related to the phenomenon of interest (Etikan, Musa and Alkassim 2016: 2). Only the radiographers who qualified in 2019 and 2020 were thus allowed to participate in the study.

Gumpili and Das (2022: 9) defines a sample size as the fraction of an entire population, selected from a larger ‘‘population’’ which encompasses the entire group of interest in a research question. In qualitative research, the sample size must be large enough to capture a comprehensive range of information necessary to unfold rich and new insights about the phenomenon under study (Sharma *et al.* 2024: 133). At the same time, it must be small enough to allow for a deep analysis of the qualitative data. The sample size must accurately represent the entire population because it is essential to ensure the validity and credibility of qualitative research (Sharma *et al.* 2024: 133).

There were 43 and 41 radiography graduates in 2019 and 2020 respectively and 64 of them were working in the eThekwini district during the time of data collection. The sample size included a minimum of 16 radiographers (10 diagnostic radiographers and 6 ultra-sonographers), however only 15 responses were received and the maximum would be determined by data saturation. Data saturation is defined as a point during data collection at which there is no new information emerging (Saunders *et al*. 2017: 1894). Furthermore, the researcher interviewed two more participants beyond data saturation to ensure that there was indeed no new information emerging.

In order to delineate a target population, the researcher must specify a set of inclusion or exclusion criteria (Robinson 2014: 2). The inclusion criteria must specify an attribute that participants must possess to qualify for the study. In the present study, radiographers were qualified and registered within a particular district. The exclusion criteria must specify attributes that disqualify a potential participant from the study (Robinson 2014: 23). For instance, radiographers working outside the setting of this study were excluded by default. The following inclusion and exclusion criteria were used to determine participants in the current study:

4.6.1 Inclusion criteria

- Qualified diagnostic radiographers and ultra-sonographers who graduated with the Bachelor of Health Science (BHSc) in Radiography at a UoT in the eThekwini district in 2019 and 2020.
- Registered with the HPCSA and working within the eThekwini district.

4.6.2 Exclusion criteria

- Diagnostic radiographers and ultra-sonographers who do not possess a BHSc in Radiography.
- Radiographers who did not graduate in 2019 and 2020.
- Radiographers who are not registered with the HPCSA.
- Community service and student radiographers.
- Nuclear Medicine and Radiotherapy radiographers.

4.7 THE RECRUITMENT PROCESS

According to Manohar *et al.* (2018: 1), recruitment is defined as the dialogue between an investigator and a potential participant prior to the initiation of the consent process. The recruitment process includes identifying, targeting, and enlisting potential participants, providing them with information about the study, and establishing their interest in participating. In determining the recruitment strategy for this study, several factors were considered, including identifying potential participants, establishing contact, and implementing screening based on the exclusion criteria. The researcher targeted radiographers who had graduated with a BHSc in 2019 and 2020 as potential participants. This was accomplished by contacting the heads of department at the selected hospitals and requesting them to encourage recent graduates within their departments to participate in the study. The graduates then voluntarily reached out to the researcher.

To refine the participant pool, the researcher screened the initial list of potential participants who had contacted him and excluded those residing outside the eThekwini region. This is because the study is focused on the experiences of

graduates from the DUT within this region. Additionally, the study focused exclusively on diagnostic radiographers and ultra-sonographers, ensuring that the participants had relevant experience and expertise aligned with the study's objectives. This targeted approach helped to ensured that the data collected would be specific, relevant, and reflective of the experiences and perspectives of radiographers practicing within the defined geographic and professional scope.

4.8 PRETESTING OF THE STUDY

Pretesting is a method used to ensure that questions function as intended and are understood by the individuals who are likely to respond to them (Hilton 2015: 21). The current study was pretested by conducting interviews with two participants (recent graduates) and their results were included in the final results. An interview was held with the participants to enquire on the clarity of questions and the use of the language. There was no need to make changes to the interview schedule as the participants cited no challenges with it.

4.9 DATA COLLECTION PROCESS

Grove, Gray and Burns (2015: 47) described data collection as the precise and systematic gathering of information relevant to the research objectives or questions of a proposed study. Most data collection methods can be used in both qualitative and quantitative research. The distinction is primarily due to the limitations imposed on a researcher's flexibility, structure, sequential order, depth, and freedom during the research process (Kumar 2011: 131). According to Kumar (2011: 131), quantitative methods support these constraints, whereas qualitative methods oppose them. The classification of a method into the quantitative or qualitative category depends upon answers to the following questions:

- What philosophical epistemology is underpinning the approach to research enquiry?
- How was the information collected? Was it through a structured or unstructured/flexible format of data collection?

- Were the questions or issues discussed during data collection predetermined or developed during data collection?
- How was the information gathered recorded? Was it in a descriptive, narrative, categorical, quantitative form or on a scale?
- How was the information analysed? Was it a descriptive, categorical or numerical analysis?
- How do you propose to communicate the findings? Do you want to write in a descriptive or analytical manner?

The method used to collect data in the current study was determined by the purpose of the study, the resources available, and the researcher's skills. Data was collected primarily through the interviews with the participants and supplemented with secondary data from other studies and government reports. The researcher made use of field notes to pen down queries from the interviews and research observations. No other sources were consulted.

Before the data collection commenced, full ethics clearance was granted by the Institutional Research Ethics Committee (IREC) of the Durban University of Technology (Appendix 1). Gatekeeper permissions were sought and approved by the eThekwini District Manager (Appendices 2a and 2b), the KZN Department of Health (Appendices 3a and 3b), and Hospital Managers (Appendices 4a, 4b, 4c, 4d, 4e and 4f). The interview process was conducted entirely online using Google Forms, with participants submitting written responses. As a result, there was no need for an independent moderator. The typical role of a moderator (Newcomer, Hatry and Wholey 2015: 492) involves facilitating in-depth exploration of opinions, eliciting reactions to new ideas, or conducting group brainstorming, this was not required given the nature of the online, individual format of the interviews.

Participants were thoroughly briefed on the purpose of the study and the measures taken to ensure confidentiality. They were provided with detailed information about the study's aims, procedures, and their rights as participants, which included their right to withdraw from the study at any time without penalty.

Once they had a clear understanding of all aspects of the study and felt comfortable with the information provided, they were asked to sign a consent form (Appendix 6) to formally agree to participate.

To facilitate the interviews, each participant was given a link to access the online interview platform. This platform was chosen because it is user-friendly and secure, ensuring that participants could complete the interview from the comfort of their own homes or preferred locations.

The online interviews were conducted according to a structured interview schedule, which guided the questions and ensured that each participant was asked consistent and relevant questions. This approach allowed for a systematic collection of data while maintaining flexibility to explore responses in depth. The interview schedule was developed to align with the study's objectives and to gather comprehensive insights into the participants' experiences and perspectives (Appendix 7). Thus, the following questions were asked:

Research question 1: What entrepreneurial and business skills are incorporated into modules offered by a University of Technology in the eThekwini district?

Probing questions

- Which modules do you consider to be essential components of entrepreneurship and were these modules part of your curriculum?
- What other modules should be incorporated into radiography curriculum to help students develop the entrepreneurial capacities.

Research question 2: Starting a business necessitates certain skills and characteristics. What entrepreneurial knowledge and skills did you acquire during radiography training?

Probing questions

- Do you think you were adequately equipped with entrepreneurial and workplace management skills during your undergraduate studies?

- In your opinion, what skills are necessary for one to succeed as an entrepreneur within the field of radiography?
- What challenges did you face in establishing your private practice?

Research question 3: What changes are necessary to the radiography curriculum for the development of entrepreneurs?

Probing questions

- What can academic institutions do to promote entrepreneurship amongst graduates?
- Do you consider any modules taught during radiography training redundant?
- Do you suggest incorporation of new modules to enhance entrepreneurship amongst graduates and what are these modules?

4.10 DATA COLLECTION TOOL

For the purposes of this study, primary data was collected using a semi-structured interview schedule addressed to the participants (Appendix 7). This semi-structured interview schedule allowed for both absolute and middle-ground answers to the questions posed by giving participants more flexibility when answering. Furthermore, probing which involves the use of questions or prompts that encourage participants to expand on their previous responses was used. This is evident from the questions listed above as well the participants' responses (Robinson 2023: 382). Probing is recognized in the literature as a crucial component of the research interview process because it helps elicit rich, detailed, and in-depth data (Robinson 2023: 382).

Attributes of bracketing were infused into the study, as a means of minimising potentially deleterious effects arising from preconceptions during the data collection process (Tufford and Newman 2010: 80). The interview schedule was divided into two major sections. Section A required participants' demographic information. Demographic information was requested from the participants

because Kolb's theory emphasizes the importance of the social context and its impact on learning (Schenck and Cruickshank 2015: 81).

Understanding the participants' demographic backgrounds helps to identify these external factors, which could have influenced their interest in entrepreneurship. By considering elements such as age, gender, socioeconomic status, and prior educational experiences, we can better understand how these factors shape their learning processes and entrepreneurial inclinations. It was highlighted earlier in this thesis that there is a correlation between the individual characteristics of an entrepreneur and entrepreneurial firm performance, specifically the level of education, occupation of parents, age, managerial skills, previous entrepreneurial experience, and industry experience levels.

Section B dealt with substantive questions designed to elicit responses relevant to the study's objectives. All questions were drafted in simple English sentences. A semi-structured interview schedule is one of the essential tools in conducting qualitative research (Kakilla 2021: 1). Multiple research models portray semi-structured interview schedules in critical qualitative research as essential tools for uncovering knowledge through interaction, conversations, and subjects from various life experiences. Furthermore, shared stories and life experiences about other topics are arbitrarily interpreted to expand knowledge across multiple platforms (Kakilla 2021: 1).

The interview schedule distributed in this study consisted of a set of questions, usually open-ended, that were arranged in a standardised interview sequence and administered to a fixed data sample in order to collect relevant information. The interview schedule was designed to elicit information directly from the research participants and was structured in a self-report form.

4.11 DATA ANALYSIS

In qualitative research, data analysis entails preparing and organising the data (i.e., text data as in transcripts or image data as in photographs) for analysis; reducing the data into themes through coding and condensation of the codes; and finally representing the data in figures, tables, or a discussion (Creswell and Poth 2016: 180).

The first stage of the analysis, known as open coding, entailed meticulously examining the content of the interview from multiple perspectives (Qureshi and U¨nlu 2020: 2). Once the core idea or phenomenon was identified, the identified concepts were classified based on their qualities. This occurred during the axial coding stage, where the relationships within the data in terms of context, consequences, interactions, and causality are examined (Qureshi and U¨nlu 2020: 2). For example, when reviewing the responses to the online interviews, if a participant independently mentioned three factors that affected graduates' adaptability to the professional environment, these items would be grouped into a single category based on their common characteristics. After the categories were chosen, they were given names that described their relationship to the underlying notion or phenomenon. In addition, the following steps were taken:

- The online interviews were reviewed at various intervals to avoid missing important components to the study (Asif and Rodrigues 2015: 281). This iterative review process involved multiple readings and cross-checking of the data to capture nuanced details and emerging themes.
- Pseudonyms were used to ensure anonymity and confidentiality among interviewees. This step was critical in protecting the identities of the participants and maintaining ethical standards. The researcher ensured that all personal identifiers were removed or masked in the transcripts, and any sensitive information was handled with utmost care to prevent potential breaches of confidentiality.
- The data was collected in a flexible manner using the thematic analysis method by analysing and reporting on the established themes (Castleberry and Nolen 2018: 808). Thematic analysis allowed the

researcher to identify and interpret patterns of meaning within the data, providing a detailed and nuanced understanding of the participants' experiences and viewpoints.

- In order to meet the study's objectives, the collected data was classified, measured, analysed, and interpreted. The researcher manually transcribed the data and used the inductive approach to categorize the data. This interpretation involved linking the findings to the broader context of radiography education and entrepreneurial training, providing a comprehensive understanding of the issues at hand.

Furthermore, a desktop review was conducted to determine whether the results of this study are consistent with existing literature.

4.12 TRUSTWORTHINESS

Polit and Beck (2014: 259) define trustworthiness as the level of confidence in the data, analysis, and methods used to ensure the quality of a study. As a result, credibility, dependability, confirmability, transferability, and authenticity were prioritised by the researcher. Furthermore, to ensure trustworthiness, a reliable research tool (semi-structured interview) was used which was pilot tested prior the actual data collection.

4.12.1 Credibility

Credibility refers to the truth of the data or the participant's perspectives, as well as the researcher's interpretation and representation of them (Cope 2014: 89). The credibility of the data in this study was enhanced through reflexivity, referential adequacy as well as prolonged engagement with data and triangulation (Korstjens and Moser 2018: 121). Besides the aforementioned measures used to ensure credibility, the researcher also invested sufficient time in collecting the data. The findings of the study were not shared with the participants as doing so prematurely would have influenced participants to alter their answers to align with or contradict the findings, which introduces bias into the research and undermines its credibility.

4.12.2 Dependability

Dependability refers to the stability of data over time and under different conditions (Stenfors, Kajamaa, and Bennett 2020: 598). High dependability means that the study findings can be replicated with similar participants under similar conditions, ensuring the reliability of the research process and descriptions (Cope 2014: 89). Furthermore, researchers should make certain that the research process is logical, traceable, and thoroughly documented. By providing clear and detailed records of the research process as done in this study, readers are better equipped to evaluate its dependability. This transparency allows for the assessment of the consistency and reliability of the research methods and findings (Nowell *et al*. 2017: 3).

4.12.3 Confirmability

Confirmability refers to objective reporting, or the degree to which other researchers can confirm precision, significance, or interpretation of data (Korstjens and Moser 2018: 121). This was achieved through peer debriefing where the researcher consulted his supervisors for feedback to validate his interpretation of the data (Ahmed 2024: 2).

Furthermore, the results were triangulated so that they would not be tainted by bias or prejudice from the researcher. To ensure triangulation, the researcher integrated many data sources to validate the findings of the study (Ahmed 2024: 2). Therefore, the results of this study were obtained through interpretations which emerged directly from the accumulated data. This is demonstrated by the inclusion of rich excerpts from participants depicting each emerging theme. These measures were deliberately enforced in order to obtain accurate and genuine responses from the participants.

4.12.4 Transferability

The ability to draw conclusions is referred to as transferability. It assumes that results can be generalised or externally validated (Abdalla *et al*. 2018: 92). A

qualitative study meets this criterion if the findings are meaningful to people who were not involved in the study and readers can relate the findings to their own experiences. The researcher provided sufficient information about the informants and the research context for the reader to evaluate the findings ability to be “fit” or transferable (Cope 2014: 89). The findings from this study were transferable to other settings similar to the one researched, and the researcher made certain that the setting was adequately described to enable a build-up for further research purposes.

4.12.5 Authenticity

Authenticity refers to the extent to which researchers present a variety of realities in a fair and faithful manner (Cope 2014: 89). Readers get a sense of the experience through participant excerpts when one reports in this descriptive style. The target population of this study was large enough to accommodate the lived experiences or realities of all affected radiographers within the eThekwini area and the data reflected this.

4.13 ETHICAL CONSIDERATIONS

Taquette and Borges da Matta Souza (2022: 2) explains that a researcher is accountable for the ethical integrity of the research. The researcher is expected to perform research competently, to handle resources honestly, to appreciate those who contributed to the research, to convey the results fairly, and to examine the influence of the research on the participants, both positively and adversely. Sanjari *et al*. (2014: 1) adds that researchers have the duty to maintain anonymity, confidentiality and ensure informed consent. Therefore, during the online interviews, the researcher upheld the participants’ rights to honesty, respect, non-discrimination, and confidentiality. Furthermore, the data was presented in a manner that was fair and did not have a detrimental effect on the participants.

During the data collection phase, the researcher ensured that the POPI Act (Protection of Personal Information Act) was adhered to. Section 17 and 18 of POPIA stipulate that responsible parties (researchers) must maintain a record of all processing of personal information. These provisions further provide that the data subject (participant) must be informed about why the information was collected, who collected it, where it is being held, their rights to access and delete/correct the data, and whether the data will be transferred to a third party during the processing. However, it is not necessary to inform the data subject of these details if their information is being processed solely for research purposes. Most of this information was relayed to the participants even though their information was collected for research purposes. Furthermore, to ensure protection of data, the researcher stored the data in a pass-worded hard drive, which is intended to be deleted five years after the completion of the study. This is also in line with an which requires the researcher to keep data secure and to maintain confidentiality and integrity (South Africa, Department of Justice 2013: 32).

The researcher gave adequate credit to the sources used in the research by citing them within the project's body. Prior to beginning the research process, the appropriate ethical clearance from the Institutional Research Ethics Committee (IREC) was obtained (Appendix 1) as well as permission from the eThekwini District Manager (Appendix 2a), Department of Health (Appendix 3a) and Hospital Managers (Appendices 4a, 4b and 4c, 4d, 4e and 4f).

The following rules were followed and communicated to the research participants during the data collection and analysis process:

4.13.1 Informed consent

Section 37 of the POPIA (Adams *et al*. 2021: 3) defines consent as any voluntary, specific and informed expression of will in terms of which permission is given for the processing of personal information. In line with this definition, the researcher gave a verbal description of the research study, its goal, the

researcher's details, and the ethical review process to the research participants as per Appendix 5. Following this explanation, the participants were then requested to sign the consent form (Appendix 6). On administration of the interview schedule (Appendices 7), participants were given the opportunity to seek clarification. All of the aforementioned measures were taken prior to the online interviews in order to ensure that the participants were aware of the entire process and how it could affect them. The researcher made certain that participants understood the interview schedule by emphasising the information on the consent form.

4.13.2 Confidentiality

The researcher made it clear that all data would be kept private throughout the study. The researcher made certain that the names and organisational information of the participants were not linked to any aspect of the research. The research participants' personal information as well as responses were kept strictly confidential. Only the primary researcher handled all data collected during the interviews and only he had access to the online interviews as these were kept in his pass-worded hard drive.

4.13.3 Anonymity

The anonymity of the research participants was protected through the use of pseudonyms, with the identity of the participants known only to the researcher. Furthermore, participants were permitted to revise their interview schedule responses at any time.

4.13.4 Research participation and withdrawal

The researcher made it clear to the research participants that if they are uncomfortable with any aspect of the online interview, they can withdraw at any time without any consequences or the need to provide further reasons to the researcher. This was done to ensure voluntary and consensual participation.

Should any participant have withdrawn, the information they provided would have been discarded.

4.13.5 Objectivity

To ensure objectivity throughout the study, the researcher maintained a neutral stance during the interview process, avoiding any bias towards potential outcomes. This impartial approach ensured that the results were based on evidence rather than personal opinions. When the researcher conducted the interviews, he strictly adhered to the institution's research ethics guidelines, with the support and oversight of supervisors. This adherence to ethical standards further reinforced the objectivity and integrity of the research findings (Wood and Kahts-kramer 2023: 15).

4.14 SUMMARY OF THE CHAPTER

This chapter highlighted that a semi-structured interview schedule was appropriate for evaluating the adequacy of radiography training provided at a UoT, based on the perspectives of recent graduates practicing in the eThekwini district. Additionally, the various pillars of trustworthiness, such as dependability, confidentiality, and credibility, were thoroughly discussed to ensure the robustness of the research. It is evident that the interview schedule underwent rigorous testing during its development and was deemed effective for measuring the constructs under investigation. Chapter 5 presents the data collected, as described in this chapter.

CHAPTER 5: PRESENTATION OF FINDINGS

5.1 INTRODUCTION

This chapter outlines the findings that were derived from a total of 15 participants from the eThekwini District. As indicated in the previous chapter, data was obtained with the aid of a semi-structured interview schedule. Thereafter, the researcher analysed the responses and arranged them into themes that addressed the research objectives of the study. The aim of the study was to explore the entrepreneurial knowledge of radiographers (diagnostic radiographers and ultra-sonographers) and make recommendations on how to improve entrepreneurship in radiography education. The research questions that were formulated for this study include the following:

- What entrepreneurial and business skills are incorporated into modules offered by a University of Technology in the eThekwini district?
- What entrepreneurial knowledge and skills are acquired by graduates during radiography training?
- What changes are necessary to the radiography curriculum for the development of entrepreneurs?

5.2 DEMOGRAPHICS OF THE PARTICIPANTS

The participants were asked to indicate their demographic details. The demographic details that were required were the hospital or healthcare centre where the participants worked, whether the hospital was private or public, the participant's age, race, gender, highest level of education and employment status. Table 5.1 illustrates the demographic details of the participants.

Table 5.1: The demographics of the participants of the study

P number	Hospital code	P Code	Gender	Race	Age	Highest degree or level of education you have completed	Public / Private sector	Current Employment Status
P1	C	C	Male	African	18-24	Bachelor's Degree	Private	Employed Full-time
P2	D	D	Female	Indian	18-24	Bachelor's Degree	Private	Employed Full-time
P3	F	ME	Female	Indian	25-39	Bachelor's Degree	Private	Employed Full-time
P4	F	ME	Female	Indian	18-24	Bachelor's Degree	Private	Employed Full-time
P5	B	KE	Female	Indian	25-39	Bachelor's Degree	Public	Employed Full-time
P6	H	H	Female	Indian	25-39	Bachelor's Degree	Private	Employed Full-time
P7	E	E	Female	Indian	18-24	Bachelor's Degree	Private	Employed Full-time
P8	A	I	Female	Indian	18-24	Bachelor's Degree	Public	Employed Full-time
P9	E	E	Female	Indian	18-24	Bachelor's Degree	Private	Employed Full-time
P10	G	CG	Female	Indian	18-24	Bachelor's Degree	Private	Employed Full-time
P11	C	C	Female	Indian	18-24	Bachelor's Degree	Private	Employed Full-time
P12	G	CG	Female	Indian	18-24	Bachelor's Degree	Private	Employed Full-time
P13	C	C	Female	Indian	18-24	Bachelor's Degree	Private	Employed Full-time
P14	G	CG	Female	Indian	18-24	Bachelor's Degree	Private	Employed Full-time
P15/16	E	E	Female	Indian	18-24	Bachelor's Degree	Private	Employed Full-time

Key : P1 = Participant 1, P2 = Participant 2 etc.

Table 5.1 above illustrates that the study had a sample size of 16 participants, however, 15 of the participants were part of this study (n=15). There was one male participant and 14 female participants. Table 5.1 further illustrates that there was one African participant and 14 Indian participants. Furthermore, there were 12 participants that were aged between 18-24 and three that were aged

25-39 years. All participants had a Bachelor's degree as their highest level of qualification. There were 13 participants that worked in private hospitals and only two that worked in public hospitals. All 15 participants were employed full-time.

The data was collected from two public hospitals and six private hospitals within the eThekwini district of KZN. Eight hospitals, all involved with diagnostic imaging were included. The researcher was able to gain access into all the chosen healthcare institutions. The healthcare institutions approached for this study, their classification, and the number of participants per hospital, are indicated in the Table below:

Table 5.2: Classification of healthcare centres from which data was collected

Healthcare Centre	Classification	Number of participants
Hospital A	PB	1
Hospital B	PB	1
Hospital C	PV	3
Hospital D	PV	1
Hospital E	PV	3
Hospital F	PV	2
Hospital G	PV	3
Hospital H	PV	1
Total		**15**

Key: PV (Private); PB (Public)

5.3 THEMES AND SUB-THEMES THAT EMERGED FROM DATA ANALYSIS

In this study, inductive reasoning was employed. Inductive reasoning is characterized by moving from specific observations to broader generalizations, whereas deductive reasoning starts with general principles and works towards specific conclusions (Woiceshyn and Daellenbach 2018: 188). Arguments based on experience or observation are best expressed inductively. In this study, the inductive approach allowed for the collection and analysis of participants' perspectives, which were then used to develop broader themes and generate a theory that connects these themes. The thematic analysis that was carried out by the researcher led to the formulation of these three themes:

- Incorporation of skills.
- Entrepreneurial knowledge and skills acquisition.
- Proposed changes to the curriculum.

The researcher consolidated these themes from the primary data and further derived sub-themes. Direct excerpts that were provided by the participants of the study were inserted to serve as evidence for the themes and sub-themes that were generated. A sample of an interview transcript is attached (Appendix 9). Table 5.3 outlines the themes and sub-themes of the study.

Table 5.3: The themes and sub-themes of the study

THEMES	SUB-THEMES
5.3.1 Incorporation of skills	5.3.1.1 Essential Entrepreneurial modules 5.3.1.2 Relevance of current entrepreneurial modules 5.3.1.3 Theory-practice gap in entrepreneurship teaching and learning
5.3.2 Entrepreneurial knowledge and skills acquisition	5.3.2.1 Fundamental skills for aspiring entrepreneurs 5.3.2.2 Current skills acquired in the curriculum
5.3.3 Proposed changes to the curriculum	5.3.3.1 Incorporation of entrepreneurial practical aspects 5.3.3.2 Restructuring Radiography training modules 5.3.3.3 Modules and skills recommended to promote entrepreneurship

5.3.1 Incorporation of skills

In line with the first research question, participants were asked which modules they considered to be essential components of entrepreneurship and if these modules were part of their curriculum. The participants differed in some opinions whilst they agreed in some. The similar views were recognised and categorised into sub-themes as follows: Essential Entrepreneurial modules; Relevance of current entrepreneurial modules; Theory-practice gap in entrepreneurship teaching and learning.

5.3.1.1 Essential Entrepreneurial modules

As previously indicated, there has been a revision of the new radiography curriculum in South Africa, which now offers theoretical and research-oriented components (van de Venter and Engel-Hills 2022: 17). The new features of this degree include Entrepreneurship and Business Studies (van de Venter and Engel-Hills 2022: 17). This is commendable as radiographers need to have up-to-date skills and expertise (Mung'omba and Botha 2017: 2). However, an examination of South African HEI's reveals that very few of them include entrepreneurship as a mandatory module in their undergraduate programs

(Naong 2019: 3). As a result, entrepreneurial education is often relegated to the periphery. Consequently, more institutions need to offer entrepreneurship as a course or at least integrate it more extensively into existing courses where it is already present (Nicolaides 2011: 1046).

The participants identified Small Business Management, Accounting, Managerial and Entrepreneurial skills, Management for Health Professionals, Ethics and Medical Law, Professional Practice and Management, Leadership and Supervisory Development and The Entrepreneurial Edge as essential modules relevant to entrepreneurship. The following excerpts demonstrate the participants' opinions in this regard:

"The essential modules are Small Business Management, Accounting, Managerial and Entrepreneurial skills." **P#3; Female; Private**

"Modules that I found essential components for entrepreneurship in radiography were Management for Health Professionals, Small Business Management, Ethics and Medical Law and Professional Practice and Management." **P#8; Female; Government**

"The modules I believed that are instrumental to entrepreneurship were; Leadership and Supervisory Development, The Entrepreneurial Edge and Small Business Management." **P#9; Female; Private**

In addition, the participants believed that the modules currently offered by their institution such as Professional Practice and Management, Small Business Management, Leadership, Management, and Values in the Workplace would suffice for entrepreneurship. This is demonstrated by the following excerpts:

"I consider Professional Practice and Management, Small Business Management, Leadership, Management and Values in the Workplace the only valuable modules included in our curriculum that can assist with entrepreneurship." **P#4; Female; Private**

Other participants indicated that modules such as Entrepreneurial Edge, Small Business Management and Leadership and Supervisory were essential components of entrepreneurship. The excerpts from the participants of the study below supported this:

"The Entrepreneurial Edge, Small Business Management, Leadership and Supervisory are Entrepreneurial modules." **P#1; Male; Private**

"Entrepreneurial Edge, Small Business Management and Leadership and Supervisory are important components in developing entrepreneurial and business skills." **P#6; Female; Private**

5.3.1.2 Relevance of current entrepreneurial modules

The participants indicated that the essential entrepreneurship modules highlighted in the previous sub-theme were offered by the institution. While some participants stressed the importance of the entrepreneurial modules offered during their undergraduate studies; others observed that these modules merely touched on basic concepts. This is consistent with existing literature which emphasises that entrepreneur education in South Africa is highly uncultivated in terms of encouraging or motivating professionals to venture into private practice (Price and Ronnie 2021: 4).

This sentiment is echoed by Zegeye and Singh (2019: 27) who argue that the way that curricula are prepared in Africa is to train students to be effective workers for existing businesses and institutions. Radipere (2012: 11015) explains that this is because the South African curricula make use of teacher-centred methodologies and do not include practical learning avenues.

The excerpts below are evidence of this:

“No doubt, the entrepreneurial modules were important; however, they merely touched on fundamentals.” **P#2; Female; Private**

“Out of the four years of the radiography curriculum and the several modules that we had done, I had found that only four modules held significance or components to that of entrepreneurship.” **P#13; Female; Private**

5.3.1.3 Theory-practice gap in entrepreneurship teaching and learning

Based on the findings of this study, the curriculum contains an excessive amount of theoretical content. This is a problem because as Ramchander (2019: 6) posits, the competency elements of perseverance, resilience, and self-efficacy cannot be adequately developed through theory alone as actual venture creation provides the ideal context for developing these competencies. Thus, the ‘‘textbook scenarios” described by the participants as part of the current curriculum are inadequate because entrepreneurial learning involves simulating a context for student learning that mirrors how entrepreneurs learn in real-world environments (Fulgence 2015: 245).

The participants indicated that the essential entrepreneurial modules were offered but did not provide enough information for them to venture into their own independent business endeavours. The excerpts below illustrate this:

“Personally, we were taught the essential skills, the so-called bare minimum and as previously mentioned just one aspect was lacking; of how to actually go about starting our own radiography practice.” **P#6; Female; Private**

“We were taught the fundamentals needed to operate the field of entrepreneurship within radiography, but a lot was textbook scenarios when it came to the workplace management skills.” **P#8; Female; Government**

5.3.2 Entrepreneurial knowledge and skills acquisition

The researcher asked participants what fundamental skills and characteristics they considered to be necessary when starting a business. In addition, the researcher asked the participants if they were adequately equipped with entrepreneurial and workplace management skills during their undergraduate studies. The participants' responses were categorised into the following sub-themes:

5.3.2.1 Fundamental skills for aspiring entrepreneurs

The participants mentioned entrepreneurial skills, accounting skills, management for health professionals, leadership skills and workplace management skills as some of the key skills required prior starting a business. The excerpts below attest to this:

"*In my opinion, it is mandatory to possess leadership, managerial and entrepreneurial skills before starting a private practice.*" **P#3; Female; Private**

"Before starting a business, I believe it is needful to possess accounting, business management and managerial skills." **P#9; Female; Private**

5.3.2.2 Current skills acquired in the curriculum

The participants stated that their institution had managed to give them basic theoretical knowledge pertaining to entrepreneurship and workplace management skills. However, they were not provided with practical skills. The excerpts below outline this:

"Yes and no, we were taught the fundamentals needed to operate the field of entrepreneurship within radiography, but a lot was textbook scenarios when it came to the workplace management skills. So, it doesn't adequately prepare you for management." **P#8; Female; Government**

"I was not adequately equipped with the skills required to be a successful entrepreneur." **P#9; Female; Private**

"It was only after I was placed in the working environment that I grasped what it takes to manage a radiology department. Therefore, I do not believe that I was adequately equipped with these skills during my undergraduate studies." **P#11; Female; Private**

The participants' responses outlined that the entrepreneurial and workplace management skills obtained during their studies were of general application. The participants were not given skills that were specific to entrepreneurial radiology practice. The excerpts below provide evidence of this:

"We were not educated on the basics for starting up our own radiology business during our undergraduate studies." **P#3; Female; Private**

"During our studies we were only equipped with skills associated to our degree and none of which can assist with entrepreneurship." **P#4; Female; Private**

"When the modules were delivered it was just done in a general setting, it did not focus on the specific skills needed to be an entrepreneur in the radiography field." **P#9; Female; Private**

5.3.3 Proposed changes to the curriculum

In line with the last research question, the researcher asked the participants how the academic institution concerned could promote entrepreneurship amongst graduates and their responses were classified into the sub-themes below.

5.3.3.1 Incorporation of entrepreneurial practical aspects

The participants emphasised the need to implement a practical aspect to the modules so that students can connect them to the real-world business environment. Furthermore, the participants shared the belief that there was a

need to encourage or motivate graduates to seek their own private practices. The excerpts below provide evidence to this:

"They could link the curriculum to real world business challenges. Host seminars to promote entrepreneurship and explain how it is done and things that need to be considered when it comes to opening a business." **P#4; Female; Private**

"Introduction of the financial aspect of running a business, with all the necessary components reinforced and taught in a practical way rather than theoretical. Institutions could introduce graduates to entrepreneurs who have a successful business and who are able to provide guidance and support." **P#5; Female; Public**

"Specifically, in radiography, final year students should be given an opportunity to organise and operate their own clinic just to get a feel what's it like before heading off to community service." **P#6; Female; Private**

"Motivate them to start their own practice. Educate them thoroughly to be aware of what they may face as radiology practice owners." **P#10; Female; Private**

"Universities should also host entrepreneurs from the radiography field to speak to students in order to improve their understanding of the requirements of starting and managing their own department." **P#11; Female; Private**

"Introduce students to business owners as that would motivate and encourage students to pursue their own business." **P#12; Female; Private**

5.3.3.2 Restructuring Radiography training modules

The participants were asked to indicate whether they considered any modules that were taught during their radiography training redundant. Some of the

participants were of the opinion that the modules serve several important purposes for the students. The excerpts below point out to this:

"No. I do believe that the general education modules played a vital role in shaping a student in terms of ensuring a well-rounded and balanced approach to learning, allowing for the exploration of educational material outside your field of study." **P#2; Female; Private**

"No. While some of the modules may have had similar information, all modules contained information that others did not. All modules taught were relevant and have shaped us to become the radiographers we are today." **P#7; Female; Private**

"No, these modules go hand in hand. There is a link between all modules." **P#9; Female; Private**

However, other participants believed that some of the modules did not serve any purpose and were an unnecessary part of the curriculum. The excerpts below provide evidence of this:

"There were a few modules that were redundant such as professional practice and management and small business management. These modules had a lot of similar course outcomes. Professional practice and management were taught throughout the course and the course content was repetitive." **P#5; Female; Public**

"Professional practice and management were a little redundant with each year." **P#8; Female; Public**

"Some of the general education modules seemed unnecessary and unjustified. I agree that they could have been informative and helpful if the lecturers took on a different approach to the module and their students." **P#13; Female; Private**

5.3.3.3 Modules and skills recommended to promote entrepreneurship

The participants were asked to indicate the skills that are necessary for one to succeed as an entrepreneur within the field of radiography. The participants responded by indicating that there are several different sets of skills that are necessary for a person to run an entrepreneurial venture in the radiography field. The excerpts below illustrate this:

"Organisational skills - managing a department will require this skill to ascertain that every aspect of the department is in order and up to date." **P#11; Female; Private**

"Branding skills - every business venture comes with competitors. Hence, it is important to implement a good marketing strategy to establish a business that is known within the community and surrounding area which will attract consumers." **P#11; Female; Private**

"Clinical skills - to attract consumers and establish a reputable and successful department, clinical skills are much required. It is important to not only be business minded but also important to warrant successful medical assistance that the patients require which is within the radiographers' scope of practice." **P#11; Female; Private**

"Leadership skills - to motivate staff for productivity and optimal performance." **P#13; Female; Private**

"Management skills - ensures that there is order in the workplace along with time management so that deadlines are met and customers are not disappointed." **P#13; Female; Private**

"Professionalism - ensures a smooth and ethical working environment." **P#13; Female; Private**

"Financial management skills - aids in running the business profitably and protecting financial investments." **P#13; Female; Private**

"People skills - includes communication, networking and negotiating skills." **P#13; Female; Private**

"Strategic thinking - It's important to learn and identify problems and reveal opportunities for growth." **P14; Female; Private**
"Creative thinking - allows for good business opportunities." **P14; Female; Private**

"Networking skills - This is important as growing a network helps to facilitate good business opportunities and partnership deals." **P14; Female; Private**

The participants believed that some of these skills can be imparted if modules relating to the financial aspects of running a business are incorporated into the curriculum. The excerpts below outline evidence of this:

"Finance, human resources, marketing are a major part of entrepreneurship and this needs to be considered in the radiography curricula to develop entrepreneurs." **P#4; Female; Private**

"Modules regarding the financial aspect of running a successful business, basics of business law, computer literacy, sales, and marketing." **P#5; Female; Public**

"One of the important topics that should be emphasized is the financial aspect of how to start and manage a radiology department." **P#11; Female; Private**

5.4 SUMMARY OF THE CHAPTER

This chapter was constructed with the main objective of exploring the entrepreneurial information that radiography graduates obtained during their

studies and the appropriate measures and strategies necessary to improve private practice in the radiography curriculum. The findings align with the desktop research conducted in this study, which revealed that entrepreneurship education courses in the African region closely resemble traditional business courses which primarily focus on training students to become efficient employees. Furthermore, the emphasis on clinical education only without imparting practical skills such as problem-solving was also established in the literature review.

The participants outlined that while some modules in their curriculum included entrepreneurial aspects necessary for them to establish their own private firms, they had acquired basic knowledge and skills during radiography training. They believed that to be an entrepreneur, one must possess a number of practical skills and currently, the curriculum provides theoretical knowledge. The participants outlined some changes that should be made to the radiography curriculum to promote entrepreneurial ventures. The results presented in this chapter are discussed in Chapter 6.

CHAPTER 6: DISCUSSION OF FINDINGS

6.1 INTRODUCTION

The previous chapter outlined the primary data findings acquired from the study's participants. The themes uncovered in the study were discussed in accordance with the exploration of entrepreneurial knowledge and skills acquisition at a UoT in KZN. The themes were further divided into sub-themes exposed by the primary data. Elements of the constructivism theory were infused into the study as constructivist research methodologies are invaluable for understanding experiences and subsequently enhancing healthcare practices (Burns *et al*. 2022: 1). Constructivism was also of significant importance because the participants' opinions played an important role in this study (Yadav 2016: 95).

Using the constructivist lens, the researcher concentrated on meaning, process, and action during data analysis. This is because constructivist principles require the research to go beyond literal interpretations of data and strive to uncover deeper, unspoken meanings by appreciating participants' values and beliefs (Burns *et al*. 2022: 6). This approach involves actively constructing an interpretation of the data's meaning and reflecting on the researcher's role in the co-construction of knowledge.

This chapter commences with an analysis of the study's themes: Incorporation of skills; Entrepreneurial knowledge and skills acquisition, and Proposed changes to the curriculum and then further presents the application of this study's theoretical framework and concludes with a summary of the findings.

6.2 AN ANALYSIS OF THE STUDY'S THEMES

In the problem statement of this study, the researcher pointed out that there is no clear measure of how effective modern teaching methods and curricula are in fostering entrepreneurship. It is therefore, both important and necessary to make sure that the radiography curriculum is explored so that the objectives outlined in Chapter 1 can be achieved.

Lindner (2018: 120) reports that dynamism in the global market and the influence of globalisation has increased the need for sustainable businesses and the growth of entrepreneurial education. Additionally, alleviating the shortage of healthcare services (Hardy *et al*. 2016: 1) and ensuring enhancement requires the growth of private radiography practices so that more people have access to these services. The presence of many privately-owned radiography practices would be of great assistance to the services currently offered by state funded healthcare institutions that continue to face intense pressure from the public.

An exploration of the role of education in encouraging and facilitating successful entrepreneurship among radiography graduates was necessary and inspired the present study. This study investigated whether the radiography education curriculum in KZN provided graduates with the knowledge and skills needed to be successful entrepreneurs. The results of this study were intended to fill a knowledge gap regarding the adequacy of EE. If found to be inadequate, the researcher would offer recommendations for the development of the radiography curriculum to address this need. Themes and sub-themes emerging from the data are discussed below.

6.2.1 Incorporation of skills

6.2.1.1 Sub-theme 1: Essential Entrepreneurial modules

Due to the importance of entrepreneurship-related modules in equipping graduates with the necessary skills, knowledge, and confidence to navigate the

business world (Naong 2019: 11), the present study aimed to determine, based on the participants' responses, whether these modules had practical relevance and effectively promoted creativity and innovation. By assessing the practical application of the skills taught in these modules, the researcher sought to understand how well the curriculum prepared students for real-world challenges and entrepreneurial opportunities in the field of radiography.

The participant's responses were based on their overall experience with the current curriculum, particularly in terms of its structure and content. The participants identified a number of courses that they considered fundamental for entrepreneurial success in radiography. Small Business Management; Accounting, Managerial, and Entrepreneurial Skills; Management for Health Professionals; Ethics and Medical Law; Professional Practice and Management; Leadership and Supervisory Development and The Entrepreneurial Edge were deemed by some to be the most important modules. The research participants opined that those who launch and grow profitable and sustainable practices typically rely on their own managerial and organisational expertise. None of the participants in this study ran their own practice and this could perhaps be attributed to the absence of practical skills.

6.2.1.2 Sub-theme 2: Relevance of current entrepreneurial modules

According to Festeu and Turlakova (2020: 180) a module-based approach to teaching entrepreneurship has been widely adopted globally. Therefore, the researcher asked the participants' if the modules that they believe to be essential for entrepreneurship were part of their radiography training. It is important to note that the participants' perception of a module's relevance may have been influenced by various factors such as the lecturer's personality, the organization and delivery of the module, students' expectations and aspirations, the extent to which the content met their personal educational needs and future career plans, and the perceived level of support (Festeu and Turlakova 2020: 182).

The participants were of the view that while essential entrepreneurship modules are offered at their institution, these modules were not taught in a manner that served their purpose of influencing entrepreneurial ventures. It has been argued that the curriculum should be developed with attention to different career pathing, and task-shifting for diagnostic radiographers (van de Venter and Engels-Hills 2022: 18). Given the current economic climate in South Africa, it is evident that there is a societal need for radiography services that cannot be met by public care alone. van de Venter and Engels-Hills (2022: 17) argue that higher education programmes “need to be responsive to societal needs and changes, as well as to the developments within the profession”. In short, course content is deemed valuable in educational settings when it is aligned with the economic realities of the country (Mzimela 2023: 41). However, education programmes do not seem responsive to this need.

In essence, the participants believed that only a few modules showed actual entrepreneurship value. Although this is inconsistent with a study conducted by Ncube and Lekhanya (2021: 9) at public institutions of learning in KZN which found that the existing entrepreneurship curriculum equips students with enough skills to start-up their own ventures, other studies confirm the view of the participants. For instance, a recent study by Mzimela (2023: 41) found that university graduates are frequently underprepared for business and often lack the necessary skills for the labour market which points to a deficiency in the educational content related to entrepreneurship.

6.2.1.3 Sub-theme 3: Theory-practice gap in entrepreneurship teaching and learning

Most universities have centres, institutes, incubators, and short courses for EE, primarily focusing on business skills (Ramchander 2019: 6). For instance, the UoT under study, developed a centre for Entrepreneurship and Innovation that is accessible to all its students (Musariwa and Tinonetsana 2023: 2). The aim of this centre is to help students become well acquainted with running and managing their own businesses from the training programmes and enhance

their capacity to convert their soft skills into feasible business ideas (Musariwa and Tinonetsana 2023: 2). The centre provides coaching, mentoring and pre-incubation lessons that are important for students at the UoT that seek to start their own businesses. In addition, young entrepreneurs receive networking support once their businesses are operational, enabling them to connect with other entrepreneurs thereby facilitating valuable opportunities for collaboration and growth (Musariwa and Tinonetsana 2023: 6). It can be argued that this is certainly an important feature for the promotion of entrepreneurial ventures.

However, the choice remains with the students of radiography to actively seek assistance from the Centre for Entrepreneurship and Innovation. Generally, most students would neither have the time nor interest to access help during their tenure as students. Most of them may only realise its importance after they complete their studies. Therefore, the Centre for Entrepreneurship and Innovation's significance must be highlighted, as there are possibly a few students who may make use of it.

6.2.2 Entrepreneurial knowledge and skills acquisition

6.2.2.1 Sub-theme 1: Fundamental skills for aspiring entrepreneurs

Entrepreneurial education encompasses instruction in recognizing opportunities, commercializing concepts, mobilizing resources amidst risk, and initiating a business venture (Naong 2019: 7). Furthermore, financial management, human resource management, social and leadership skills may be considered as fundamental skills needed in the establishment of a business (Mamabolo, Kerrin and Kele 2017: 2).

Thus, the absence of such skills may be potentially detrimental to an aspiring entrepreneur. It was established in the current study that participants were not provided with information pertaining to entrepreneurial and workplace management skills.

The participants in this study indicated several different sets of skills that are necessary for a person to run an entrepreneurial venture in the radiography field. Skills such as leadership skills, problem-solving skills, financial literacy skills, organisational skills and management skills were some of the identified skills. In their study, Ncube and Lekhanya (2021: 14) note that some institutions have recognised the drafting of a business plan as a basic aspect of entrepreneurship.

Nevertheless, literature on this point is unclear on whether students are receiving the necessary skills. Naong's study (2019: 7) found that entrepreneurial training at HEI's in South Africa remains insufficient. In contrast, in a study conducted by Ncube and Lekhanya (2021: 8), lecturers/teachers submitted that they educate students on the importance of starting their own businesses and instil an entrepreneurial mindset in them in order to encourage the importance of self-employment.

6.2.2.2 Sub-theme 2: Current skills acquired in the curriculum

As outlined under the first theme, the participants received basic theoretical knowledge pertaining to entrepreneurship. This is unsurprising, as university-based EE has often been criticized for being too theoretical (Decker-Lange *et al*. 2022: 123). The research participants reported a deficiency in both entrepreneurial and managerial abilities in the workplace. Participants felt they were not provided with adequate or any information at all about these abilities during their tertiary radiography training. What is more, many of those polled felt they had gained a solid theoretical foundation in entrepreneurship and workplace management from their university but conceded to lacking the practical training and experience to put them to use in their private ventures. The responses from the participants demonstrated that the business and management skills acquired were applicable in a variety of settings; however, they were not provided with training in entrepreneurial radiology practice skills.

Studies support this result as general educational techniques relate to health professionals and entrepreneurship (Suryavanshi *et al*. 2020: 1803). A study was carried out by Mbambo (2012: 18) to discover the views and experiences of radiographers pertaining to their growth as entrepreneurs in Gauteng. The study investigated this phenomenon during the period when the radiographers were carrying out their studies. He discovered that students that were enrolled at UJ showed low management skills and business knowledge. Thus, it was concluded that the radiography curriculum did not equip radiographers to manage and run their own practices. Therefore, the results in the current study are consistent with Mbambo's (2012: 48) primary findings that the radiography training offered to tertiary students does not prepare them for the business environment but only for clinical practice.

The lack of specific modules on entrepreneurship aside for the electives offered at most universities means that students receive the most basic skills which are integrated in other curriculum modules. Although theory-focused modules can cultivate students' entrepreneurial thinking and its application across different contexts, there is a clear necessity for modules that provide practical guidance and develop hands-on skills for aspiring entrepreneurs (Decker-Lange *et al*. 2022: 128).

Nevertheless, the curriculum attempts to offer students procedural knowledge relating to the field of radiography and to facilitate the application of procedural knowledge in a professional context. Practical experience helps bridge the gap created by poor theoretical understanding. Therefore, it is essential to establish a strong connection between theory and practice (Molomo 2019: 47).

To this end, the inclusion of WIL in the degree programme is worth noting. Nonetheless, the arrangement of the WIL curriculum relates to the nature and purpose of a qualification, its programme objectives and outcomes as well as the systems and structures available at accredited clinical placement sites (Du Plessis 2015: 33). These factors can limit students' provision with unique skills related to entrepreneurship. For example, motivating students to be

independent practitioners is not included in the module objectives, therefore it will not be an element of WIL.

6.2.3 Proposed changes to the curriculum

6.2.3.1 Sub-theme 1: Incorporation of entrepreneurial practical aspects

Although most South African universities include entrepreneurship in their curriculum, there seems to be minimal improvement in practical entrepreneurial growth among students who have taken these courses (Fayolle and Gailly, 2015: 80). Radipere (2012: 11015) argues that to enhance entrepreneurial ventures in students, it is necessary for students to be provided with practical learning activities. This is consistent with the study's findings which argue for the need to introduce practical elements of entrepreneurship which relate directly to radiography in higher learning curricula.

The research participants agreed that the current entrepreneurial modules are a great resource for anyone starting their own business. However, the modules could benefit from an added practical component to help students make the relevant connections between classroom theory and real-world applications. If students are provided with a practical or real-life experience in entrepreneurial radiography, they become aware of what it entails. The provision of such practical lessons may potentially aspire radiographers to establish their own private practices (Nwankwo *et al*. 2022: 79). Unfortunately, radiography students generally receive technical, clinical, and professional know-how that only equips them to be efficient employees within established medical facilities (Mbambo 2012: 48).

Based on existing literature, tertiary institutions in South Africa have the duty to encourage entrepreneurship as a viable alternative to formal employment for radiography graduates (Malatjie 2020: 110). The participants agreed that the most influential actors in promoting private practice are tertiary institutions. Unfortunately, students in South Africa are seldom encouraged to become job

creators. Instead, they are typically advised to seek employment to ensure a stable income for their families (Nchu 2015: 30).

One of the general ideas that emerged from the study was the need to incorporate entrepreneur-based modules in the radiography curriculum. Despite the inclusion of entrepreneurship modules in university programmes, the percentage of credits for these modules remains at a maximum of around 20% of the total programme credits (Ramchander 2019: 5).

With reference to other studies, Ramchander (2019: 3) confirms that entrepreneurship is typically included in most programs as an elective. Since modules on entrepreneurship equip radiography students with a well-rounded and balanced approach, it is a disadvantage to students who opt not to take the elective. These students may be exposed to course content that is extremely similar and repetitive, as indicated by some participants, and miss out on modules that illuminated radiography students' entrepreneurial ventures. If the current curricula are reworked, the result would be an effective and efficient curriculum which possesses all the elements for a qualified radiographer to work in formal employment but also, if he or she wishes, as an entrepreneur running a successful practice.

Nevertheless, classroom-based entrepreneurship studies alone are insufficient; students need to be stimulated to become entrepreneurial. Without practical entrepreneurship training, students will not develop the hands-on business skills needed to succeed. Instead, a false impression is created that university graduates are prepared to start their own businesses when, in reality, they lack the technical knowledge required to launch and run a business (Mzimela 2023: 41).

University entrepreneurship development centres are useful for this purpose as they ensure that students can encounter real business scenarios and, consequently, be motivated to pursue entrepreneurship as a career path (Omotosho *et al*. 2022: 15).

6.2.3.2 Sub-theme 2: Restructuring Radiography training modules

The research participants opined that there were a number of modules in the radiography curriculum that offered significant insights for entrepreneurial practice. Despite the provision of these modules, it was noted that these modules were either not taught optimally or in a manner that provided adequate training for careers in radiography entrepreneurship. This is consistent with the study conducted by Omotosho *et al*. (2022: 14) which found that the teaching method of entrepreneurship at South African universities, is not practical enough. Ineffective teaching methods dissuade graduates from pursuing careers in entrepreneurship.

Naong (2019: 10) argues that teaching entrepreneurship to university students necessitates a shift in approach due to the nature of the subject and the goal of developing future entrepreneurs and job creators. The proposed shift is from passive, traditional lecturer-centred approach (toward a more action-oriented and student-centered method.

The view herein aligns with the argument raised by Olutuase, Brijlal and Yan (2020: 263), who advocated for a ‘‘contextualized curriculum that encapsulates national, local and very importantly, institutional factors.’’ In addition to traditional teaching methods, various alternative approaches can be employed to promote EE and develop students’ skills (Omotosho *et al*. 2022: 14).

6.2.3.3 Sub-theme 3: Modules and skills recommended to promote entrepreneurship

The participants believed that as much as the entrepreneurial journey is a personal choice, the curriculum that radiography students get exposed to has a major influence in motivating them to build their own businesses. This is echoed in a study by Chiromo, Khosa and Kalitanyi (2023: 171) that focused on online entrepreneurship teaching, which established that key entrepreneurial competencies encompass recognizing and evaluating business

opportunities, managing risks, solving problems, creating value, and effectively utilizing networks.

This is supported by studies indicating that while health education programmes across the globe have integrated elements of entrepreneurial quality improvement into their curricula (Lim *et al*. 2023: 2142), this does not adequately respond to an emerging need for novel strategies that will address complex problems within the healthcare field (Suryavanshi *et al*. 2020: 1798; Ahmad and Akram 2018: 651). In other words, the current curriculum is not creating a desire in students to venture into entrepreneurship.

Zegeye and Singh (2019: 26) assessed the general curricula offered in Africa. The results revealed that the composition of the content largely encourages students to be productive under the employment of others while not establishing and managing their own private firms. Radipere (2012: 11015) further points out that there is a lack of practical entrepreneurial learning in the South African tertiary arena. This is echoed by Zondo (2016: 37) who found that the major challenge of entrepreneurship in education is ensuring that the curriculum and teaching methods are appropriate for developing students' entrepreneurial competencies and skills.

Mbambo’s (2012: 55) study further emphasised that the curriculum was made up of modules that did not focus on the entrepreneurial needs of its students but rather applied generally. It had management aspects that could be applied in several different fields of study. This secondary finding is consistent with the primary data gathered in the current study as the participants posited that there are several modules that must be incorporated in the radiography curriculum in tertiary institutions to enhance graduate students’ entrepreneurial activities. Therefore, there is a need to reconstruct the curriculum so that it supports the addition of critical modules that enhance student private ventures.

A study conducted by Pieterse, Lawrence and Friedrich-Nel (2014: 33), among third year radiography students at a South African university showed that a large contingent of the students had minimal problem-solving skills. This finding emphasises the need for essential modules that can assist students to think critically and independently.

Based on this literature and the findings of this study, it is evident that a number of entrepreneurial competencies necessary for overseeing and running a radiography business are important elements that should form part of entrepreneurship studies. The participants believed that for entrepreneurs to be able to oversee and run a private practice, they should be acquainted with financial management skills. They were aware that administering finances is an essential part of a private business, and that it must be taken into serious consideration when someone seeks to be successful.

Bellavatis *et al*. (2017: 2) confirms that entrepreneurs must be well versed in financial management so that their firms can be successful. These include general or traditional financial management activities. However, the modern entrepreneur must take a step further and be involved in new sources of financing too e.g., crowdfunding. Alshebami and Al Marri (2022: 1) emphasise that entrepreneurs must make sure that they educate themselves and make informed decisions on investment, planning and seizing financial opportunities that may present themselves. The background for radiography students' entrepreneurial knowledge lies in the institutions from which they acquire their qualification. Therefore, these institutions should ensure that they offer financial management for entrepreneurs, in order to make them independent practitioners one day.

6.3 APPLICATION OF THE THEORETICAL FRAMEWORK

This study was guided by Kolb's experiential learning cycle. Kolb's experiential learning theory is often linked to entrepreneurship education and is regarded as a highly effective approach for cultivating entrepreneurial skills.

The key feature of experiential learning is that the learner's experience occupies a central place in teaching and learning (Rodrigues 2023: 6). Learners analyse their experiences by reflecting, evaluating, and reconstructing them to draw meaning from prior experiences (individually and collectively) (Morris 2020: 5). Kolb's theory is particularly strong in higher education because it offers clear applications, supports a variety of teaching methods, provides a theoretical rationale for practice, and suggests improvements.

In this study conducted at a UoT within the eThekwini district, the researcher used open-ended questions to elicit the participants' views and opinions on their entrepreneurship studies. Under the concrete experience stage (Kolb and Kolb 2018: 9), the researcher presented the study participants with the following questions:

- What entrepreneurial and business skills are incorporated into modules offered by a University of Technology in the eThekwini district?
- What entrepreneurial knowledge and skills are acquired by graduates during radiography training?
- What changes are necessary to the radiography curriculum for the development of entrepreneurs?

Participants responded based on their knowledge and experiences with the radiography curriculum and entrepreneurship modules, providing insights into the training they received. The findings of the study aligned with Kolb's theory in as far as the active experimentation and reflective observation show a strong preference for action. To activate entrepreneurship, opportunities and creative ideas need to be followed through.

This research's findings further aligned with the selected theory as the participants were of the opinion that learning the practice of entrepreneurship requires engaging in experiential knowledge, often described as 'learning by doing' (Rodrigues 2023: 6). This approach places the learner at the centre of the process, requiring them to take shared responsibility for learning from the experience. However, this study found that the experiential forms of learning

within the curriculum were present but not central, as the programs were not purely experience-based. Learners could decide autonomously by taking elective modules, thereby determining their role and how they made sense of their experiences.

6.4. SUMMARY OF THE CHAPTER

This chapter discussed the themes uncovered throughout this study. The themes were discussed in accordance with the exploration of entrepreneurial knowledge and skills acquisition at a UoT in KZN and were compiled in line with the participants responses and discussed with the application of Kolb's Experiential Learning Cycle. The next chapter provides the conclusion, identifies limitations, offers recommendations, and outlines areas for future study.

CHAPTER 7: SUMMARY, RECOMMENDATIONS, LIMITATIONS AND CONCLUSION

7.1 INTRODUCTION

The effective transition from classroom to clinical learning and practice is an essential competency for radiography students in an era of rapid technological advancements. The findings of this study revealed that there was a good structuring of academic course content in South Africa, but the gap between theoretical and clinical elements pertaining to entrepreneurial training does not support students' and graduates' transition from classroom learning to clinical learning and practice. This chapter provides a summary of the findings of the study, researcher's reflections and recommendations for future research.

7.2 CONCLUSIONS DERIVED FROM THE RESULTS

This study aimed to explore diagnostic radiographers' and ultra-sonographers' entrepreneurial knowledge and provide recommendations on how to improve entrepreneurship in radiography education. The following themes emerged from the study's thematic analysis: (i) Incorporation of skills; (ii) Entrepreneurial knowledge and skills acquisition; and (iii) Proposed changes to the curriculum. The first objective of this study was to determine entrepreneurial and business skills within the current curriculum, thus the findings highlighted areas for improvement and provided recommendations for enhancing entrepreneurship in radiography education.

Secondly, the study explored the entrepreneurial knowledge and skills acquired during radiography training. Insights into the graduates' perspectives revealed a critical need for rapid advancements in diagnostic radiography technology and offered valuable suggestions for refining educational programming. The research emphasized the necessity of incorporating practical courses to better prepare students for professional environments, thereby increasing their skills and potential for successful, sustainable private practices. In particular, the

curriculum needs to impart leadership skills, financial skills, and communication skills amongst others.

Lastly, the study had the objective of exploring necessary changes to the radiography curriculum. The findings indicate that immediate changes to the curriculum are not feasible. Instead, a continuous process involving consultations with practitioners and students is essential for addressing current needs. The research advocates for aligning the radiography degree curriculum with international developments and incorporating contemporary practitioners' knowledge to enhance graduates' practical competence.

7.3 STRENGTHS OF THE STUDY

This study was necessary for the field of radiography more generally and contributes to the scientific knowledge of entrepreneurial radiography in South Africa. The promotion of entrepreneurial radiography services in South Africa is necessary because it will result in more radiography service providers and will further assist by alleviating the burden on the public healthcare system.

This research highlighted the importance of developing and incorporating entrepreneurial aspects into the South African radiography education curricula. The study proposes this measure because it would increase the chances of radiography graduates from South African tertiary institutions entering private practice successfully and sustainably. Furthermore, the findings of this study will assist tertiary institutions providing radiography training in the process of planning and formulating a tailored curriculum that aligns with the present and future demands of the medical sector and produces radiographers who not only possess skills and expertise in the modern technological era, but also end up being successful in their private practices.

At the time of writing, the researcher submits that existing studies conducted in KZN (Thambura, Swindon and Amusa 2014: 1202; Zulu 2022: iv; Mung’omba and Botha 2017: 1) did not investigate the adequacy of radiography training in

tertiary institutions when it comes to the promotion of entrepreneurship and entrepreneurial potential in students. As a result, this research serves to fill the knowledge gap identified.

7.4 RECOMMENDATIONS

The recommendations provided herein are derived from the responses of study participants and the literature reviewed in this study. The two key recommendations are directed at decision-makers within the South African tertiary educational boards, the radiography department at this chosen UoT within the eThekwini district, and the radiography fraternity in South Africa.

The key to successful EE lies in identifying the most effective approaches and strategies for the introduction of teachable skills and relationships between the learners' needs and teaching methods (Esmi, Marzoughi and Torkzadeh 2015: 172). This study found that while some elements of EE are present within the curriculum, their implementation and application to real-life contexts lacks consistency. Experiential approaches are common in the pedagogical process, especially when the goal is to develop entrepreneurial skills and an entrepreneurial mindset (Rodrigues 2023: 2).

Rodrigues (2023: 1) analysed an EE program at the University of Lisbon, aimed at fostering an environment conducive to open innovation and entrepreneurship. This program, introduced in the 2022/2023 academic year, provides training and capacity building in entrepreneurship and innovation for undergraduate, master, and doctoral students (Rodrigues 2023: 8). It includes an internal mobility program allowing students to attend entrepreneurship-related curricular units in various faculties free of charge and integrating these units into their course curricula. The main instructional methods used are case studies, practical activities, debates, and project-based learning (Rodrigues 2023: 8).

Reflecting on the program's importance, students interviewed in Rodrigues' study highlighted the strengths of the EE, such as different curricular approaches, interesting content, practical relevance, and the promotion of creativity and innovation (Rodrigues 2023: 9). They appreciated the development of new skills, such as problem-solving, time management, and financial literacy.

Based on this study, the following recommendations are made for the UoT, within the eThekwini district which served as this study's research site:

7.4.1 Adoption of Entrepreneurial Teaching Strategies

It should adopt the entrepreneurial teaching strategies advocated by Nwankwo *et al*. (2022: 79). These strategies promote practice-oriented teaching and learning "for" and "through" entrepreneurship, thereby addressing the criticism from current study participants that their undergraduate entrepreneurial lessons were merely theoretical.

7.4.2 Utilization of Common Pedagogical Approaches

Based on Rodrigues' findings, common pedagogical approaches in business education, such as problem-based learning and the "learning-by-doing" approach, should be implemented (Rodrigues 2023: 2). These approaches provide a conducive environment for constructive idea-sharing and include experiential, problem-solving, project-based, and creative learning, along with peer assessment and service learning, offering students real-life scenarios to apply and examine academic concepts.

7.4.3 Collaborative Pedagogical Models

There is a need to use collaborative pedagogical models in EE to develop entrepreneurial skills, such as design thinking and problem-based learning (Rodrigues 2023: 4). These models, framed within experiential pedagogical approaches, emphasize student-centered learning, which is crucial in EE.

7.5 LIMITATIONS OF THE STUDY

The process of conducting a study entail recognising and addressing any limitations that may be present. The study's limitations are the aspects of the research design or methodology that could potentially lead to unfavourable results and undermine confidence in the study's conclusions (Kothari 2018: 22). The following are the current study's observed restrictions:

- Due to enhanced lockdown restrictions on personal contact, in-person interviews were not possible. As a result, the researcher was limited in his or her ability to ask follow-up questions outside the scope of the interview schedule sent to the participants. The ability to ask follow-up questions is essential for gaining an understanding of the obstacles encountered. In order to overcome this obstacle, participants were encouraged to provide additional justifications for their responses; and
- The second limitation of the study was that the researcher held a tertiary degree in radiography prior to completing the study and was, therefore, an insider to the investigation being conducted. The researcher utilised a variety of methods to ensure the credibility and dependability of the findings. This was required to ensure that the researcher's prior experience did not influence the collection, evaluation, and presentation of data. Several strategies were utilised, including group membership verification, co-coding, and triangulation. Essop (2018: 116) emphasises that the researcher must acknowledge his prior knowledge and experience of the upcoming social context under investigation. The researcher accomplished this by compiling a list of all personal observations made during clinical practice before and after graduation.

7.6 RESEARCHER'S REFLECTIONS

The researcher's reflections include information pertaining to the thoughts of the researcher when he was carrying out a study. The researcher's reflections for this study include the following:

- Entrepreneurship is essential in radiography to alleviate the demand for state funded radiography services and to improve the quality of medical

services. The presence of more private radiography firms within the eThekwini region would increase people's options and access to medical services, thereby improving the supply of medical services and the general health of residents within this region.

- Entrepreneurship education is important for radiographers to realise that they are not limited to employment in hospitals and other medical institutions. Ultimately, this would promote entrepreneurial activities and the improvement of economic conditions within the eThekwini region by increasing employment opportunities through the establishment of private practices.
- The researcher recognised the need for additional studies employing comparable methodologies. This perspective was obtained due to the difficulty in locating data relevant to the investigated phenomenon. This discrepancy indicated a dearth of studies or knowledge concerning entrepreneurship and radiography. Likewise, this realisation suggests that few radiographers within the eThekwini region operate private practices. This realisation confirms that there is a great deal of pressure on the current health services that are available to provide radiography-related medical assistance.
- As Rodriguez indicates, there must be a practical initiative or course that can be made available to radiographers interested in entrepreneurship. This course must be presented in a specific manner to accommodate radiography-related issues that entrepreneurs and those seeking private practice may encounter. The course must progress from the most fundamental to the most complex and entail essential business management knowledge. A postgraduate program focused on entrepreneurship could bridge this gap, providing radiographers with the knowledge and tools to manage and grow their own practices or take on strategic roles within healthcare organizations.
- Applying Kolb's theory to this study supports the idea that EE requires a hands-on approach to ensure effective skill learning.
- Similar to Ahmad and Akram's approach (2018: 651), a comprehensive approach to integrating entrepreneurship into the curriculum involves

incorporating structured classroom activities, including small group learning, lectures, simulation games, and case studies. These methods allow students to actively engage with and reflect on their entrepreneurial skill development throughout their studies.

7.7 RECOMMENDATIONS FOR FUTURE RESEARCH

The continuous evaluation of curricula for quality assurance in higher education is essential to ensure that amendments to the present curriculum can inform future curriculum revisions. The following recommendations are made for future research:

- Studies of a similar nature must be conducted in other South African provinces so that the phenomenon can yield more concrete results. While entrepreneurship is often offered as an elective module, the UoT in the eThekwini District has included mandatory entrepreneurial modules within the radiography curriculum. Other institutions are encouraged to follow a similar approach so that all students are exposed to entrepreneurial principles.
- There is a need for a study that demonstrates how a radiographer can pursue an entrepreneurial endeavour from a practical standpoint. This research must take a step-by-step approach that would serve as a guide for radiographers seeking to enter private practice.

7.8 CONCLUSION

This chapter highlighted how the key findings in this study related to the overall objectives. It has been established that effective curriculum design is key, but the current radiography curriculum has not successfully integrated entrepreneurial training, thereby hindering students' transition to private clinical practice. The study highlighted the need for practical courses to prepare students for professional environments, emphasizing leadership, financial, and communication skills.

Addressing the gap in entrepreneurial training within South African radiography education is vital for increasing private practices and alleviating public healthcare burdens, and the findings in this study will assist in curriculum planning to meet existing demands. To this end, recommendations have been made including the adoption of entrepreneurial teaching strategies, utilizing problem-based learning approaches, and employing collaborative pedagogical models to develop entrepreneurial skills. The researcher emphasized the importance of entrepreneurship and further recommends additional studies and practical entrepreneurship courses tailored to radiographers' needs, incorporating experiential learning methods.

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APPENDICES

Appendix 1: DUT Ethics clearance

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

26 August 2022

Mr V Govender
145 Greenvale Avenue
Westcliff
Chatsworth

Dear Mr Govender

An assessment of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal
Ethical Clearance number IREC 168/22

The DUT-Institutional Research Ethics Committee acknowledges receipt of your gatekeeper permission letters.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the DUT-IREC according to the DUT-IREC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the DUT-IREC as outlined in the DUT-IREC SOP's.

Yours Sincerely

Prof J K Adam
Chairperson: DUT-IREC

Appendix 2a: Letter of permission to the eThekwini District Manager

145 Greenvale Avenue
Westcliff, Chatsworth
Durban
4092
28 July 2022

Highway House
83 Jan Smuts Highway
Mayville
Durban
4001

Request for Permission to Conduct Research

Dear Dr Matyo

I am currently studying towards my Master's Degree in Health Science: Diagnostic Radiography. My proposed topic of study is **'An exploration of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal'**.

Access to diagnostic radiographers and ultra-sonographers is critical in order to complete this study. I would like to request your permission to interview diagnostic radiographers and ultra-sonographers from the selected hospitals in the eThekwini District. The participants will be selected through a purposive sampling technique. I will seek the informed consent of the participants prior to conducting the interviews.

The research proposal, letter of information, interview schedules, informed consent and provisional ethics clearance are attached.

If you require any further information, please do not hesitate to contact my supervisor, Dr N.P. Gam at nkululekog@dut.ac.za

I look forward to hearing back from you.

Yours sincerely,

……
Varushan Govender
Cell No: 073 696 6696
Email: 21707030@dut.ac.za

Appendix 2b: Approval letter from the eThekwini District Manager

KWAZULU-NATAL PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

DIRECTORATE: DISTRICT DIRECTOR

Physical address: 83 King Cetshwayo Highway; Highway House; Mayville 4091
Postal Address: private Bag X 54318, Durban 4000 eThekwini District Office
Tel: 031 240 5309 Fax: 031 240 5555 Email: Thabisile.sakyi@kznhealth.gov.za
www.kznhealth.gov.za

Enquiries:Zandile Matyo
Date: 01/08/2022

Dear Mr V. Govender
Durban University of Technology
Faculty of Health Sciences

RE: SUPPORT FOR RESEARCH STUDY AN ASSESSMENT OF ENTREPRENEURIAL KNOWLEDGE AND SKILLS ACQUIRED BY RADIOGRAPHERS DURING RADIOGRAPHY TRAINING AT A UNIVERSITY OF TECHNOLOGY IN KWAZULU-NATAL

I have the pleasure in informing you that the District is granting you support to conduct the research study titled, 'an assessment of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal.'

Please note the following:

1. Please ensure you adhere to all the policies, procedures, protocols, and guidelines of the department of health with regards to this research.
2. This research will only commence once this office has received confirmation from the provincial health research committee in the KZN department of health.
3. Please ensure this office is informed before you commence your research.
4. The District office/facility will not provide any resources for this research.
5. You will be expected to provide feedback on your findings to the district office/facility

Thanking you.
Sincerely,

(District Director) EThekwini Health District
Date:

GROWING KWAZULU-NATAL TOGETHER

Appendix 3a: Letter of permission to the KwaZulu-Natal Department of Health

145 Greenvale Avenue
Westcliff, Chatsworth
Durban
4092
19 August 2022

Department of Health
Natalia Building
Room 102, South Tower
Pietermaritzburg
3200

Request for Permission to Conduct Research

Dear Dr Lutge

I am currently studying towards my Master's Degree in Health Science: Diagnostic Radiography. My proposed topic of study is **'An exploration of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal'**.

Access to diagnostic radiographers and ultra-sonographers is critical in order to complete this study. I would like to request your permission to interview diagnostic radiographers and ultra-sonographers from the selected hospitals in the eThekwini District. The participants will be selected through a purposive sampling technique and I will seek the informed consent of the participants prior to conducting the interviews.

The research proposal, letter of information, interview schedules, informed consent and provisional ethics clearance are attached.

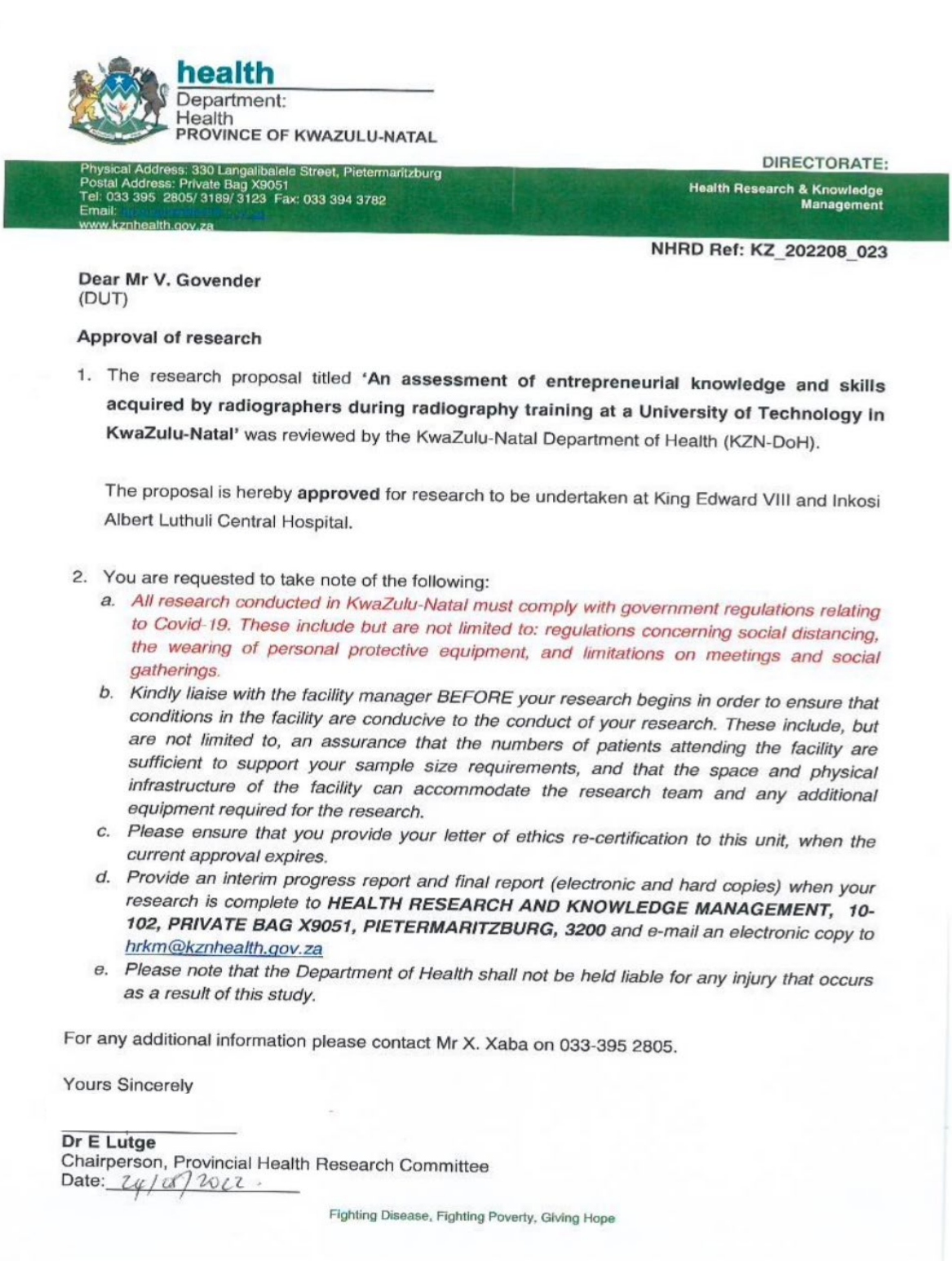
If you require any further information, please do not hesitate to contact my supervisor, Dr N.P. Gam at nkululekog@dut.ac.za

I look forward to hearing back from you.

Yours sincerely,

……
Varushan Govender
Cell No: 073 696 6696
Email: 21707030@dut.ac.za

Appendix 3b: Approval letter from the KwaZulu-Natal Department of Health



health
Department:
Health
PROVINCE OF KWAZULU-NATAL

Physical Address: 330 Langalibalele Street, Pietermaritzburg
Postal Address: Private Bag X9051
Tel: 033 395 2805/ 3189/ 3123 Fax: 033 394 3782
Email:
www.kznhealth.gov.za

DIRECTORATE:
Health Research & Knowledge Management

NHRD Ref: KZ_202208_023

Dear Mr V. Govender
(DUT)

Approval of research

1. The research proposal titled **'An assessment of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal'** was reviewed by the KwaZulu-Natal Department of Health (KZN-DoH).

   The proposal is hereby **approved** for research to be undertaken at King Edward VIII and Inkosi Albert Luthuli Central Hospital.

2. You are requested to take note of the following:
   a. *All research conducted in KwaZulu-Natal must comply with government regulations relating to Covid-19. These include but are not limited to: regulations concerning social distancing, the wearing of personal protective equipment, and limitations on meetings and social gatherings.*
   b. *Kindly liaise with the facility manager BEFORE your research begins in order to ensure that conditions in the facility are conducive to the conduct of your research. These include, but are not limited to, an assurance that the numbers of patients attending the facility are sufficient to support your sample size requirements, and that the space and physical infrastructure of the facility can accommodate the research team and any additional equipment required for the research.*
   c. *Please ensure that you provide your letter of ethics re-certification to this unit, when the current approval expires.*
   d. *Provide an interim progress report and final report (electronic and hard copies) when your research is complete to* ***HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200*** *and e-mail an electronic copy to hrkm@kznhealth.gov.za*
   e. *Please note that the Department of Health shall not be held liable for any injury that occurs as a result of this study.*

For any additional information please contact Mr X. Xaba on 033-395 2805.

Yours Sincerely

Dr E Lutge
Chairperson, Provincial Health Research Committee
Date: 24/08/2022

Fighting Disease, Fighting Poverty, Giving Hope

Appendix 4a: Letter of permission to the Manager of Hospital A

145 Greenvale Avenue
Westcliff, Chatsworth
Durban
4092
03 August 2022

The Manager
Radiography Department
Inkosi Albert Luthuli Central Hospital
Private Bag X03
Mayville
4058

Request for Permission to Conduct Research

Dear Ms Mfeka

I am currently studying towards my Master's Degree in Health Science: Diagnostic Radiography. My proposed topic of study is **'An exploration of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal'**.

Access to diagnostic radiographers and ultra-sonographers is critical in order to complete this study. I would like to request your permission to interview diagnostic radiographers and ultra-sonographers from your hospital. The participants will be selected through a purposive sampling technique and I will seek the informed consent of the participants prior to conducting the interviews.

The research proposal, letter of information, interview schedules, informed consent and provisional ethics clearance are attached.

If you require any further information, please do not hesitate to contact my supervisor, Dr N.P. Gam at nkululekog@dut.ac.za

I look forward to hearing back from you.

Yours sincerely,

……
Varushan Govender
Cell No: 073 696 6696
Email: 21707030@dut.ac.za

Appendix 4b: Letter of Permission to the Manager of Hospital B

145 Greenvale Avenue
Westcliff, Chatsworth
Durban
4092
03 August 2022

The Manager
Radiography Department
King Edward VIII Hospital
Private Bag X02
Congella
4013

Request for Permission to Conduct Research

Dear Mrs Dlamini

I am currently studying towards my Master's Degree in Health Science: Diagnostic Radiography. My proposed topic of study is **'An exploration of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal'**.

Access to diagnostic radiographers and ultra-sonographers is critical in order to complete this study. I would like to request your permission to interview diagnostic radiographers and ultra-sonographers from your hospital. The participants will be selected through a purposive sampling technique and I will seek the informed consent of the participants prior to conducting the interviews.

The research proposal, letter of information, interview schedules, informed consent and provisional ethics clearance are attached.

If you require any further information, please do not hesitate to contact my supervisor, Dr N.P. Gam at nkululekog@dut.ac.za

I look forward to hearing back from you.

Yours sincerely,

……
Varushan Govender
Cell No: 073 696 6696
Email: 21707030@dut.ac.za

Appendix 4c: Letter of Permission to the Regional Operations Manager

145 Greenvale Avenue
Westcliff, Chatsworth
Durban
4092
03 August 2022

The Regional Operations Manager
Jackpersad and Partners Inc.
P.O Box 48900
Qualbert
4078

Request for Permission to Conduct Research

Dear Mrs Farouk

I am currently studying towards my Master's Degree in Health Science: Diagnostic Radiography. My proposed topic of study is **'An exploration of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal'**.

Access to diagnostic radiographers and ultra-sonographers is critical in order to complete this study. I would like to request your permission to interview diagnostic radiographers and ultra-sonographers from your hospital. The participants will be selected through a purposive sampling technique and I will seek the informed consent of the participants prior to conducting the interviews.

The research proposal, letter of information, interview schedules, informed consent and provisional ethics clearance are attached.

If you require any further information, please do not hesitate to contact my supervisor, Dr N.P. Gam at nkululekog@dut.ac.za

I look forward to hearing back from you.

Yours sincerely,

……
Varushan Govender
Cell No: 073 696 6696
Email: 21707030@dut.ac.za

Appendix 4d: Approval letter from the Manager of Hospital A

KWAZULU-NATAL PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Physical Address 800 Vusi Mzimela Road, Mayville - 4058
Postal Address: Private bag X03 Mayville – 4058
Tel: 031 240 1124 Fax: 031 240 1005 Email: linda.mtshali@ialch.co.za
www.kznhealth.gov.za

DIRECTORATE:
OFFICE OF THE MEDICAL MANAGER
INKOSI ALBERT LUTHULI CENTRAL HOSPITAL

Reference: IREC 168/2022
Enquiries: Dr. A. Harrichandparsad

8th August 2022

Mr. V. Govender
Department of Health Sciences
Durban University of Technology

Dear Mr. Govender

RE: PERMISSION TO CONDUCT RESEARCH AT IALCH

I have pleasure in informing you that permission has been granted to you by the Medical Manager to conduct research on: **An assessment of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu- Natal**

Kindly take note of the following information before you continue:

1. Please ensure that you adhere to all the policies, procedures, protocols and guidelines of the Department of Health with regards to this research.
2. This research will only commence once this office has received confirmation from the Provincial Health Research Committee in the KZN Department of Health.
3. Kindly ensure that this office is informed before you commence your research.
4. The hospital will not provide any resources for this research.
5. You will be expected to provide feedback once your research is complete to the Medical Manager.

Yours faithfully

....
Dr. A. Harrichandparsad
Clinical Care Manager
Office of the Medical Manager
IALCH

GROWING KWAZULU-NATAL TOGETHER

Appendix 4e: Approval letter from the Manager of Hospital B

health
Department:
Health
PROVINCE OF KWAZULU-NATAL

OFFICE OF THE HOSPITAL CEO
KING EDWARD VIII HOSPITAL

Private Bag X02, CONGELLA, 4013
Corner of Rick Turner (Francois Road) & Sydney Road
Tel: 031-360 3854, Fax:031-2061457; Email: Jabulani.mwelase@kznhealth.gov.za
www.kznhealth.gov.za

Ref.: KE 2/7/04/ (08/2022)
Enq.: Mr. J.M Mwelase
Research Programming

04 August 2022

Mr. V Govender
145 Greenvale Avenue
Westcliff
Chatsworth

Dear Mr. Govender

PROTOCOL REFERENCE NUMBER: IREC168/22

Project Title: "An assessment of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal."

Permission to conduct research at King Edward VIII Hospital is provisionally granted, pending approval by the Provincial Health Research Committee, KZN Department of Health.

Kindly note the following:-

- The research will only commence once confirmation from the Provincial Health Research Committee in the KZN Department of Health has been received.
- Signing of an indemnity form at Room 8, CEO Complex before commencement with your study.
- King Edward VIII Hospital received full acknowledgment in the study on all Publications and reports and also kindly present a copy of the publication or report on completion.

The Management of King Edward VIII Hospital reserves the right to terminate the permission for the study should circumstances so dictate.

Yours faithfully

SUPPORTED / NOT SUPPORTED

11/08/2022
DATE

DR. J.V.W KALALA
CLINICAL MANAGER

Appendix 4f: Approval letter from the Regional Operations Manager

JACKPERSAD & PARTNERS INC.
SPECIALIST DIAGNOSTIC RADIOLOGISTS

DIAGNOSTIC EXCELLENCE 25TH ANNIVERSARY 1997 - 2022

71/73 Ismail C Meer St (Lorne St),
3rd Floor, Maxwell Centre, Durban
Tel : 031-365 2100
Fax : 086 272 1976
E-mail: info@jrp.co.za
www.jackpersad.co.za

Dear Mr V Govender

3rd August 2022

Subject: Approval of Research Proposal

The research proposal titled 'An assessment of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal was reviewed by Jackpersad and Partners Inc. The proposal is hereby approved by JPI Inc, for research to be undertaken at the following hospitals: Chatsmed Garden, Durdoc, City, Mount Edgecombe, Busamed Hillcrest Private and eThekwini Private Hospital and Heart Centre.

Please note the following:

1. Please ensure that you adhere to all the policies, procedures, protocols and guidelines of each institution with regards to this research.
2. Please ensure all clinical information is managed responsibility in terms of the POPIA (Protection of Personal Information Act), Act No.4 of 2013
3. Make the necessary arrangements with the identified hospitals before commencing with your research project.
4. Please conduct all online interviews with the staff after hours, to ensure no impediments to workflow
5. You will be expected to provide feedback on your findings to each institution.

Kind Regards,
Fathima Farouk
Regional Operations Manager

Cell: 083 306 7439
Direct: 031 365 2165
www.jackpersad.co.za

JACKPERSAD & PARTNERS INC.
REG. NO: 2007/027164/21
VAT REG. NO: 4480241142
PR NO. 3804917
P.O. BOX 48900
QUALBERT 4078

JACKPERSAD & PARTNERS INC.
SPECIALIST DIAGNOSTIC RADIOLOGISTS

DIAGNOSTIC EXCELLENCE 25TH ANNIVERSARY 1997 - 2022

Appendix 5: Letter of information for participants

Title of the Research Study: An exploration of entrepreneurial knowledge and skills acquired by radiographers during radiography training at a University of Technology in KwaZulu-Natal

Principal Investigator/s/researcher: Varushan Govender (MHSc: Radiography Candidate)

Co-Investigator/s/supervisor/s: Supervisor: Prof M.N. Sibiya, D Tech: Nursing (Supervisor); Dr N.P. Gam, PhD: Health Sciences (Co-Supervisor).

Brief Introduction and Purpose of the Study: The purpose of this study is to explore and determine if the radiography education curriculum in the eThekwini district of KZN promotes entrepreneurship and equips graduates with the skills needed to start and successfully run their own private enterprises. Tertiary institutions are viewed as important drivers of innovation in the healthcare field due to their role in teaching and research. If radiography curricula are transformed in this way, radiographers who go into private practice will have a lowered chanced of failure and heightened chances of success. In order to meet future workforce needs, students must be trained in new healthcare practices and develop novel solutions for healthcare. Your participation will help the researcher collect data on the specific challenges that graduates face when entering radiography practice, as well as make recommendations for changes to the teaching and training curriculum to encourage successful entrepreneurship.

What is Research? Research is a systematic search or enquiry for generalised new knowledge.

Outline of the Procedures: If you agree to take part in this study, you will have 10 minutes to read the information letter and ask any questions you may have. This procedure will be carried out at a mutually agreeable location, date, and time. You will then be asked to participate in an interview. This could take up to 45 minutes to complete. Online or in-person interviews may be conducted, depending on your preference. If a physical interview is requested, the researcher will adhere to the Infection Prevention and Control Guidelines for

COVID-19. The responses of interviewees will be recorded using a voice recorder, and the text of these responses will be captured and saved in PDF format.

Risks or Discomforts to the Participant: There are no risks or discomfort associated with this study.

Explain to the participant the reasons he/she may be withdraw from the Study: You have the option to leave the study at any time. Please notify the researcher if you decide to do so. You are under no obligation to finish the study; however, the researcher encourages you to do so.

Benefits: The findings of this study will aid educators and tertiary institutions offering radiography training to develop their curricula to meet modern technological demands and changes, as well as ensure that purposive efforts are made towards ensuring that graduates are adequately equipped for successful entrepreneurship after completing their studies.

Remuneration: There will be no monetary compensation for taking part in this study.

Costs of the Study: You will not be responsible for any expenditures as a part of this study.

Confidentiality: The data collected will be disseminated in a manner that will ensure confidentiality of the participants. Participants will not be identified by their names, instead, codes will be used. Data collected will be kept in a protected locker and electronic data will be kept in a pass-worded hard drive and will be shredded and deleted after 5 years.

Results: The findings from this study will be presented at conferences and will also be published in accredited journals.

Research-related Injury: There are no anticipated research-related injuries.

Storage of all electronic and hard copies including tape recordings: Although the personal details of the participants and their responses will be saved on a computer, only the researcher will have access to this information. Hard copies including tape recordings will be kept in a protected locker and electronic data will be kept in a pass-worded hard drive and will be shredded and deleted after 5 years.

Persons to contact in the Event of Any Problems or Queries: If you have any questions or queries relating to the study and its procedures, please contact the researcher, Varushan Govender at 21707030@dut.ac.za or the supervisors Prof M.N. Sibiya at nokuthulas@dut.ac.za and Dr N.P. Gam at nkululekog@dut.ac.za or the Institutional Research Ethics Administrator on 031-373 2375. Complaints can be reported to the Acting Director: Research and Postgraduate Support Prof. K. Motaung on 031-373 2092 or researchdirector@dut.ac.za.

Appendix 6: Consent

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Mr V. Govender about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____168/22_____,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____ _____ _____ _____

Full Name of Participant Date Time Signature / Right Thumbprint

I, Varushan Govender, herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____ _____

_____

Full Name of Researcher Date Signature

_____ _____ _____

Full Name of Witness (If applicable) Date Signature

_____ _____ _____

Full Name of Legal Guardian (If applicable) Date Signature

Appendix 7: Interview guide

SECTION 7A : DEMOGRAPHIC DATA

Participant code :

Hospital code:

Date of interview: ……...

Please answer the following questions in the spaces provided by placing X in the most appropriate option or providing an appropriate answer.

SECTION A: DEMOGRAPHIC DATA

1. Gender

Male	
Female	

2. Race

African	
White	
Indian	
Coloured	
Other	

3. Age

18-24 years	
25-39 years	
40-49	
50 and above	

4. Highest degree or level of education you have completed

Diploma	
Bachelor's Degree	
Master's Degree	
PhD	

5. Do you currently work in the public or private sector?

Public	
Private	

6. What is your current employment status?

Employed Full-Time	
Employed Part-Time	

SECTION 7B: INTERVIEW QUESTIONS

Research question 1: What entrepreneurial and business skills are incorporated into modules offered by a University of Technology in the eThekwini district?

Probing questions

- Which modules do you consider to be essential components of entrepreneurship and were these modules part of your curriculum?
- What other modules should be incorporated into radiography curriculum to help students develop the entrepreneurial capacities.

Research question 2: Starting a business necessitates certain skills and characteristics. What entrepreneurial knowledge and skills did you acquire during radiography training?

Probing questions

- Do you think you were adequately equipped with entrepreneurial and workplace management skills during your undergraduate studies?
- In your opinion, what skills are necessary for one to succeed as an entrepreneur within the field of radiography?
- What challenges did you face in establishing your private practice?

Research question 3: What changes are necessary to the radiography curriculum for the development of entrepreneurs?

Probing questions

- What can academic institutions do to promote entrepreneurship amongst graduates?
- Do you consider any modules taught during radiography training redundant?
- Do you suggest incorporation of new modules to enhance entrepreneurship amongst graduates and what are these modules?

Appendix 8: Permission from David Kolb for Experiential Learning Cycle

Your request for reflective learning model Inbox

David Kolb 16 Aug
Aloha Varushan--I am not sure what you are asking permission for. Please send

Varushan Govender 16 Aug
Hi Mr Kolb, I am requesting permission to use yours and Mrs Kolb's Reflecting Learning

David Kolb 18 Aug
to me

Aloha Varushan--The experiential learning cycle you sent is old. I am attaching the current version and the tech specs. Note this is not called the reflective learning cycle.
You have permission to use either version with the correct name.

Best, Dave

Appendix 9: Sample of a transcript

Participant Two

The purpose of this study is to explore and determine if the radiography education curriculum in the eThekwini district of KZN promotes entrepreneurship and equips graduates with the skills needed to start and successfully run their own private enterprises.

This Interview schedule consists of the following sections:

Section A: Demographic Data

Section B: Interview questions

Section A: Demographic Data

Please answer the following questions by selecting the most appropriate option.

Participant Code:

D

Date of Interview:

08/30/2022

Gender:

Female

Race:

Indian

Age:

18-24

Highest degree or level of education you have completed:

Bachelor's Degree

Do you currently work in the public or private sector?

Private

What is your current employment status?

Employed Full-time

Section B: Interview Questions

This section consists of the following subsections:

Objective 1

Objective 2

Objective 3

Objective 1

Determine entrepreneurial and business skills incorporated into the modules offered by a University of Technology in the eThekwini district's current radiography curriculum.

1.1 Which modules do you consider to be essential components of entrepreneurship and are/were these modules part of your curriculum?

"The entrepreneurial edge. Leadership and supervisory development. The global environment."

"Yes, they were part of our curriculum, however the manner in which they were delivered was lacking and did not meet expectations."

''Focus during classes was largely on attendance/absenteeism and completion of tutorials and ongoing assignments throughout the semester.''

''At the end of the semester, upon external moderation of assessments, criticism was extensive and students were told that they missed the 'point' of what was taught. In total contradiction to those comments, at each tutorial students were being given positive feedback of the direction of their assessments. Extreme misdirection throughout the semester is what led to the

apparent poor performance during the assessment week, however that was never addressed."

"The lecturers sourced to deliver this course content where always from departments unrelated to the course content being delivered. I recall clearly that for one of these modules, we had a lecturer from city/town planning. The course content being delivered was heavily informed by these lecturers' personal experiences and beliefs. Very little of the information was current or trending. I further recall one of the lecturers stating in an entrepreneurial module that credit was the worst thing in the world."

1.2 What other modules should be incorporated into the radiography curriculum to help students develop the entrepreneurial capacities?

"I wouldn't advise the introduction of new modules entirely. However, more focus must be placed on the process of procuring and licensing radiology equipment, department design and management, DOH compliance and up to date rules and regulations. These are currently included in the course material, but are explored by students by means of a written assessment which is simply marked and no feedback or discussion takes place. Often, this assessment is treated as an information dump resulting in radiographers entering clinical environments in their community service years and only THEN properly grasping these concepts. Aside from the entrepreneurial knowledge required, this foundational information on what is necessary when starting a radiology practice from scratch is equally important."

Objective 2

Explore the entrepreneurial knowledge and skills acquired by radiographers during radiography training.

2.1 Starting a business necessitates certain skills and characteristics. Do you think you were adequately equipped with entrepreneurial and workplace management skills during your undergraduate studies?

‘‘No, at the end of my degree I did not feel the desire to pursue my own practice. That is, honestly, never something I had envisioned myself doing, however I do believe that I should at least be able to say now that yes, if I wanted to, I know where to begin, but that is not the case. During my undergraduate studies I learnt about a business plan and its components very broadly and completely outside the context of radiography. Most skills I have acquired of workplace management have come from practical experiences and observations in the clinical setting, not really from my degree.’’

2.2 In your opinion, what skills are necessary for one to succeed as an entrepreneur within the field of radiography?

‘‘Organisational skills. There is lots of paperwork involved that need to be kept updated all at different frequency (annual, monthly, weekly).’’

‘‘Clinical skills. Competence and a high quality of patient care is essential to ensure your practice attracts customers who would otherwise be drawn to the larger companies for their reputation and specialised radiological services.’’

‘‘People skills. Being able to confidently address a patient and maintain clear communication at all times while being tactful yet completely transparent about sensitive information. Especially in the current political climate, to be able to ensure proper procedures to mitigate risk and litigation.’’

‘‘Marketing. You as a radiographer must be marketable with regards to your level of skill and knowledge, as well as being capable of marketing your product against the competition of the already well-known, currently established practices.’’

2.3 What challenges did you face in establishing your private practice?

‘‘N/A’’

Objective 3

Explore the changes that should be made to the radiography curriculum in order to develop successful entrepreneurs.

3.1 What can academic institutions do to promote entrepreneurship amongst graduates?

‘‘Invite entrepreneurs to carry out seminars and hold Q&A sessions with students. Preferably entrepreneurs in the relevant field of study as the student to keep matters pertinent.’’

‘‘Employ lecturers who will deliver the course content in a manner that would encourage and excite students.’’

‘‘Teach up to date, relevant information in class and accurately guide students to completing assessments successfully.’’

3.2 Do you consider any modules taught during radiography training redundant?

‘‘No. I do believe that the general education modules play a vital role in shaping a student in terms of ensuring a well-rounded and balanced approach to learning, exploring educational material outside your field of study. The reason that they are looked upon with such high dislike as previously mentioned is due to the manner of how they are delivered. I believe it is important to recognise that other traditional universities offer similar general education modules for the same reason, and to be on par with other graduates, radiography training must follow the same basic principles. I feel these modules would have much better impact if delivered in a more enthusiastic manner.’’

Appendix 10: Certificate from the professional editor

Sarah Frost

B.A. (Hons in English Literature) (UCT), Masters in English Literature (UKZN)

Editing Services

Cell: 074 384 2772

Email: sfrost@juta.co.za

---

26 February 2023

Re: Editing services rendered

Please be advised that I have edited a thesis written by Varushan Govender (Student number 21707030, submitted in fulfilment of the requirements for the Master of Health Sciences in Radiography in the Faculty of Health Sciences at the Durban University of Technology.

Regards

Sarah Frost

Editor

Appendix 11: Turnitin report