# Theory-practice integration in radiography education: the role of teaching strategies

**Thesis submitted in accordance with the requirements of the University of Liverpool for the degree of Doctor of Education by Derick Seyram Sule**

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## DECLARATION

I declare that this thesis is a product of my own work, which has not, in any form, been presented to the University of Liverpool or any other university in support of an application for any other degree than that for which I am now a candidate.

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## ABSTRACT

## THEORY-PRACTICE INTEGRATION IN RADIOGRAPHY EDUCATION: THE ROLE OF TEACHING STRATEGIES

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Effective transition from classroom to clinical learning is an essential competency for student radiographers in an epoch of rapid technological advancements. Student radiographers' transition from classroom to clinical learning, however, depends on several factors of which curriculum design and delivery are paramount. This study aimed at evaluating how the design of radiography curriculum and teaching strategies in the unique context of the School of Biomedical and Allied Health Sciences (SBAHS) are helping student radiographers' transition from classroom to clinical learning. A sequential mixed-method research design was adopted. Data collection involved a documentary analysis of radiography curricula, interviews of academic instructors, observations of clinical supervisors and an online survey completed by final year student radiographers. The study results revealed that there was a good structuring of academic course content, but the separation between theoretical and clinical elements within the curriculum was creating an artificial dichotomy which did not support students' transition from classroom learning to clinical learning. Also, the dominance of a didactic teacher-centered approach (characterized mainly by lecture notes - PowerPoint presentations) and limited clinical situations did not support the effective integration of classroom learning with clinical learning. In conclusion, the integration problem was not identified as an issue pertaining to only content and delivery but also as an infrastructural level issue, for which recommendations proposed to educational developers include radiography curriculum restructuring, the formal teacher training of instructors, the establishment of dual role lecturer/clinical radiographers and collaborative partnerships between SBAHS and health facilities supporting students with their clinical education. Recommendations are also made for potential areas for further studies on the integration of classroom and clinical leaning in radiography education.



Keywords: Radiography, curriculum, teaching strategies, theory, practice, integration,

transition, know-how, know-that

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES



## ABBREVIATIONS

| | |
|---|---|
| AAU | Association of African Universities |
| ASRT | American Society of Radiologic Technologists |
| BSN | Bachelors of Science in Nursing |
| CoR | College of Radiographers |
| CT | Computed Tomography |
| DoH | Department of Health |
| FDNA | Faculty Development Needs Assessment |
| GES | Ghana Education Service |
| HE | Higher Education |
| HEI | Higher Education Institutions |
| HPC | Health Professions Council |
| HSG | Hysterosalpingography |
| ISRRT | International Society of Radiographers and Radiological Technologists |

| | |
|---|---|
| ITP | Integration of Theory and Practice |
| IV | Intravenous |
| JRCERT | Joint Review Committee on Education in Radiologic Technology |
| KH | Knowledge-how or Know-how |
| KSA | Knowledge, Skills, and Abilities |
| KT | Knowledge-that or Know-that |
| MCQ | Multiple-choice questions |
| MOE | Ministry of Education |
| MOH | Ministry of Health |
| MRI | Magnetic Resonance Imaging |
| NTC | National Teaching Council |
| OSCE | Objective Structured Clinical Examination |
| PBL | Problem-based learning |
| PIS | Participant Information Sheet |
| QAA | Quality Assurance Agency |
| SBAHS | School of Biomedical and Allied Health Sciences |
| SBE | Simulation-based education |
| SOP | Standards of Practice |
| UG | University of Ghana |
| UK | United Kingdom |
| UoL | University of Liverpool |
| USA | United States of America |
| VPREC | Virtual Program Research Ethics Committee |

# CHAPTER 1

# INTRODUCTION

One of the ultimate goals in higher education is that educators will provide the necessary supports which enable students' effective use or transfer of the learning gained in one situation to other learning situations (Wrenn & Wrenn, 2009; Choi & Lee, 2008; Ferguson & Jinks, 1994). When students, however, fail to meet this goal, it is considered a problem, especially from the view that the transition from say - classroom learning to clinical learning situations and vice versa is a key characteristic of effective learning (Wrenn & Wrenn, 2009). Students' failure in reaching this goal thus raises concerns about the quality of training, for which some critics have assailed tertiary institutions for the inadequate planning, design, and delivery of their training programmes (Hora & Ferrare, 2013; Arum & Roksa, 2011; Bok, 2005).

Recorded incidences of this problem in training programmes of some health professions like nursing, medicine, public health, and social work have resulted in studies being conducted within these disciplines and professional training contexts (Johanson, 2013; Philips, 2013; De Swardt, Du Toit, & Botha, 2012; Allan, Smith, & O'Driscoll, 2010; Mortell, 2009; McCaugherty, 1991). Given that students' inability to effectively integrate classroom learning with clinical learning is fast becoming a global problem for healthcare professions (Cameron, Millar, Szmidt, Hanlon, & Cleland, 2014; Wrenn & Wrenn, 2009; Tight, 2003; Ferguson & Jinks, 1994), the researcher hope to address some aspects of this issue by looking at the design and delivery of the radiography curriculum.

## 1.1 Rationale: The researcher’s practice-based problem

For almost a decade now, there has been a similar increasing expression of professional concerns regarding the teaching, learning, and practice of radiography in Ghana. A typical example of such concerns is the perceived notion of the poor integration of classroom knowledge into clinical practice among some student

radiographers trained at the School of Biomedical and Allied Health Sciences (SBAHS), where the researcher works. Feedback from some clinical settings suggests that even though these students seem to demonstrate excellent academic capabilities, they, however, fail to exhibit such academic prowess in their clinical practice. In short, the main problem the researcher wishes to explore here is the lack of effective transition from classroom learning to clinical learning. While it is here acknowledged that a student's development of such skill regarding the effective transition from classroom to clinical learning situations might continue far beyond the final stages of professional training, student radiographers, however, need to develop this skill before graduation.

In view of this problem, the researcher has questioned continuously with regards to: (1) whether radiography education in Ghana is really supporting quality patient management; (2) whether radiography curriculum is helping achieve the goals of radiography education both locally and globally; (3) whether teaching strategies are enabling student radiographers to become integrators of classroom and clinical learning; (4) whether better strategies could be adopted in the teaching and learning of radiography in Ghana.

In the first place, people across the globe die each year from unintended and preventable medical errors (Kiersma, Plake & Darbishire, 2011; Kohn, Corrigan & Donaldson, 2000). Similarly, in radiography, there is clear evidence of low-dose risks of ionizing radiation resulting from its misapplication to patients (Acharya *et al.,* 2003; Abylkassimova *et al.,* 2000; BEIR V, 1990, 2005; Archer, 1989; Baverstock & Papworth, 1985). Also, since safe and quality patient care is claimed to be directly impacted by the quality of training received by healthcare professions' students (Leotsakos *et al.,* 2014; Kiersma, Plake, & Darbishire, 2011), research is needed to re-evaluate health professions education so as to guide curricular review, explicitly paying particular attention to teaching methods and interdisciplinary collaborations that lead to the integration of classroom and clinical learning (Jha, Orav, Li, & Epstein, 2007; Madigosky *et al.,* 2006).

Again, the questions posted above are based on the researcher's understanding that educators of healthcare professionals have a duty to minimize patient risk in health

care and improve the quality of patient management by strengthening their educational systems (Leotsakos *et al.,* 2014). In other words, the researcher holds the opinion that the design and delivery of radiography education needs to support the integration of classroom and clinical learning because quality patient management is a duty and a critical part of health professions' education.

At the conceptual level, Allen (2009) and Darling-Hammond (2006), whose works focused on theory-practice integration, offered an explanation which suggests that the ineffective transition from one form of learning to another is an application problem, or better phrased as a problem of enactment, meaning the challenge is with the students' inability to integrate theoretical knowledge appropriately with practical situations. This conception implies that focus needs to remain placed on helping such students link or connect actual theoretical knowledge obtained in the classroom with practical experiences (Allen, 2009). Given the above explanation, a suggested approach to achieve this is through curriculum design and practicum-type periods where students are encouraged to put into practice the theories explored on campus (Allen, 2009). Also, this approach requires that instructors target a range of standards against which students must demonstrate competence before they are allowed to progress in the program (Allen, 2009).

Another view suggests that the ineffective transition from one form of learning to another may arise when students lack practical wisdom which often is referred to as the inability to make rational, informed judgments without recourse to any formal decision procedure (Falkenberg, Goodnough, & MacDonald, 2014; Phelan, 2005; Korthagen, 2001). From this perspective, resolving the integration problem is not only a matter of bridging acquired theoretical knowledge with practical experiences (as described by Allen, 2009), but also, a case of students having the knowledge of what is good or bad and then having the capacity to act on such knowledge within a practical context through reflection and deliberation during the delivery of the curriculum (Falkenberg, Goodnough, & MacDonald, 2014; Korthagen, 2001).

Although varied in their views, each view, however, makes an essential point by emphasizing the need to combat the integration problem by paying attention to the

design and delivery of curriculum. It is in these views, coupled with a deeply embedded belief that the effective transition from classroom learning to clinical learning is a skill (competency) which is imperative for working efficiently within radiography that the researcher found his interest to investigate the integration problem at SBAHS.

## 1.2 Terminology: theory, practice, and knowledge

There are diverse interpretations of what theory-practice integration is and interestingly, these different interpretations are grounded in distinct notions of theory and practice as forms of knowledge. Knowledge itself is defined as the theoretical or practical understanding of a subject and may be presented in distinct forms as facts, information and skills acquired through experience or education. Given the understanding that this distinction is important and fundamental to how the forms of learning are represented and operationalized in this study, the varieties, nuances and slightly different dichotomies are briefly touched on in the next sections.

Going by epistemology, distinctions can be made among three kinds of knowledge (Lum, 2017; Winch, 2017; Hetherington, 2006). One type of knowledge encompasses knowing that a fact is true – say, Wilhelm Roentgen discovered ionizing radiation in 1895. Another kind of knowledge is to know something – say, ionizing radiation in diagnostic radiography is used to detect bone fractures. There is also another type of knowledge, which is to know how to do something – say, produce a radiograph of a patient's fractured limb. The first referred to knowledge-that (KT) or propositional knowledge while the last refers to knowledge-how (KH) (Lum, 2017; Hetherington, 2006; Snowdon, 2004; Alter, 2001; Stanley & Williamson, 2001).

Again in epistemology, the use of the term ‘theory’ most commonly refers to propositional knowledge, declarative knowledge, factual knowledge or knowledge-that whilst ‘practice’ on the other hand, is a term defined as knowledge-how or procedural knowledge of something which sometimes can be abstract and theoretical too (Bengson & Moffett, 2012a, 2012b). This last statement implies that knowledge-how may sometimes be dependent on knowledge-that and may sometimes also be independent

of knowledge-that. Doubtlessly, the statement above does call for several deliberations on the degree to which knowledge-how is dependent or independent of knowledge-that. Of course, the knowing how to perform a procedure may not necessarily be about knowing lots of facts about the procedure. Again, to demonstrate one's know-how of a procedure, one's ability may also not necessarily be preceded by some implicit or explicit consideration of the facts about how to perform the procedure.

One can deliberate on the points above by considering several schools of thought. For instance, Gilbert Ryle's (1971) anti-intellectualism conception offers an explanation which suggests that there is a significant degree of independence between knowledge-how and knowledge-that (Bengson & Moffett, 2012a, 2012b; Sax, 2010). Again, this view argues that a students' know-how in performing say - a radiographic procedure, is not to know the right facts about how the procedure should be done. To thus demonstrate the know-how of a radiographic procedure, this school of thought posits that the student need not first precisely consider the facts about how the procedure is performed. Picturing this conception through radiography education, of course, to some extent this is true. For example, in a just-in-time learning situation (Williamson *et al.,* 2004; Morgan, 1990), learning may occur spontaneously (i.e., without premeditation) during clinical radiography practice where students might not have had any prior classroom knowledge of the procedure.

Another school of thought, quite contrary to Gilbert Ryle's (1971) anti-intellectualism, is intellectualism which also posits that know-how and know-that are dependent (Bengson & Moffett, 2012a, 2012b; Sax, 2010). This perspective argues that a student's know-how in performing say - a radiographic procedure is to know the right facts. So, with this school of thought, a student's ability to demonstrate know-how of say - a radiographic procedure requires a prior explicit or implicit consideration of a proposition. Picturing this conception through radiography education, here again it is agreed that this to some extent is also true because, a student's ability to perform a particular procedure say – Barium studies (swallow, meal and enema) would require a student to have prior classroom knowledge about the anatomy and physiology of the digestive system as well as radiographic imaging technique.

The discussions above validate the report by Winch (2015) that many of the debates on the relationship between knowledge-how and knowledge-that have been coined around whether or not knowledge is to be conceived of as an ability (know-how) or as the possession of propositional knowledge (know-that). Also, distinctions can be made between a person's knowing-that and knowing-how based on whether what the person knows is made manifest in the form of 'utterances', 'acts' or a 'picture of a mind' (Lum, 2017).

Further, from Lum's (2017) postulation, it is seen that in our attempts at articulating what it is that other people know, our judgments may be rooted in our ambiguities of language, attributions/conceptions of knowledge and perhaps our focus (i.e. whether or not our attention is on the object/knower, the observer or the processes brought to bear by the observer in making judgments). According to Lum (2017), this clarification is very important because it has serious implications for vocational and professional education assessment, especially when educators set out to determine what their students know. For instance, on the one hand, some educators may set out to determine what their students know by employing formal processes centered on objective criteria which merely seek to confirm the absence or presence of some specific predetermined behavioral manifestations. According to Lum (2017) this kind of judgment is termed as 'judgment of identity' and, more often than not, is the precise thinking that lies behind the current vogue for outcomes, skills and competencies in non-critical, informal or vocational learning circumstances. On the other hand, some educators may set out to determine what their students know by drawing on any available evidence deemed to be relevant and by this approach such educators are able to construct a 'picture of a mind' which is constantly updated as more evidence becomes available and in turn helps them judge what their students know (Lum, 2017). The latter kind of judgment is what Lum (2017) termed as 'Judgment of significance' which often, is the preferred approach in formal or high stake learning circumstances, especially when it is vital to determine what a student actually know. Lum (2017) therefore cautions that instead of making references to specific manifestations which the know-how and know-that distinctions may be associated with, our attempts at judging what a student knows should rather be focused on the student's comprehension

or understanding or other notions which are not characteristically un-bifurcated. Also, rather than consider the know-how and know-that distinctions as epistemological categories, Lum (2017) suggests that the know-how and know-that distinctions should be seen as merely the means by which we indicated how a person's knowledge is made manifest.

Interestingly, Winch (2017), from a more practical position, posits that although know-that and know-how may be seen as distinct, yet they are closely related epistemic abilities. Moreover, in assessing professional capacity, they both are often found together as part of overall professional competence (Winch, 2017). Also, given the complexity and context-specificity of educational processes (Winston, 2015), Winch's (2017) suggestion about the need to understand these know-that and know-how constructions by referencing their use in professional contexts does make much sense because a strong contextual understanding is needed to make sense of these constructions. For instance, while some professional contexts will insist or give priority to ability to act (knowing how to do the job), some other professional contexts may also insist that it is the knowing-that that is the wellspring of expertise. Therefore, what matters is being clear about where our use of the know-how/know-that distinction does make sense and where it doesn't make sense (Lum, 2017).

Following the above emphasis on the contextualization of these constructions, a 'theory' may be seen from different professional contexts either as formal/classroom learning, coursework, academic knowledge, acquisition of declarative knowledge, a foundation to practice or a conceptual form of professional practice (Lum, 2007, 2009, 2017; Winch, 2017; Dalkir, 2005). Similarly, 'practice' may also be seen from different professional contexts either as clinical learning, the application of theory, providing the context for theory or the act of doing which may happen only in practice settings or may also happen in both academic (e.g. classroom learning) and practice/clinical learning settings (Lum, 2007, 2009, 2017; Dalkir, 2005). The argument that 'practice' may occur in any of the forms of provision thus suggests that not all knowledge arising from classroom and clinical contexts can be classified respectively as 'theoretical' and 'practical'. In other words, there are some learning instances/situations in which the

knowledge gained from classroom is not always ‘theory’. Following these descriptions, the researcher is using the terms ‘theory’ and ‘practice’ in this thesis to mean classroom learning and clinical learning respectively.

In view of the descriptions of ‘theory’ and ‘practice’ given above, the distinction between know-how and know-that could similarly be seen as being overlapped by the distinction between theoretical and practical knowledge; declarative and procedural knowledge; as well as the modes of provision. Moreover, depending on which of these conceptions of knowledge one may subscribe to, the relationship between theory and practice can also be seen either as that of mutual dependency or hierarchical relationship. Individual understandings of theory and practice thus give rise to how the relationship between theory and practice is conceptualized.

In the context of radiography education at SBAHS, the university-based faculty (academic instructors) provides the classroom learning on how to perform radiographic procedures through coursework while the hospital-based instructors (clinical supervisors) make provision for clinical learning. Basically, both provisions of learning are to ensure that there is effective transition of learning from one form to the other. The two distinct groups of instructors in their respective settings however give a picture of what Wenger-Trayner and Wenger-Trayner (2015) describe as two ‘communities of practice’ (i.e. university-based and hospital-based instructors), The two groups show unique ‘landscape of practice’ (nature of practice knowledge), in that, the body of knowledge required in the practice of each professional, is quite different but jointly, they share a common vision, which is, to train student radiographers in developing professional competence. In the first place, the varied professional background of some university-based instructors (e.g. radiologists, medical physicists) and that of hospital-based instructors (e.g. clinical radiographer/supervisors) is a confirmation that the ‘landscapes of practice’ of the two groups of instructors differ. However, their distinct ‘landscapes of practice’ is not to say that university-based instructors do not have a role to play in helping students within the classroom setting to develop practical knowledge as well. In other words, knowledge of the radiography profession should not be seen as being developed in only one learning context (i.e., either classroom learning or clinical

learning situation). In other words, the transition from one form of learning to another should not be seen as uni-directional because both academic and clinical instructors within their unique landscape of practice need to ensure that knowledge is developed and transferred in both directions (i.e., from classroom to clinical learning situations and vice versa).

Moving on, the relationship between theory and practice in radiography education, to some extent, may also be seen as somehow hierarchical, in the sense that theoretical underpinnings are first delivered and used to guide the practice by providing the framework for understanding clinical observations. Here, theoretical frameworks not only prescribe what should be done in specific clinical situations but also explain why such actions in clinical practice are relevant. For example, in an imaging modality such as ultrasonography, an instructor, in the classroom situation may provide students with the knowledge on basic principles guiding ultrasonography and the formation of images on the monitor. After this, a clinical supervisor may then take over, teaching students how to handle the ultrasound transducer practically and how to position it on the patient's body, to demonstrate specific internal anatomical structures. In this case, a hierarchical relationship between the theoretical and practical modes of provision (classroom learning and clinical learning) is witnessed. However, in another teaching situation where the instructor can interweave theory (classroom learning) with practice (clinical learning) through appropriate teaching strategies, the theory may be seen as part of practice, and in such learning situations, the relationship between the two modes of provision (classroom and clinical learning) is that of mutual dependency. For instance, if the same instructor, in the classroom situation not only teaches the principles of ultrasonography but also practically demonstrate these principles by way of hands-on on an ultrasound machine, the students are more likely to see theory as an integral part of practice. The illustration above suggests that academic instructors' and clinical supervisors' modes of provision influences the extent to which students see the relationship between theory and practice as either mutually dependent or hierarchical.

Regarding the distinction between theoretical knowledge and practical knowledge, some propositions concern purely theoretical matters, say what will happen if a patient is over-exposed to ionizing radiation. Some other propositions concern

practical matters, say - what is the right way of protecting patients from incurring unnecessary irradiation during radiographic imaging procedures. Knowledge of the former is theoretical while knowledge of the latter is practical. Also, concerning how such knowledge is learned, it is possible that a student who reads a book on radiation protection and another student who learns how to protect patients using the radiation protective gadgets have different knowledge about how patient's safety is ensured during radiographic imaging procedures. In this scenario, the first student learned by being told while the second student learned by doing and perhaps this difference reflects the kind of knowledge they both might have about radiation protection and patient safety. According to Sun and Zhang (2004), such distinctions in the ways learning occurs might map roughly to the difference between explicit and implicit knowledge or procedural vs. declarative knowledge. For instance, in learning by experience, the student is more likely to take note of details that possibly get left out by reading books. In further support of this argument, reference is made to Winch's (2015) ‘concept mastery' in which transition from concept acquisition to concept mastery is offered, stressing the significance of learning in operational conditions to achieve expert performance, which in itself indicates concept mastery. Also, although Winch (2015) might have equated concept mastery to expert performance, an added emphasis was however placed on ‘activity concepts' which he argued are the context-sensitive aspects of concept mastery (Winch, 2015). It is thus seen here that the approach to learning or the delivery process of knowledge plays a significant role in how expertise is developed.

So with the identified practice-based problem being suggestive that student radiographers can describe radiographic procedures but fail in their ability to perform such procedures in clinical situations, the identified classroom vs. clinical/work practice situation highlights the difference between being able to describe radiographic procedures and enacting such procedures as well, and for which this dichotomy needs integrating. In other words, the discussion (writing or speaking) about an imaging technique say - lumbar spine radiography is one thing, and performing the imaging technique (which does not inherently involve words much of the time, and if it does then it won't necessarily be describing actions as such but for example - giving instructions and asking questions) is another. In this perspective, the integration problem can be

coined as know-that vs. know-how situation or a theory vs. practice situation or classroom vs. clinical learning.

Another twist to the theory-practice dichotomy needing highlight in radiography education is the argument that if what is discussed and described in radiography is more concrete and specific than abstract and general (which often is more theoretical), then the theory-practice dichotomy (the contrast between classroom and clinical learning) can be termed as codification vs. action. This is to say that a student's claim of knowing how to perform a radiographic technique could also mean that he/she can describe the steps to take in carrying out the procedure, e.g. knowledge embedded in the students' mind through observation but again, even though that should help, it does not necessarily follow that the student can practically perform the procedure (Hornsby, 2012; Bengson & Moffett, 2012b; Dalkir, 2005; Davidson, 2001). In other words, the know-that vs. know-how dichotomy in the context of this study which is being rephrased as codification vs. action is in the view that codified (explicit) knowledge is easily identified or employed; and does facilitate action but does not necessarily mean the real action of it (Hornsby, 2012; Bengson & Moffett, 2012b). So since in the context of this study, theory (classroom learning) is set up on the one hand and practice (clinical learning) is set up on the other hand, the use of ‘theory-practice integration' in this study is therefore only shorthand for two forms of provision (classroom and clinical learning) that should more properly be integrated such that there is effective transitioning from classroom to clinical learning and vice versa. In other words, the researcher’s use of theory-practice integration in the context of this study signifies the integration of two forms of provision purposely to ensure effective transition of learning in both directions.

Having therefore identified theory-practice integration as a skill (competency) imperative for working efficiently in radiography, the primary question here is: how are students being supported to develop such skill? Generally in education, the extent to which this skill is developed depends on several factors, including the educational curricular characteristics. Indeed, the educational curriculum does influence how, where and when the theory is applied to practice (De Swardt *et al.,* 2012). However, having said this, it is not to dispute the fact that student characteristics (individual effort and

preferred learning styles) are possible factors also worthy of consideration, especially when addressing an integration problem. Nevertheless, there was no such intention to focus this study on student characteristics, perhaps primarily because of the importance of limiting this study to a manageable scope.

### 1.3 Rationale: The researcher's practice-based motivation

At the time this study was conducted, the researcher's institution (School of Biomedical and Allied Health Sciences - SBAHS), was the only tertiary institution offering radiography education in Ghana. It tells a lot about the critical position of the researcher's institution and how crucial this was both in the training and practice of radiographers within Ghana. Moreover, as with regards to the researcher's role as Clinical tutor, the fundamental responsibility is to provide student radiographers with all the necessary supports which augment and expand their learning, purposely to enable them to become competent in clinical practice. The researcher's duties, therefore, include teaching radiographic anatomy; sometimes teaching radiographic technique; sometimes organizing tutorials for student radiographers, and monitoring student radiographers' attendance in clinical placements. Aside from these duties, the researcher's role goes with an added responsibility of liaising with clinical supervisors to obtain feedback on students' clinical performance. It was during such duty of liaising with clinical supervisors through informal conversations, purposely to obtain feedback on students' clinical performance that such feedback was suggesting an ineffective transition of learning from the classroom to clinical situations amongst some student radiographers. Given the researcher's responsibilities, it became quite worrying when feedback on students' clinical performance suggested some level of incompetence in their integration of their classroom learning with clinical situations. This discovery thus left the researcher with a strong desire to investigate the radiography training programme at SBAHS and consider his practice his research field (McNiff & Whitehead, 2005). Adding to this, the fact that radiography is paramount in patient management drove the researcher's motivation to conduct the study; thus professional competencies of student radiographers must be guaranteed before their entry into the job market.

Turning now to the researcher's role as an insider researcher, this study was intended to help gain an in-depth understanding of this phenomenon (theory-practice integration) from varied subjective perspectives, thus enabling the construction of a rich description of the design of the radiography curriculum and experiences relating its delivery within the unique context of SBAHS, UG. Regarding the practitioner research, gaining such understanding was necessary to: further inform appropriate clinical supervision; enable the identification and recommendation of teaching practices that could help students better integrate classroom and clinical learning, not only in radiography education but also in training of other healthcare professions within and beyond Ghana. The research findings are therefore of great significance to (1) the researcher's professional obligation as clinical tutor (2) quality of education and practice of radiography and other health sciences (3) as well as quality patient management in Ghana and beyond.

Internationally, the practice of radiography and its associated training programmes have, over the years, been guided by some regulatory bodies like the College of Radiographers (CoR), the American Society of Radiologic Technologists (ASRT), and the Joint Review Committee on Education in Radiologic Technology (JRCERT). These regulatory entities are mandated to ensure that specific standards of practice and training are met, as far as radiography education and practice are concerned. For instance, Standard - 3 of the Joint Review Committee on Education in Radiologic Technology's standards for an Accredited Educational Program in Radiography requires that curriculum and academic practices of an educational programme must ensure that trainees are adequately prepared for professional practice (JRCERT, 2014). Grounded in the view that students who can integrate classroom and clinical learning are the ones prepared for professional practice, this thesis was aimed at determining whether the design and delivery of radiography curriculum at SBAHS were adequately preparing student radiographers towards this goal. Moreover, being optimistic that this standard equally applies to other health professions education, the researcher anticipated that the findings from this thesis would go a long way to serve as a guide for future design and delivery of curricula within other health-related training programmes.

Given the study aim mentioned above, three different theoretical frameworks were considered: (1) Trigwell and Prosser (1993, 1996) teaching approaches (2) Bogo & Vayda (1998) integration of theory and practice - ITP Loop Model and (3) Bernstein's classification and framing of educational knowledge. A blend of the three theoretical frameworks was considered based on their corresponding elements in helping better understand the design and delivery (classroom and clinical instruction) of SBAHS radiography programme. Also, as suggested by Dick (1996) and Hager & Beckett (1995), the blending of different philosophical frameworks is one unique way of investigating complex research problems.

## 1.4 Structure of the thesis

This thesis is organized into six main chapters. Chapter 1 provides an overview of the study, clearly stating the rationale for the study.

Chapter 2 is a literature review with an initial introduction to the three theoretical frameworks used in this study. It then considers the importance of theory-practice integration in professional or service-related fields, further showing what is already known about theory-practice integration as related to curriculum and teaching strategies, how it has been studied in different disciplinary perspectives and the gaps in the literature that gave rise to this study. Finally, this chapter outlines the primary research question and sub-questions.

Chapter 3 outlines the research design, explaining and justifying the mixed-method approach used in this study, the data collection methods and how data was analyzed at each stage of the study.

Chapter 4 outlines the study findings from the four different research methods outlined in Chapter 3, comprising results from an analysis of radiography documents, interview of academic instructors, clinical observations made with respect to clinical supervision of student radiographers in clinical areas and finally, students' perception of their learning in academic and clinical learning environments.

Chapter 5 dwells on the key findings outlined in Chapter 4 to discuss how the study addressed the primary research question.

Chapter 6 is the concluding part of the thesis, outlining the authenticity of the study, the answer to the research question, the contribution of the study to existing knowledge, the limitations of the study, the study recommendations for practice and finally recommendations for future studies.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Structure of the review

This Chapter starts with an introduction of theoretical frameworks guiding both the understanding of key concepts and the analysis of findings that emerged in this study. Because of its centrality to this thesis, this Chapter dwells on a discussion of the importance of theory-practice integration to highlight why it is necessary to pay attention to the sprawling concepts of curriculum design and teaching strategies in health professions education. Following the review of what is already known and how these phenomena were investigated, a gap in the literature is highlighted on the grounds of representation, conceptual frameworks and also about how teaching strategies of radiography instructors support student radiographers in their transition from classroom to clinical learning. Although a few studies in other disciplines have drawn links between theory-practice integration and a few teaching models, the need for simultaneous consideration of the perspectives of students and instructors on this subject offers an essential rationale for the study. At the concluding part of this chapter, the primary research question and sub-questions are outlined.

## 2.2 Theoretical frameworks

The need to measure or determine the effectiveness of teaching in higher education has long been established in the literature. This need signifies the growing importance of improving the quality of teaching in higher education institutions. On the one hand, research indicates that an effective way to address issues relating to teaching quality is to develop quantitative measures which provide empirical data on different aspects of teaching (Goh, Wong, & Hamzah, 2014; Leckey & Neill, 2001). On the other hand, literature cautions that the development of quantitative measures takes a long time and encompasses rigorous processes, thus suggesting the modification and the use of existing standards that have been developed and validated in various

contexts to suit the new setting (Lonka, Olkinuora, & Makinen, 2004; Richardson, 2004). Given this latter suggestion, a possible modification of the frameworks of Trigwell and Prosser (1993, 1996) and Bogo and Vayda (1998) were considered as primary guiding frameworks for this thesis. Bernstein's classification and framing of educational knowledge were however used intermittently as the overarching framework for further analysis of study findings.

### 2.2.1 Trigwell and Prosser's approaches to teaching:

Trigwell and Prosser (1993, 1996) raise a controversial issue on whether teachers' conceptions and intentions towards teaching have a direct impact on their teaching approaches (teacher-centered, student-centered, teacher-student interaction). On the one hand, the authors argued that teachers who intend to develop or change their students' conceptions often adopt a student-centered approach to their teaching while teachers with the intention of transmitting information to their students adopt a more teacher-centered approach to teaching (Trigwell & Prosser, 1993, 1996).

Trigwell and Prosser's (1993, 1996) postulations can similarly be supported by Ajzen and Fishbein's (1980, 2000) theory of reasoned action and planned behavior which also posits that behavioral intentions, which are the immediate antecedents to behavior, are a function of salient information or beliefs about the likelihood that performing a particular behavior will lead to a specific outcome? Fishbein and Ajzen (2010) thus proposed that human behavior can best be predicted from a person's intentions, and that these intentions are determined by the person's attitudes toward the behavior, perceived norms regarding the behavior, and perceptions of control regarding the behavior. Their argument suggests that intentions have considerable predictive validity (Fishbein & Ajzen, 2010, p. 68).

Moving on, Trigwell and Prosser (1993, 1996) thus postulated that, the approaches to teaching can be differentiated based on teachers' intentions, notably:

1. Teacher-focused strategy with the aim of transmitting information to students

2. Teacher-focused strategy with the objective that students acquire the concepts of the discipline
3. A teacher/student interaction strategy with the intention that students learn the concepts of the discipline
4. A student-focused strategy aimed at students developing their conceptions
5. A student-focused strategy aimed at students changing their conceptions

The authors explained that instructors who fall within the first two orientations see the curriculum as a set of principles, concepts, facts, and procedures that the students must learn (Trigwell & Prosser, 1993, 1996). From their perspective, such instructors are usually found focusing on a set of learning objectives (fixed body of knowledge) without much attention to students' diversities in knowledge and experience (Trigwell & Prosser, 1993). The understanding gained is that since instructions from these perspectives are usually teacher-centered, presumably, the teaching practices of such instructors are likely to be characterized by presentations and methods in which these instructors tell students what they need to know. The authors went further to describe the last two approaches which they claimed are student-centered because teachers in these categories have the intention to help students acquire, develop or change their conceptions (Trigwell & Prosser, 1993, 1996). One key point made by the authors is the fact that teaching practices in these categories need to be characterized by teacher-student interactions which can help develop meta-cognitive abilities (self-awareness and self-assessment) in students.

Norton *et al.* (2005) confirmed Trigwell and Prosser's notions by demonstrating that teachers' conceptions and intentions reflect their orientation towards learning facilitation and knowledge transmission. Similarly, they also revealed that teachers with the aim of transmitting information to students were found to be adopting teacher-focused approaches while teachers who aimed at bringing about conceptual change in students were found to be taking student-focused approaches (Norton *et al.,* 2005). Using the same instrument, Coffey and Gibbs (2002) expand the discussion, highlighting that teachers who adopt a student-focused approach tend to use a more extensive

repertoire of teaching methods which are more student engaging than the teacher-focused approach.

Some other scholars have also discussed this same subject from a different point of view, arguing that teaching approaches of teachers are based on both students' characteristics and constitutional attributes of teachers themselves: style of thinking, personal features, experience and training (Zhang & Sternberg, 2002; Gibbs & Coffey 2001; McKeachie 1997). In confirmation of this notion, Goh, Wong, and Hamzah (2014) conducted a study which indicated that a student-centered approach to teaching happen with students who desired to understand what they were studying. On the other hand, teacher-centered approach to teaching exhibits a positive correlation towards a superficial learning approach (copying or memorizing) on the part of the students (Goh, Wong, & Hamzah, 2014).

Further building on Trigwell and Prosser's framework, Norton *et al.* (2005) used different contextual variables to argue why different teachers adopt different teaching approaches. Their explanation suggests that context shapes everything and for which account must be taken of the various factors (such as characteristics of the students, teacher, course design, course content and the institutional system) which may influence teaching. For instance, Norton *et al.* (2005) made a point that teachers who adopt a student-focused approach are more likely than those who adopt a teacher-focused approach to report that their institutions or departments prioritize or value teaching. However, an identified controversial issue is that, assuming all contextual factors remain constant, will teachers adopt similar teaching approaches? Unfortunately, their study failed to highlight why teachers might adopt different teaching approaches, even in similar contexts.

According to Trigwell and Prosser, there are intrinsic and extrinsic factors contributing to the choice of strategies adopted by teachers in the learning environment. Given this, teachers are considered to be in a better position to explain why they prefer specific teaching strategies to others. Although teachers may know how learning takes place and may identify the appropriate teaching strategies to make learning happen effectively, it is argued that the changing terrain of student learning and the roles played

by teachers in active learning still require that teachers continuously develop themselves professionally (Goh *et al.,* 2014). It is given such arguments, which this thesis considers it a good idea to evaluate teaching strategies from academic instructors' perspective.

With the growing need to obtain feedback from individual teachers, the Approaches to Teaching Inventory (ATI) developed by Trigwell and Prosser (2004) has over the years become deeply rooted in educational research involving the investigation of teaching quality. Although frequently used in Western universities, the usage of this framework in Ghanaian higher education is still lacking. Perhaps, it could be resulting from a fundamental ambiguity, in that the inventory only assesses the beliefs and intentions of teachers while focusing less on what takes place in the classroom. Interestingly, Trigwell and Prosser's (1993) analysis of approaches to teaching with regards to teachers' intentions and strategies and the subsequent implementation in the 'Approaches to Teaching Inventory' show this ambiguity. Drawing from the study of Norton *et al.* (2005), Trigwell and Prosser's account of teachers' intentions and the items in their inventory which are intended to measure teachers' intentions were found to be concerned primarily with teachers' beliefs about teaching. For example, a teacher is cited to have organized a class test for students just with the belief that such a test will offer students the opportunity to demonstrate their changed conceptual understanding of a particular topic (Norton *et al.,* 2005). On the contrary, Norton *et al.,* (2005) again reported that Trigwell and Prosser's account of teachers' strategies and the items in their inventory which are intended to measure teachers' strategies were found to be concerned primarily with teaching intentions. The authors cited the example of a teacher who showed that during lectures for his subject, he uses difficult examples to provoke debate (Norton *et al.,* 2004).

Some researchers like Samuelowicz and Bain (1992) also postulate that teachers might have both working conceptions and ideal conceptions of teaching. Basing their argument on limited evidence, they explained that the goals of teaching expressed by academic instructors coincide with the ideal conception of teaching while their teaching practices are indicators of their working conception of teaching (Samuelowicz & Bain,

1992). From this perspective, the authors suggested the need to direct research towards the factors (student, teacher, institution-related) which prevent academic instructors from performing based on their ideal conception of teaching and by so doing, a solution can be found to one of the major puzzles of higher education - the incoherence between the stated goals (development of critical thinking) and educational practice (uninventive scope of content and examining of factual recall) so often referred to in the literature (Norton *et al.,* 2004; Samuelowicz & Bain, 1992).

Kember and Kwan (2000) also postulate that an instructor's approach to teaching might reflect the instructional behavior that, other things being equal, the instructor finds the most compatible, in which case it is likely to be closely aligned with the instructor's conception of teaching. Norton *et al.,* (2005) also argue that a teaching approach might reflect teaching behavior that the instructor is obliged to adopt by the curriculum, the institution or the students themselves. In this latter case, it is likely to be more closely aligned with the instructor's perceptions of the teaching environment than with their conception of teaching (Norton *et al.,* 2005). In other words, the teaching approach of an instructor represents a specific response to a defined teaching situation that will be directly evidenced in the instructor's classroom behavior (Martin *et al.,* 2000).

Trigwell, Prosser, and Taylor (1994) developed a preliminary version of the Approaches to Teaching Inventory using a qualitative approach known as phenomenography in which the primary research method is interviewing. Norton *et al.* (2005) later add that with such phenomenographic qualitative approach, it is possible and easy to collect data on teachers' approaches to teaching as a measure of teaching quality. However, the initial explanation of Marton (1994 cited in Norton *et al.,* (2005) suggest that since phenomenographic qualitative research is usually a description of the qualitative variation in the ways participants perceive, understand, experience, understand, or conceptualize a concept, its outcome depends on one's conception of quality.

In addition to the explanations given above, Trigwell and Prosser's (1996) postulation suggest that with a phenomenographic qualitative approach it is possible to match teachers' intentions (concept development, conceptual change, information

transmission, concept acquisition) towards teaching with their teaching approaches (student-focused, teacher-focused, teacher-student interaction). For instance, teachers who intend to develop and change their students' conceptions may approach their teaching in a student-oriented manner while teachers with the intention of transmitting information to students will have a more teacher-oriented approach (Norton *et al.,* 2005). Moreover, as compared to the quantitative inventory of Trigwell and Prosser (1993, 1996), the intention to obtain qualitative data from academic instructors to enable an evaluation of their teaching strategies better posits the phenomenographic qualitative approach for this thesis.

### 2.2.2 Bogo and Vayda's (1998) Integration of Theory and Practice (ITP) Loop Model:

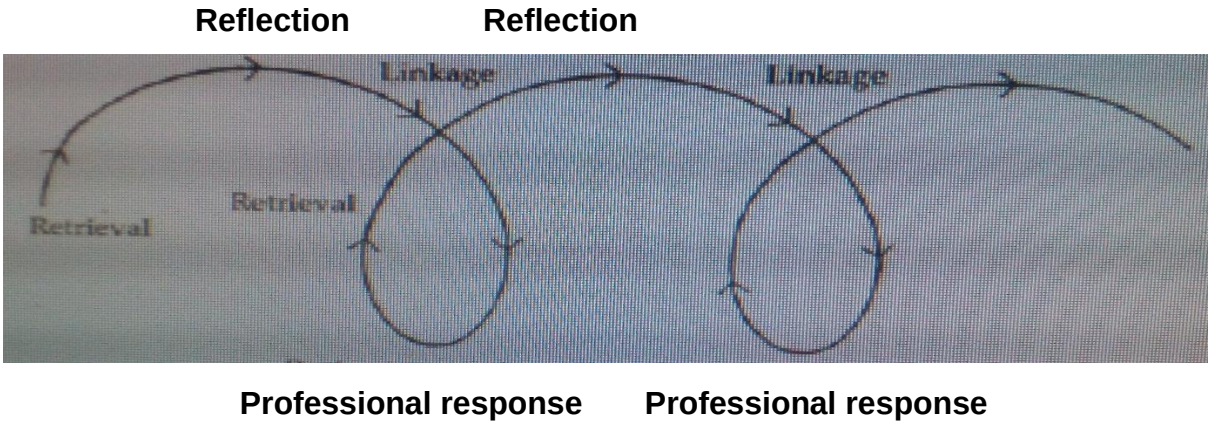
From a Social work perspective, Bogo and Vayda (1998) introduced an 'ITP Loop Model,' a generic process which provides a unifying structure for both practice and field instruction. This model more or less draws attention to the integration of theory and practice in social work practice. From the authors' perspective, practitioners and educators in social work always characterize the business of practicum as the place where theory (classroom learning) is integrated with practice (field work) (Bogo & Vayda, 1998). Moreover, since educators' primary aim is to transform students into professionals, the authors postulate that teachers must be able to examine their practices and express the thoughts, feelings, attitudes, and values that influence the actions they take in the learning environment (Bogo & Vayda, 1998).

For practitioners to become field instructors, they must first be able to examine their practice and understand the values, thoughts, feelings, and attitudes that influence their actions (Bogo & Vayda, 1998). It is just because practitioners sometimes fail to recognize that many of their actions have become second nature, so that plans and behaviors may appear to the observer, as evolving naturally (Bogo & Vayda, 1998). Moreover, also overlooked sometimes is the fact that professional behavior is based on implicit beliefs and ideas developed through educational and practical experiences. It is

thus important that this integrated knowledge be identified so that the field instructor can communicate it to the student (Vayda & Bogo, 1991; Bogo & Vayda 1987, 1998).

According to Bogo and Vayda's (1998) framework, field instruction or teaching reflects a looping process which incorporates experience, new knowledge, and future speculation and planning. Their ITP loop model of field instruction, as used with students in a practicum setting, therefore seeks to display four sequential phases (Retrieval, Reflection, Linkage and Professional response) shown in Figure 2.1 below:

**Figure 2.1: The practice of field instruction in social work (Bogo & Vayda, 1998)**




**2.2.2.1 Retrieval:** This they referred to as a recall of information (facts describing the given practice experience) and is the starting point in their loop (Bogo & Vayda, 1998). The authors' explanation indicates that teachers at this phase of the framework should focus on the use of the student's observing ego - a mind's eye paradox wherein the learner recalls a professional situation as both an observer and a participant (Bogo & Vayda, 1998). In other words, retrieval may include the careful thought of the known facts of a situation to get ready for the first encounter, or it may comprise reactions following a professional response that emerged from the previous practice encounter (Bogo & Vayda, 1998). The understanding gained from their explanation is that, through individual, group or team activities such as presentations, reading and writing reports,

the teacher can mold student's unpremeditated observations and in turn influence their interpretation of what make-up pertinent data (Bogo & Vayda, 1998).

**2.2.2.2 Reflection:** Bogo and Vayda (1998) postulate that social workers are usually trained to subject their knowledge gained in a reflective process, which forms the next phase in the ITP loop. The authors explained that reflection contains elements of the rubric of self-consciousness, which ideally should be a standard principle for every social work practice (Bogo & Vayda, 1998). They referred to reflection as the social worker's careful thought of the practice activity and, as it is used in the loop, the teacher's focus is placed on subjective meanings and objective effects (Bogo & Vayda, 1998). By their further elaboration, reflection on subjective meanings involves an examination of the personal interests that the student might have concerning the practice situation (Bogo & Vayda, 1998). The point here is that reflection entails the recognition of the assumptions, beliefs, values, and attitudes that the student attach to observed facts to make them understandable within a context and by his/her personalized assumptions of what is right (Bogo & Vayda, 1998). The authors' notion is supported by the previous work of George (1982) which reported that with field instruction the student's trait dynamics need to be considered alongside any previous or prevailing issues in the student's life which are likely to influence his or her capacity to learn effectively. Thus the purpose of reflection in teaching is to help the student gain access to personal subjective reactions to practice phenomena with which the student is involved (Bogo & Vayda, 1998). One implication of reflection is that these reactions can reflect students' internalized cultural values, distinctive reactions to similar life experiences, or personality styles (Bogo & Vayda, 1998). The main component of this phase of the loop therefore is to make explicit the student's feelings, beliefs, values, and assumptions and then subject them to critical thinking about their effect on interactions with the clients in the practice situation, on judgments being made, and on the effectiveness of plans and interventions (Bogo & Vayda, 1998). In conclusion, the teacher's role in this phase is to help students identify the challenges and changes that

are happening, or that need to happen, as learning is confronted by new knowledge and experience (Bogo & Vayda, 1998).

**2.2.2.3 Linkage:** This is the third phase of the ITP loop model and is labeled by Bogo and Vayda (1998) as the conscious application of theory to practice. They described linkage as the part of the loop that uses cognitive associations to retrieve information and to elicit associations through reflection, and then link them with knowledge acquired from reading, research studies, lectures, and general experience (Bogo & Vayda, 1998). From their explanation, the main focus of linkage is to recognize and describe knowledge that will help explain observed practice and the subjective reactions that have been evoked and to ultimately use that knowledge in planning professional response (Bogo & Vayda, 1998). In other words, they meant to say that linkage require facts and attitudes about the situation to be abstracted or generalized purposely to identify common elements that relate to a knowledge base (Bogo & Vayda, 1998). They added that the indicator of good practice is based on a well-organized knowledge composed of practical wisdom, concepts from different theories, and analytically validated results. Also, as supported by the previous study of Vayda & Bogo (1991) and Schon (1987), these fragments of knowledge form part of the practitioner's art and should be used in a seemingly instinctive manner in integrating with any practical learning situation. To help students reach this level of the loop, the authors suggest that teachers should use specific techniques such as task-centered approaches and group development strategies to bring about such skill development in students (Bogo & Vayda, 1987, 1998).

**2.2.2.4 Professional response:** According to Bogo and Vayda (1998), it is the choosing and application of a plan that informs the next experience. It implies that the social worker must take some action in response to reality at a particular point in time (Bogo & Vayda, 1998). The understanding gained from their description of this part of the loop is that the teacher needs to continually evaluate how students ground the

ideas, knowledge, and wisdom discovered in developing peculiar plans and behaviors for dealing with new situations (Bogo & Vayda, 1998). Also, the organizing principle of Bogo and Vayda's framework is based on the belief that the teacher owns a unique combination of knowledge, values, and skills that can be expressed and transferred to the student.

So far, the critical merits identified in Bogo and Vayda's ITP Loop Model includes its usefulness in:

- assisting instructors examine their teaching practice
- evaluating the learning progression of students in service-related fields
- assess the interaction between students and their instructors

In the context of this study, the ITP Loop Model is seen as a useful framework in helping evaluate the actions taken by clinical supervisors in the clinical training process. Its significance in theory-practice integration cannot be overlooked, in that it serves as a bridge, useful in helping students transfer classroom knowledge to practice by dichotomizing and classifying the elements of practice as a continually moving and advancing process (Bogo & Vayda, 1998). Accepting Bogo and Vayda's four-phase integration of theory and practice loop, therefore, provides a framework through which the level of support offered by clinical supervisors can be assessed.

In other words, the significance of Bogo and Vayda's ITP loop model to this thesis is that when related to radiography education, we can arrive at the understanding that radiographers who assume roles as clinical supervisors make a transition from being a practitioner to an educator and therefore need to continually ask themselves questions such as: what is my level of knowledge and competence? What do I teach? How do I teach students? Why do I teach this way? What do I believe is essential to teach? It is necessary to do this because educators are often credible and competent practitioners, making it necessary that they understand the basis of their competency in guiding the student through the necessary steps of knowledge acquisition, analytical thinking, skills development and practice interventions (Bogo & Vayda, 1998). Revealing the essence of the four-phase loop was necessary in addressing the clinical component of the

research question, which in this case, focused on how clinical supervisors ensured that student radiographers effectively integrate classroom and clinical learning.

### 2.2.3 Bernstein's classification and framing of educational knowledge (adapted from Gough, 2014)

**Educational knowledge codes:**

- Collection code: elements stand ‘closed' to each other, clearly and strongly bounded, a more didactic theory of learning
- Integrated code: elements stand open to each other, weakly bounded, blurred

**Classification:**

- the relationship between contents, how differentiated

**Frame:**

- structure of pedagogy (transmission of contents), the relationship between teacher and taught
  - ➢ strong framing = reduced options, less control (for either party) over selection, organization, and pacing of contents
  - ➢ weak framing = more control

**Figure 2.2: Bernstein’s classification and frame (adapted from Gough, 2014)**

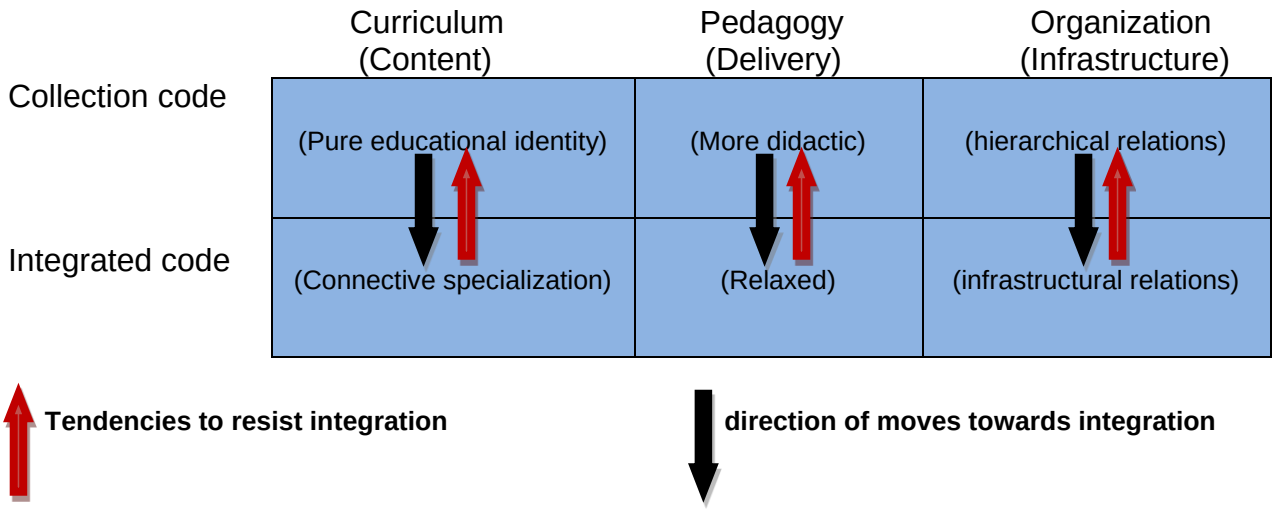


Figure 2.2 sets out general features of Bernstein's typology of educational knowledge codes. Bernstein's classification and framing describe two types of educational knowledge codes (collection and integrated codes) which Bernstein posits as differed based on the manner in which the message systems (e.g., curriculum and pedagogy) are constructed. In short, Bernstein's educational knowledge codes not only provide a language appropriate in describing pedagogic practices, interactions and relationships but also provide a proper language used in describing and analyzing how the knowledge that students develop is transmitted (relayed), constructed and then identified by the student. By exploring Bernstein's educational knowledge codes at the micro and macro levels of any educational organization, the issue of how the content learned by students is formed, controlled and legitimatized can be explored

For instance, Bernstein's discussions on ‘integrated code' emphasize the importance of connective specialization, relaxed pedagogy and infrastructural relationships (i.e., collaborative partnerships) in promoting integration and achievement of a more uniform educational knowledge. In other words, his connective specialization is seen as an innovative way of addressing the disintegrative tendencies identified as a potential consequence of specialization and growth of the intellectual division of labor in modern learning environments (Bernstein, 1971, 2000). His idea of relaxed pedagogy emphasizes how weakened or responsive pedagogical practices (e.g., sequencing and pacing) ensure effective learning.

Bernstein's (1971) idea of infrastructural relationship points to corporatism in which new forms of professional association are seen as sources of integrating classroom and clinical learning. In further support of this idea, Winston (2015) adds that collaborations can result in the sense of ownership that is beneficial to the delivery of any course. Importing Bernstein's ideology into the context of this study, the understanding gained is that more homogeneous teaching approaches can be developed when teachers who aim at the same learning outcome work more closely and teach as a team, irrespective of their educational/professional identities. Moreover, through the lens of his suggested "team teaching" ideology, the integration of classroom and clinical learning can be much more possible for students when professional

identities of both academic and clinical instructors become less emphasized in the teaching process (Berk, 2005; Bernstein, 2000). In other words, professional identities (the specialization of different fields of knowledge), regarding the weakness or strength of their boundaries and the degree of insulation between different fields is blurred out in the teaching process (Bernstein, 2000).

Bernstein's framework is thus a useful analytical tool for this study primarily because: (1) with a complex teaching and learning phenomenon like theory-practice integration, his theorization was seen as a good foundation that could help explore how the educational curriculum was helping shape radiography students' view of radiographic practices (2) his emphasis on attaching importance to content, delivery and infrastructural levels of educational knowledge are well supported in literature for coherence across programme components (Falkenberg, Goodnough, & MacDonald, 2014; Darling-Hammond, 2006; Beck & Kosnik, 2006), collaboration between institutions (Darling-Hammond, 2006), and the bridging together of theory-focused course learning with practice-focused field experiences (Falkenberg, Goodnough & MacDonald, 2014; Allen, 2009); (3) his integrated code typology (Bernstein, 1971, 2000) lays much emphasis on the balance of power between parties (which in the case of this study includes academic instructors, clinical instructors and students) purposely to enable student's access deep structure knowledge.

The above-mentioned framework of Bernstein is thus used in conjunction with Trigwell & Prosser's (1993, 1996) and Bogo & Vayda's (1998) frameworks to analyze and discuss the theory-practice problem in view of its relationship with curriculum (what is taught), delivery (how taught) and infrastructural relationships (organization of educational knowledge).

## 2.3 Why integrate theory with practice?

In professional education, the concept of theory-practice integration has received more attention because of its importance in the future role of professionals (Spouse, 2008). From the public health perspective, Helitzer and Wallerstein (1999) point out that

learning about theories only in the classroom is not enough to offer students the chance to enact them in the field, which is specifically the skill they are expected to have upon graduation. In other words, the need to achieve health education competencies and an understanding of the relationship between key areas of theory, research, policy development, and disease content makes it crucial for public health students to practically apply their theoretical knowledge to support and improve the public health system. Although the authors never said directly that theory-practice integration is an academic objective in public health education, they, however, offer the impression that students' development into theory-practice integrators is more important than sitting in an academically secluded setting postulating about hypothetical situations. The argument made by these authors is that the most important benefit of learning in the public health domain, actually, is the effective transition from classroom to field practice. Moreover, stemming from their arguments, there is a need to develop students into effective public health leaders/practitioners, and perhaps, students' development of such competence is one of the ways of ensuring that communities are served better (Helitzer & Wallerstein, 1999).

From the perspective of medical education, the studies of Mahmud (2013) and Michau *et al.,* (2009) have also shown that theory is very much inseparably connected with practice. The main thrust of these authors' argument is that gaining an understanding on how to perform specific procedures is just not enough, and therefore, students ought to transfer such understanding into real clinical situations (Mahmud, 2013; Michau *et al.,* 2009). Nurse educators have similarly made this claim and have further added that even though nursing students do have prior substantial theoretical education, matching textbook definitions of clinical situations with the actuality of practice has however always been a challenge and an issue for concern amongst members of the nursing profession (Scully, 2011).

This importance of theory-practice integration is also emphasized in the literature by Falkenberg, Goodnough and MacDonald (2014), Darling-Hammond (2006) and Beck & Kosnik (2006). For instance, in the report by Beck and Kosnik (2006), integration is considered a central theme of social constructivism and their identified integrative

strategies for social constructivist teacher education programs include the coherence and consistency of campus courses, the formation of the collaborative faculty team, and the development of a shared philosophy.

From the perspective of radiography education, the requirements for qualification as espoused in international standards for radiography education are indicative that theory-practice integration amongst its students is a desired competency and one of the yardsticks for measuring output quality of any radiography institution/educator (ASRT, 2012, 2016, CoR, 2002, 2003). With this in mind, an institution's claim of effective training for student radiographers cannot be complete without referring to students' effective transition from classroom to clinical learning.

Although some critics might object that theory-practice integration is the most crucial issue in health professions education, it is however widely accepted that it is a challenge inevitably encountered by students at various stages of their learning process, irrespective of field (Mahmud, 2013; Scully 2011; Michau *et al.,* 2009). The point is that the intended goal of health professions education is to produce graduates who are confident and capable of making decisions independently while delivering quality healthcare services to patients. Therefore, students' failure to integrate classroom with clinical learning should be a cause for worry not only in health professions education but other areas of educational enterprise as well.

## 2.4 How has this phenomenon been studied?

Given the importance of theory-practice integration, recorded incidences of ineffective integration of classroom with clinical learning in professional training programmes and health professions education (e.g. nursing, social work, public health and medicine) have over the years called for the need to study this problem within different disciplines and professional training contexts (Botwe *et al.,* 2016; Botma, 2014; Gough, 2014; Johanson, 2013; Philips, 2013; De Swardt, Du Toit, & Botha, 2012; Allan, Smith, & O'Driscoll, 2010; Mortell, 2009; Wrenn & Wrenn, 2009; Helitzer & Wallerstein, 1999; McCaugherty, 1991). However, to help justify the methodological approach

utilized in this study, a few of these studies from different disciplinary perspectives are discussed in the next sections.

Starting with Botwe *et al.,* (2016), a descriptive survey design, using a semi-structured questionnaire consisting of open and close-ended questions was employed in gathering data from 26 radiography students who had completed theory lessons in chest imaging and had either completed or were undertaking clinical rotations in chest imaging. Through this approach, the authors were able to confirm a lack of congruence between theory and practice, which was accounting for a theory-practice gap (a mismatch between formal provision and professional practice) in chest imaging during clinical rotations. Although it can be argued that lack of working materials, massive workload equipment breakdowns and supervisory factors could be possible causes of their identified gap between classroom and clinical learning, their study was however limited in the sense that their focus on only chest imaging makes it is difficult to tell whether the problem applies to all imaging procedures and if so, what other factors could be contributing to this. Moreover, they failed to implement any existing theoretical framework in their analysis and only have the perspective of one set of stakeholders, a small sample of students. These flaws in their study design bolster the significance of adopting a pragmatic methodological approach, taking into consideration a theoretical framework that best helps in studying this complex phenomenon (theory-practice integration) in radiography education.

The study by Kenyon, Dole, and Kelly (2013) provides informative discussion on a theory-practice gap in Pediatric Physical therapists' education. Aside from the use of a Delphi method which engaged a panel of experts in pediatric physical therapy, survey instruments and focus groups were employed by these authors to examine academic faculty and clinical supervisors' perspectives on entry-level DPT (Doctor of Physical Therapy) preparation for pediatric physical therapist practice. They argue that, in preparing students for pediatric practice, the entry-level curriculum must reflect the essential knowledge, skills, and abilities (KSA) required for pediatric physical therapist practice. Their study findings suggest that achievability of this goal is easier only when both academic faculty and clinical instructors come to a consensus on their

perspectives. Although, Kenyon, Dole and Kelly's small sample size appears to be a methodological flaw, relating their study focus to the context of radiography education, however, does evoke the question of whether or not there is a consensus between academic faculty and clinical supervisors in radiography education. Acknowledging the lack of consensus as a possible contributor to the problem of ineffective integration of classroom and clinical learning informs the need to design a study that seriously takes into consideration this factor.

In the study of Johanson (2013), an attempt was made at determining if new Bachelors of Science in nursing (BSN) nurses perceived their education to be relevant for the current demands of the profession. Although theory-practice integration is not mentioned explicitly in her study, the study outcome, however, seems to have partially addressed the problem of theory-practice integration in nursing education, in that, the focus of this study was on graduate nurses' perception on how adequately nursing education was preparing them to transit into professional practice. With a non-experimental, descriptive survey design, data were collected from correspondents. Her findings suggest that although new graduates perceive their academic preparedness to be sufficient for transitioning into professional practice; they however also wish that their training offer more opportunities to practice clinical skills. The key issue of concern in her study is that low exposure to clinical practice might reduce these graduates' confidence and competence with practice-related skills in the nursing profession (Johanson, 2013). The author's methodological approach is reasonable and is applicable in the context of radiography education research. For instance, her survey design can be employed in radiography education to assess students' perception of how adequately a radiography training program is preparing them for professional practice. This approach can also lead to an identification of the weaknesses in curricular design and implementation, therefore informing possible recommendations to improve students' learning experience. One major weakness in her study is that only student perspectives were explored, neglecting the views of instructors. This limitation may suggest that a holistic approach in which all the key stakeholders are covered would not be out of place.

Like in other educational enterprises, the incompetence of nurses to transfer to the clinical setting what they have studied in class gave rise to a controversial issue on whether or not teaching strategies of nurse educators do promote the transfer of learning. Botma (2014) addresses the question by investigating nursing students' perceptions on how immersive simulation (interaction with patients) promotes the integration of classroom and clinical learning. Utilizing a qualitative descriptive study design which involved two focus group interviews, she revealed that simulation helps students to apply in practice what they have studied in class (Botma, 2014). She adds that simulations help build students' certainty and makes them appreciative of the aspects of care that need to be enhanced through deliberate practice while increasing students' interest to study and transfer their knowledge (Botma, 2014). Her point is that knowledge of the benefits of simulation can guide educators to enhance the transfer of learning from the classroom to practice. Although her qualitative descriptive design was a good idea, there was, however, a disproportion in the number of high-fidelity simulators (patients) to which participants in each of the focus group was exposed, thus contributing to a significant level of bias. In other words, even though all the participants had at least three immersive simulations with standardized patients (people trained to act as patients), two out of the eight focus group participants, however, had not participated in the simulation with a high-fidelity human simulator before (Botma, 2014). Also, this disparity in the number of simulations with the high-fidelity human simulator is noted to have contributed to the differences in students' perceptions on how immersive simulation helps them apply in practice what they have learned in class. Again, her typology is limited by its focus on the exploration of only student perspectives and not any actual outcomes or other stakeholder perspectives. Moreover, although the study findings proved positive, her research finding, however, could not be generalized owing to it being restricted only to the classroom context. Perhaps an assessment on how immersive simulation promotes theory-practice integration in the real clinical practice contexts would make it more generalizable.

The study by Allan, Smith, and O'Driscoll (2010) presents an entirely different twist to the issue of theory-practice integration. The authors identified supernumerary status (an essential aspect of the hidden curriculum) as a key factor contributing to the

theory-practice gap in nursing; in that nursing students were often expected by trained staff to work while they learn and also to work competently immediately on registration. The authors noted that such expectations are contrary to those of academic nurses and are contributing to a theory-practice gap for nursing students because these expectations not only shape the clinical context but also compel students to learn to negotiate their status as supernumerary students in practice to meet these expectations. Their ethnographic case study design approach, involving the use of interviews to collect qualitative data from key stakeholders in four different institutions across England enabled the authors to investigate the problem holistically. The authors' methodological rigor was noted to have been enhanced by the utilization of an online survey, observational participation in the clinical areas and documentary analysis of the written curriculum in each higher education institution (Allan, Smith & O'Driscoll, 2010). Because of the authors' methodological orientation, not only is their approach suitable for investigating the role being played by stakeholders in other educational enterprises like radiography but also is useful in investigating how the clinical learning environment understands and emotionally supports students' transfer of classroom knowledge to clinical practice.

Gough's (2014) report on the Chartered Accountancy profession in the UK context and accounting education as a whole, offers a discussion on pedagogical practices and the transformation of students into professionals. With the aim of determining the conditions for the formation of the trainee into the professional accountant, the author discusses pedagogical requirements of contemporary professionals in respect to developing their understandings of the nature of professionalism (Gough, 2014). In Gough's (2014) paper, consideration is given to the design of curriculum in terms more extensive than just content, being concerned with aspects of delivery, i.e. pedagogical approaches to teaching the programme of study, and also in terms of infrastructure, i.e. the systems of relations of the organizations involved in facilitating the programme. And of the three theoretical frameworks used by Gough, his use of Bernstein's (1971) typology (classification and framing) of educational knowledge relates more with this thesis because this offered a reasonable explanation of pedagogical approaches and showed how the linkage across content, delivery and

infrastructural levels between higher education and the profession contributes to acceptable frameworks of effective and lifelong learning.

To conclude this section, it is acknowledged that the studies reviewed have so far attempted at addressing the issue of poor theory-practice integration, from different disciplinary and methodological perspectives. As much as these attempts are appreciated, they, unfortunately, reveal limitations concerning narrowed study focus, non-utilization of theoretical framework, methodological flaws and a gap in the literature on the grounds of representation (i.e., a gap based on the lack of critical studies relating to the effective integration of classroom and clinical learning in radiography education).

## 2.5 Why focus on curriculum design and teaching strategies?

The term ‘teaching strategy' tends to be synonymous with "teaching approach," "teaching method" and "instructional practice" in many peoples' minds. Some see ‘teaching strategy' as the approach to classroom or clinical instruction and do sometimes categorize it as didactic, facilitative or Socratic, which can be used individually or in combination with others (Carlson, Wann-Hansson & Pilhammar, 2009; Mulholland, Mallik, Moran, Scammell, & Turnock, 2005; Banning, 2005; Ramsden, 2005; McCaugherty, 1991). Many other scholars also classify teaching approaches as either teacher-centered or student-centered (Norton *et al.,* 2005; Kember, 2001; Prosser & Trigwell, 1999; Trigwell & Prosser, 1993, 1994, 1996).

The truth is that irrespective of the classification or categorization one may opt for, the interrelated processes between the teacher and students in any educational enterprise ought to provide the necessary support for effective application of knowledge acquired to professional practice. Literature has also shown that the extent to which teachers engage and support students during the learning process depends on several factors that influence teaching in higher education (Norton *et al.,* 2005; Kember, 2001; Prosser & Trigwell, 1999; Trigwell & Prosser, 1996, 1994, 1993).

As briefly mentioned in Chapter 1, the inability of students to transfer knowledge from one learning setting to the other may be because teachers do not use teaching strategies that help the student develop such skills (Botma, 2014). Of course, there are a few views on how students could be helped in developing this skill. Moreover, indeed, some initiatives have even been introduced (De Swardt *et al.,* 2012; Wrenn & Wrenn, 2009; Cohen *et al.,* 2006; Williamson, Gunderman, Cohen & Frank, 2004; Spouse & Redfern, 2000; Ferguson & Jinks, 1994) focusing on different aspects of teaching and learning in higher education. These attempts at explaining how theory-practice integration occurs in higher education or perhaps other areas of the educational enterprise have however been problematic because the environments, audiences, and goals of higher education are arguably more diverse and complex than can be imagined. To, however, aid in establishing why this thesis is focused primarily on teaching strategies and curriculum design, a few of the views on how this issue of ineffective integration of classroom and clinical learning can be resolved are considered in the next sections.

Some scholars have suggested different models by which the integration of what is taught with what is practiced can be achieved. On the one hand, researchers like Ferguson and Jinks (1994) have postulated that theoretical and clinical practice integration is better achieved through a multidimensional model which focuses more on the curriculum process, which they postulate usually constitutes the curriculum model, design, course content and assessment criteria (Ferguson & Jinks, 1994). Helitzer and Wallerstein (1999) also provide fascinating and enlightening discussions of curriculum to bring about better integration of the ivory tower and the real world. The authors thus proposed a problem-based curriculum which integrates theory and practice for public health education (Helitzer & Wallerstein, 1999).

Further, Davhana-Maselesele, Tjallinks, and Norval (2001) in their study also advocate the need for an integrated, holistic curriculum, implying that a problem-based and community-based curriculum would enhance the integration of classroom and clinical learning. McCaugherty (1991) also adds that the way in which a curriculum is planned can either broaden or narrow the gap between formal provision and

professional practice. For example, he explains that when planning the curriculum, the schemes of assessment and study blocks are commonly divided into two separate parts (theory/classroom learning and practice/clinical learning). It may carry the assumption that these two elements are separate and integration is not a primary concern for curriculum planning (McCaugherty, 1991). However, since curriculum influences how, where and when a theory can be applied to practice (De Swardt *et al.,* 2012), it must be well structured such that it prepares students both theoretically and practically to become competent practitioners.

In summary, all the authors mentioned above, have so far, focused on one common theme, which is the ‘curriculum.' Moreover, what can be taken away from their arguments is that curriculum is an important element in educational practice and must be well structured if the problem of poor theory-practice integration is to be minimized or avoided. The added understanding gained is that curriculum describes what is intended to be learned by students and also contributes greatly to the learning experience of students. It could thus be concluded that a curriculum is an essential element in educational practice which must be adequately planned, executed, and monitored continuously to inform any need for review. Given these explanations, it is important to consider whether or not the existing structure and design of the curriculum model at SBAHS meets international standards for radiography education. If not, which aspects of radiography curriculum need a reform?

Some scholars also argue that aside from the need to focus on formal curriculum, attention ought to be given to the ‘learning environment' as well. From this perspective, it is believed that good learning environments positively influence students' socialization, encourage students' attainment of enough exposure, build their confidence in the practice and eventually improve their theory-practice integration (Cohen, Garcia, Apfel, & Master, 2006; Felder & Brent, 2003; Boud, 1987). A typical example is the informal, intangible or hidden curriculum (often the less attended to) which refers to the beliefs held by individuals in the learning environment, the unwritten lessons (such as interpersonal relationships and managing problems), the expectations of both instructors and students in terms of roles, responsibilities, practices, instructional

strategies and learning output (Williamson *et al.,* 2004; Spouse & Redfern, 2000; Hargreaves, 1980). With regards to socialization, it is the hidden or informal curriculum that helps students socialize into professional cultures, behaviors and practices both in academic and clinical learning environments (Hall, 2006; Brammer, 2006; Field, 2004, Spouse, 1998a)

The study of Helitzer and Wallerstein (1999) is a typical example, illustrating from the public health education perspective, how the learning environment influences theory-practice integration. Their study is established in health education competencies and skills which have extensive support in public health education. With their systematic reflection on how students can narrow the gap between classroom provision and professional practice in public health, they found out that traditional programs in public health, which utilize a cookbook (step-by-step) instructional or teaching strategy, fail to help students to make an upswing from learning theories out of books to application in the field (Helitzer & Wallerstein, 1999). The authors thus proposed a labor-intensive teaching approach (problem-oriented and community-based approaches) to public health education, given the notion that these give students exposure and actual opportunities to apply theories and methods directly as they learn them (Helitzer & Wallerstein, 1999). This approach entails students being divided into working groups and with a scope of professional interests within each group (Helitzer & Wallerstein, 1999). Each working group is then tasked to identify a public health problem of their interest. The groups are then tasked to locate a community (learning environment) where such health problem is prevalent (Helitzer & Wallerstein, 1999). Through this approach, students can establish longstanding rapport with communities where these tasks are carried out (Helitzer & Wallerstein, 1999). Students' involvement in such learning environments (communities) offers them the opportunity to reflect on their role as health professionals in connection to matters of community self-determination, power and the possibilities of true collaborative participations (Helitzer & Wallerstein, 1999). Also, with their proposed community-based approach students are not expected to inhale a breadth of information on a number of possibly unconnected topics and with further expectation that they sort the details after they have reached a hyperventilation state of confusion around the time of graduation (Helitzer & Wallerstein, 1999). Although

it could be argued that Helitzer and Wallerstein's (1999) community-based approach cannot fit into all academic settings without some adjustment, the elementary concept of the learning environment's role in helping students learn by doing, applying theory and creating community participations certainly could fit into all academic settings. Moreover, by viewing this notion through Bernstein's three levels perhaps what needs to be done is to force a change at the infrastructural level such that a highly supportive learning environment is created to enable students to express and validate their personal goals.

Another perspective of this argument is that the learning setting could be very intolerable for students more specifically when it raises stress to levels that are debilitating to academic and clinical performances of students (Cohen *et al.,* 2006; Felder & Brent, 2003; Boud, 1987). In other words, a good learning environment must as much as possible be devoid of elements which hinder students' commitment to learning (Cohen *et al.,* 2006; Boud, 1987). Judging from the authors' arguments, some factors (e.g., socio-cultural factors) prevalent in a learning environment tends to impact the motivational beliefs and learning experience of students. For instance, in learning environments where student autonomy, independence and all developmental stages of skill attainment are treasured, the methods required for active learning are usually made clear in institutional policies, procedures, and instructional practices.

Several other scholars also believe that, aside from the need to focus on curriculum, and the learning environment, theory and practice can better be integrated by concentrating more on the role played by teachers both in academic and clinical settings. As will be discussed shortly, Wrenn and Wrenn (2009), for instance, lay emphasis on the importance of the teacher's role through an active learning model; other authors (Swardt, Du Toit & Botha, 2012; Scully, 2011; Landers, 2000; Hornyak, Green & Heppard, 2007; Jerlock *et al.,* 2003; Greenwood, 2001; Bogo & Vayda, 1998; MacNeil, 1997) similarly demonstrated this through their arguments on students' learning experience and guided reflection. Darling-Hammond (2006, p.41) adds to the argument by emphasizing that "good teaching permeates all coursework and clinical experiences such that well-defined standards of practice and performance are used to

guide and evaluate coursework and clinical work." The arguments so far are in support of the notion that the teacher is the most important factor influencing students' achievement and also the control center for all the factors above.

In Wrenn and Wrenn's (2009) active learning model, for instance, we can picture the significance of the teacher's role in encouraging students to develop into theory-practice integrators. The authors make the claim that students' ability to function effectively within any professional domain is best achieved when instructional practices engage students in cyclical processes (observation, application, reflection, and the sharing of experiences) which challenge students to integrate thinking and acting, reflect on their actions, and then share their reflections and observations with others (Wrenn & Wrenn, 2009). The key component of their claim is that theory-practice integration greatly depends on instructional practices and how well the teacher creates the learning environment conducive for such purpose. For instance, is there focus on the development of students' skills rather than only transmitting information? Are students being engaged in the learning process? Is emphasis being placed on students' exploration of their values and attitudes? Are students being engaged in higher order thinking such as evaluation, analysis, and synthesis? Dwelling on these questions, an argument can be placed that although it is crucial that students in professional programs put into practice what they have studied in classroom settings, the challenge in making this transition from theory to practice arises, at least in part, from the failure of teachers to integrate both theory and practice into the same course in the curriculum in ways that are meaningful and relevant to students (Wrenn & Wrenn, 2009; Clapton & Cree, 2004). If it is therefore so important that students integrate classroom with clinical learning, then there is a need to concentrate on teaching practices that bring the field into the classroom as well as take the classroom into the field (Clapton & Cree, 2004). Also, the argument some try to make is that the more educators try to help build theoretical content and skills of students and also try to help every trainee succeed in higher education, the more these educators need to be deliberate about creating and bridging learning experiences in classroom and clinical learning environments. Because of this, a range of strategies that draw closer the integration of theory and practice is well supported by the literature. For instance, reflection on practice (Winston *et al.,* 2013,

2012; Darling-Hammond, 2006); case study approach (Scott, Pachana, & Sofronoff, 2011; Darling-Hammond & Hammerness, 2005); live demonstration of clinical skills in classroom (Scott, Pachana, & Sofronoff, 2011); modeling (Darling-Hamond & Hammerness, 2005); student self-reports on client work (Scott, Pachana & Sofronoff, 2011); referencing field experiences in classroom courses (Bullock & Russell, 2010); audio-visuals of practice (Scott, Pachana, & Sofronoff, 2011), simulations (Cleland, 2017; McGaghie, Issenberg, Barsuk & Wayne, 2014; Botma, 2014; Leinhardt e*t al.,* 1995).

To a great extent, the above arguments relate to this thesis because some studies in the local context have shown that Ghanaian teachers are mostly found to display prescriptive instructional behaviors, being autocratic in the classroom and expecting students to listen and memorize correct answers or procedures (Amoah, 2011; Akyeampong *et al.,* 2006; Ponefract & Hardmen, 2005). Unfortunately, these are the exact teaching practices frowned at in the literature. For instance, the studies by Winston *et al.,* (2012, 2013) on remediation of at-risk medical students highlight that significant differences exist between outcomes of students working with experienced and inexperienced teachers. They emphasized that remediation of struggling medical students is better achieved when teachers are able to combine roles with high levels of teaching presence and practical wisdom (Winston *et al.,* 2012, 2013). Also, their description of experienced teachers includes being able to provide more challenging and disruptive facilitation as well as making explicit links across the curriculum and taking a dialogic stance which encourages more collaborative group dynamics amongst the students (Winston *et al.,* 2012, 2013). Instead of adopting such dialogic stance, research has however shown that Ghanaian teachers resist reforms within their work; that they are unwilling to give up unacceptable practices (Amoah, 2011; Oduro, 2008). With this in mind, it is thus believed that the competencies of Ghanaian teachers are derived from their innate qualities and that their behaviors are mostly influenced by many factors which include: type of teacher training undertaken, their innate trait based on their beliefs, their self, as well as the prevailing societal and cultural dimensions in their practices (Amoah, 2011; Oduro, 2008). Given these discussions, it could be true that as teachers try to construct classroom practices using prescriptive and autocratic

strategies which are mostly unfavorable, these are promoting disengagement amongst students and preventing the integration of theory-practice.

In the local context for instance, final year radiography students at SBAHS, having gone through the four-year training period are expected to be good theory-practice integrators because at the final stage of their radiography training, student radiographers are presumed to have been presented with the necessary classroom knowledge and clinical experiences required for independent and competent radiographic practice. Students' inability to apply classroom knowledge in clinical situations before qualification thus calls for a need to look at how instructors deliver the curriculum critically. According to Rowland (2006), an institutions' ability to achieve its goals, objectives and learning outcomes greatly depends on instructional strategies. Also, taking cognizance of Association of African Universities' (AAU) initiatives for quality assurance as well as initiatives to improve university education, the quality of instruction is considered a vital indicator of the quality of university education (Alabi & Mba, 2012). More importantly, quality assurance in university education suggests that instructional processes have direct bearings on learning outcomes or desired characteristics in students, signifying the relationship that exists between these variables (Roger, 1993). With this in mind, it is necessary to look at the relationship between teaching strategies of instructors and the accomplishment of desired learning outcome (theory-practice integration).

Moreover, the Standards of Practice (SOP) for the teaching profession in Ghana, as evidenced in the handbook for teachers on performance management (Ministry of Education, 2008), jointly compiled by the National Teaching Council (NTC) and Ghana Education Service (GES), do not only define key result areas but also define the daily practice of teachers. Given the required daily practices of teachers within the teaching profession, the handbook suggests that:

- Teachers must be dedicated to their care and commitment to learners.
- Teachers need to treat learners equitably and with respect and must be sensitive to factors that influence the individual learner.

- Teachers need to strive to be current in their professional knowledge and recognize its relationship to practice
- Teachers must understand and reflect on learner development, learning theory, pedagogy, curriculum, ethics, educational research, and related policies and legislation to inform professional judgment in practice.
- Teachers in professional practice need to apply professional knowledge and experience to promote learning.
- Teachers must use appropriate pedagogy, assessment, evaluation, resources, and technology in planning for and respond to the needs of individual learners and learning communities.

Given above SOPs, it could also be argued whether or not teaching strategies are genuinely reflecting these standards. Indeed, the call for a change in teaching practices/methods at various levels of Ghana's educational system is worth considering too. However, there has yet been any documented evidence on the inappropriateness of current teaching methods, to warrant such a call for change. Radiography education in Ghana, for instance, is yet to provide any such documented evidence on appropriateness or inappropriateness of current teaching strategies. Moreover, although there is evidence of several attempts at addressing the integration in different disciplines, there is a paucity of evidence in the literature on how the content and delivery of radiography education programmes promote the transfer of classroom learning to clinical practice in radiography education.

## 2.6 Radiography education

As stated earlier in Chapter 1, the training and practice of radiography have over the years been guided by frameworks of some regulatory bodies like the College of Radiographers (CoR), the American Society of Radiologic Technologist (ASRT), and the Joint Review Committee on Education in Radiologic Technology (JRCERT). Frameworks of these regulatory entities ensure that standards of practice and training are met, so far as radiography is concerned.

In the United States of America, the JRCERT (2014) framework spells out standards for radiography education. The whole of JRCERT's (2014) framework requires a radiography program to articulate its purposes; to demonstrate that it has adequate human, physical, and financial resources effectively organized for the accomplishment of its purposes; to document its effectiveness in accomplishing these purposes; and to provide assurance that it can continue to meet accreditation standards. However, of great significance to this study is Standard - 3 which explicitly requires that curriculum and academic practices of an accredited radiography educational programme must ensure that all trainees are adequately prepared for professional practice (JRCERT, 2014). With the notion that accreditation is the primary means of assuring and improving the quality of radiography education, it is similarly expected that all accredited radiography programs will ensure that trainee radiographers are exposed to an equitable classroom and clinical practice experiences that adequately prepare them for the job market (JRCERT, 2014). The argument being made here is that the best learning environment is created when these two learning modalities (classroom and clinical learning experiences) are integrated throughout a training programme rather than partitioned in the curriculum (Wrenn & Wrenn, 2009; Clapton & Cree, 2004).

The ASRT's radiography curriculum is also developed purposely to serve as another blueprint for educators to follow in designing radiography programs, such that it guides educators (radiography training institutions) in meeting both the requirements for accreditation standards and the needs of the local community (ASRT, 2016). Also in ensuring that such programs match the profession's standards, there is an emphasis that educators in radiologic sciences must teach the essential theoretical knowledge and clinical skills that employers expect of graduates as well as ensure that such students are thoroughly prepared to take certification examinations offered by the American Registry of Radiologic Technologists (ASRT, 2016).

In the UK, the College of Radiographers (CoR) and the Radiographers Board at the Council for Professions Supplementary to Medicine carried out a study at the University of Hertfordshire, Department of Radiography, focusing on curriculum

development in radiography education. The outcome of this and subsequent studies (Burchell, Higgs, & Murray, 1999; Price, High, & Miller, 1997) have over the last three decades, contributed significantly to changes in radiography education. In the context of these changes, the education base of radiography in the United Kingdom (UK) shifted from mostly hospital-based schools of radiography, offering the diploma of the College of Radiographers, to university-based education, offering degree level qualifications (Thompson & Lodge, 2004). Moreover, to ensure the appropriate use of standards of proficiency, benchmark statements, professional standards, standards of education, training and professional development, the Health Professions Council (HPC), was mandated to assume the professional regulation for radiography in the UK (Thompson & Lodge, 2004). Its mandate required that students achieve both academic and clinical competencies before registration.

The emerging reforms in radiography education in Ghana can be seen through radiography education reforms in the UK and USA. This claim is given the fact that, just as was witnessed in the UK and USA, the introduction of Bachelor of Science (BSc.) Radiography programme by SBAHS was preceded by a radiologic technology education which was initially run by the Ministry of Health (MOH). Those who passed the final exams were afterward awarded a Proficiency Certificate by the MOH and then posted to various parts of the nation where they rendered radiologic services. Similar to the situation in the UK and USA, this initial training programme was a hospital-based school characterized by more clinical education (apprenticeship system) as compared with academic education. In 2001, the government of Ghana realized the need for qualified graduate radiographers and therefore mandated the SBAHS to take over the training programme from MOH, transforming it from its initial Certificate programme to Diploma and Bachelor of Science degree programmes. Introduction of the degree programme was aimed at exposing radiographers to more theoretical content to enable them to not only produce images but also to have an extended role towards quality patient management. For this reason, exposure of student radiographers to clinical, radiographic practice starts in the first semester of the third year. Also, being the only institution offering radiography education in Ghana, it was not too much to have

expected that radiography education by SBAHS was going to support quality management of patients in Ghana.

## 2.7 Generating the research question

Literature has so far shown that students' failure to transit/transfer from classroom to clinical learning or to integrate both forms of provision is an issue of primary concern with health professions education and other service-related training programs (Botwe *et al.,* 2016; Gough, 2014; Johanson, 2013; Mahmud, 2013, Philips, 2013; De Swardt, Du Toit, & Botha, 2012; Scully, 2011; Allan, Smith, & O'Driscoll, 2010; Mortell, 2009; Wrenn & Wrenn, 2009; Michau *et al.,* 2009; Bennett *et al.,* 2004; Corlett *et al.,* 2003; Helitzer & Wallerstein, 1999; Ferguson & Jinks, 1994; McCaugherty, 1991). Although several attempts, focusing on different aspects of higher education (e.g., curriculum planning, designing and assessment; organizational infrastructure, hidden curriculum, and students' characteristics) have made attempts at addressing the issue, a few gaps in the literature were highlighted where new research could contribute to existing knowledge on the concept.

First, the concept of theory-practice integration in radiography education is under-represented in literature. Second, there is a paucity of evidence on how teaching strategies support students' transition from classroom to clinical learning. Third, there is little evidence on pragmatic research approaches that seek to improve teaching quality by simultaneous consideration of various stakeholders' (students' and teachers') perceptions on teaching strategies, thus giving rise to the need to conduct further investigations on this phenomenon. These gaps in literature coupled with the practice-based rationale and Bernstein's (1975) code theory which emphasize the need to question ways in which dominant value systems within schools work towards supporting student learning, gave rise to the primary research question:

1. ***How are teaching strategies and radiography curriculum design at SBAHS supporting the transition from classroom to clinical learning?***

The primary research question is further broken down into four sub-questions which include:

1. How is the relationship between theoretical and clinical elements of the radiography curriculum of SBAHS supporting transition from classroom to clinical learning?
2. What teaching philosophy and teaching strategies do academic instructors employ in ensuring effective transition from classroom to clinical learning?
3. How are clinical supervisors ensuring effective transition from classroom to clinical learning?
4. How do student radiographers perceive their learning experience?

Sub-question one seeks to evaluate the structure and design of SBAHS radiography curriculum, referring to existing frameworks for radiography education. This focuses on establishing any flaws in radiography curricular design. The answer to this question is essential because the literature on theory-practice integration recognized curriculum as an important element in educational practice and for which it is recommended that it must be well structured. Moreover, since the curriculum describes what is intended to be learned by students and also determines when and how theory is applied to practice, it is believed to contribute significantly to students' learning experience. Therefore, establishing how the existing design of the radiography curriculum supports the effective transition from classroom to clinical learning is considered a pre-step to any meaningful review or reforms in our radiography curriculum.

Sub-question two seeks to identify teaching intentions of academic instructors and what teaching strategies are helping student radiographers develop into theory-practice integrators. The literature on teaching and learning has highlighted how teachers' intrinsic factors influence their approach to teaching. The answer to this question is therefore considered very important in establishing the link between radiography instructors' teaching intentions and their preferred approaches (student-centered, teacher-centered, teacher-student interaction) and subsequently the influence of their

teaching strategies in the delivery of radiography curriculum. This question is fundamental because even though there is a call for change in current teaching practices at various levels of Ghana's educational system, there has however not been any documented evidence on teaching strategies in radiography education to inform/support such a call for change.

Sub-question three seeks to find out how the clinical teaching strategies employed by clinical supervisors are helping student radiographers develop into theory-practice integrators. Literature evidences several types of clinical teaching strategies and how useful each of these could help students' transition from classroom learning to clinical learning and vice versa.

Sub-question four seeks to explore student radiographers' learning experiences as related to classroom and clinical practice instruction. Although the literature has shown that the student also has a responsibility in the learning process, it is however recognized that the student's responsibility falls under the influence or direction of the teacher. Therefore, with the student being positioned at the receiving end of the learning process, this question offers students the opportunity to reflect on their learning experiences in the classroom and clinical settings. The answer to this question is important because it is an ideal way of obtaining the students' voice/feedback on the effectiveness of our approach to the delivery of radiography curriculum. Also, based on the answer to this question, the current approach to radiography education can either be maintained or possible changes proposed.

With the primary and sub-questions of this study outlined, the next chapter discusses the methodology and methods adopted in addressing them.

# CHAPTER 3

# METHODOLOGY

This chapter discusses the study design, justifying the choice of methodological pluralism approach to this study. It then outlines the methods employed in addressing the primary research question, further rationalizing the thematic data analytical strategies used. Finally, ethical considerations for the methodology and methods are briefly described.

## 3.1 Methodological pluralism - Sequential mixed-method research design: Features, challenges, and rationale

In a simplified description, sequential mixed-method research is a pragmatic approach which could either be the combination of qualitative and quantitative research methods, a mix of different qualitative research methods, or a mix of different quantitative research methods, but carried out sequentially in the same study (Onwuegbuzie & Leech, 2004a, 2006; Johnson & Onwuegbuzie, 2004; Creswell, 2003, 2006; Johnson & Christensen, 2000). Mixed-method research designs come in diverse forms (paradigmatic foundations), owing to the possible number of ways that mixing could occur and the numerous potential classification dimensions that could emerge (Morse & Niehaus, 2009; Morgan, 2007; Johnson & Onwuegbuzie, 2004; Creswell, 2003; Patton, 2002; Tashakkori & Teddlie, 1998, 2003; Morse 1991).

Precisely, the sequential mixed-method design employed in this study involved the combination of qualitative and quantitative research methods. The two primary issues which guided this decision include: (1) whether or not to operate mainly within one dominant paradigm (2) whether or not to conduct the qualitative and quantitative phases sequentially or concurrently. The conclusion to work primarily within the qualitative paradigm while carrying out both qualitative and quantitative mini-studies was driven by the four sub-questions outlined in Chapter 2. Further, with this approach, qualitative data collection took place first because this alongside with the literature

review was very relevant to obtaining useful material that assisted with the development of the survey instrument.

Mixing data-collection methods, as employed in this study, is what the literature refers to as methodologic triangulation (Lincoln & Guba, 2000; Cobb, 2000; Barbour, 1998; Greene & Caracelli, 1997; Lincoln & Guba, 1985). Methodologic triangulation is usually classified into two types: within-method triangulation and between- or across-method triangulation (Thurmond, 2001). On the one hand, within-method triangulation is generally characterized by the use of at least two data-collection procedures from the same design approach (Kimchi *et al.,* 1991). For quantitative methods, the procedures could consist of administering survey questionnaires and using preexisting information from a database (Thurmond, 2001). In qualitative approaches, non-participant observations could be combined with focus group interviews (Thurmond, 2001). On the other hand, between- or across-method triangulation is usually characterized by both qualitative and quantitative data collection methods being used in the same study (Thurmond, 2001; Boyd, 2000; Denzin, 1970; Kimchi *et al.,* 1991; Mitchell, 1986). Such between-methodologic triangulation, for example, could take the form of a combination of participant interviews and questionnaires in the same study (Denzin, 1970), and the use of participant observation with surveys (Thurmond, 2001).

In the context of this thesis, the between-methodologic triangulation approach described by Thurmond (2001) and Denzin (1970) matches well with the sequential mixed-method design of this study; in that, there is a combination of interviews, observations, and surveys in this same study. Also, such correspondence between the different elements of this research design adds to the internal consistency of this methodology (Crotty, 1998). Also, one key objective for using this type of methodologic triangulation was to decrease the "deficiencies and biases that often stem from any single method" (Mitchell, 1986, p. 19) whilst creating "the potential for counterbalancing the flaws or the weaknesses of one method with the strengths of the other" (Mitchell, 1986, p. 21). Again, this type of methodologic triangulation was later realized not only to have provided a clearer understanding of the research problem but also helped in

creating innovative ways of understanding the research phenomenon and increased confidence in the research data (Thurmond, 2001).

## 3.2 Methods and procedures: Study site, study participants, and instrumentation

Two sites were used for this study. The first study site was the Radiography department, located within the School of Biomedical and Allied Health Sciences (SBAHS). This study site accommodates academic instructors who play significant roles in the academic training of student radiographers. As already mentioned in Chapter 2, the views of academic instructors were required for addressing sub-question two, which focused on identifying the teaching intentions and conceptions of radiography instructors. Additionally, this study site was chosen because, apart from it being the only tertiary institution offering radiography education in Ghana, recruiting participants from this site provided the opportunity to play the role of an insider-researcher. Moreover, the researcher's existing familiarity with participants within this study site was seen as an advantage in maintaining the participants' cooperation through a sense of belonging and ownership of the study (Costley, Elliott & Gibbs, 2010).

The second study site was the Radiology department of Korle-Bu Teaching Hospital which is associated with SBAHS. This site was included because it housed clinical supervisors who have significant roles in the clinical training of student radiographers. Using this study site proved to be advantageous because it is Ghana's premier teaching hospital, providing the imaging units which serve as clinical settings for professional practice placements of student radiographers from SBAHS. The above groups of participants were included because they have active and direct contact with student radiographers in their training processes. Also, as noted earlier, being an insider-researcher was advantageous because these sites are also where the researcher work.

A total of fifty-four (54) subjects participated in the study: academic instructors (n=7); final year student radiographers (n=31); clinical supervisors (n=16) from the eight

imaging/clinical areas within the Radiology department. The decision to recruit the entire population of participants was mainly to eliminate bias while increasing the reliability of the study's findings (Cohen, Manion & Morrison, 2011, p. 201). Additionally, the targeted participants were people known to be directly involved in the radiography training program. Information obtained from them was thus considered as valuable owing to their lived experience.

Data collection was conducted in 4 stages. Table 3.1 below illustrates how each data collection stage addressed the four sub-questions:

**Table 3.1: Data collection stages and sub-questions addressed**

| | Data collection stages | Sub-questions addressed |
|---|---|---|
| **Stage 1** | Review of documents and literature | This addressed sub-question one by focusing on the structure and design of the radiography curriculum in SBAHS. |
| **Stage 2** | Interview of academic instructors | This addressed sub-question two by focusing on teaching intentions of academic instructors and their ways of delivering the radiography curriculum. |
| **Stage 3** | Observation of clinical supervisors | This addressed sub-question three by focusing on how clinical supervisors relate with students in the clinical setting. |
| **Stage 4** | Online student survey (Web form) | This addressed sub-question four by focusing on the perception of student radiographers regarding classroom and clinical instruction. |

### 3.2.1 Review of radiography related documents

An initial search for radiography curricula, handbooks and other documents relating to radiography education was conducted on Google search, using keywords like radiography education, radiography curricula, and radiography handbooks. These keyword searches led to the retrieval of 12 documents (7 curricula, 5 handbooks) and 20 institutional websites. Table 3.2 below provides a list of institutions and their respective documents used for the analysis.

**Table 3.2: Institutional radiography documents**

| Institution | Document type |
|---|---|
| American Society of Radiologic Technologists (ASRT, 2016) | Radiography Curriculum |
| American Society of Radiologic Technologists (ASRT, 2012) | Radiography Curriculum |
| St. Clair County Community College (SCCC, 2016) | Radiologic Technology Programme Handbook |
| Joint Review Committee on Education in Radiologic Technology (JRCERT, 2014) | Standards for an accredited program in Radiography |
| Gateway Community College (GWCC, 2014) | Medical Radiography handbook |
| University of Portsmouth (UP, 2014) | BSc. Diagnostic Radiography |
| Birmingham City University (BCU, n.d) | BSc. Diagnostic Radiography |
| Northwestern Medicine School of Radiography (NMSR, 2013) | Radiography curriculum |
| Tidewater Community College (TCC, 2014) | Radiography Programme information packet |
| University of Leeds (UL, n.d) | Portfolio Guidelines for students and lecture/practitioners |
| International Society of Radiographers and Radiological Technologists (ISRRT, 2014) | Radiography Education Framework (July 2014) |
| Sheffield Hallam University (SHU, n.d) | BSc. Diagnostic Radiography |

This review included accessible documents from the above-listed institutions in Table 3.2. Analysis of documents was mainly focused on comparing the radiography curriculum in the School of Biomedical and Allied Health Sciences (SBAHS) with frameworks of other institutions mentioned above. After a close and repeated reading of documents, the frameworks of JRCERT (2014), ASRT (2016) and ISRRT (2014) were concluded on as reference documents for evaluating all the other institutional documents listed in Table 3.2. This decision was justified because the three documents detailed internationally accepted standards for radiography education.

This first phase of data collection intended to build an understanding of local and international curricular trends in radiography education. A cross-analysis of different radiography curricula and handbooks was used to highlight areas of good practice, areas of commonality and differences in the design and delivery of radiography education. Insights and good practices that were identified from the cross-analysis were then aimed at ensuring the content validity of the survey and interview instruments.

### 3.2.2 Analysis of data from the review of radiography documents:

Given the three frameworks/blueprints (ASRT, 2016; JRCERT, 2014; ISRRT, 2014) for radiography education, a comparison of radiography curricula contents at each institutional level was made. The similarities and differences noted in the design and structure of the radiography curriculum of SBAHS and those of the other institutions were summarized under three main groupings:

- philosophical underpinning
- desired competencies
- delivery & assessment

Finally, five main themes were developed from these broad groupings as presented in the results section (chapter 4).

Following the establishment of the similarities and gaps in curricular designs, the next step was focused on investigating academic instructors' approaches to the delivery of radiography curriculum.

### 3.2.3 Interviews

Invitations via email were sent to 10 academic instructors, inviting them to participate in the study. This sample size of 10 was arrived at because, at the time the study was being conducted, the radiography department of SBAHS had a teaching faculty capacity of ten (10) members. Participant information sheet and consent forms, explaining the purpose of the study were also attached to the email. Participants' responses were anticipated to offer new insights in addressing sub-question two.

Due to unreliable internet connectivity, a follow-up by telephone was made to confirm: participants' receipt of invitation documents; their willingness to participate; and their preferred date and time for our meeting. On each scheduled appointment, a one-on-one discussion was carried out with these participants. Although ten teaching faculty members were targeted for the interview, a total of seven interviews were granted. The seven interviews were concluded on because two faculty members had traveled outside the country for their PhDs and were not available by phone either. Also, one faculty member kept postponing the schedule until the stipulated period for interviews had elapsed. Since participation was expected to be voluntary, participation by duress was avoided. With the detailed nature and scope of the interviews granted, a total sample size of 7 was however considered a reasonable number.

Each interview session was aimed at gathering in-depth information on academic instructors' approaches in the delivery of different courses within the radiography curriculum. Each dialogue forum offered the opportunity to listen reflectively to faculty members as they expressed their intentions for teaching, their teaching approaches, and strategies. Their responses helped clarify personal assumptions about how SBAHS's radiography curriculum was being delivered.

In-depth interviews are very informative and often do offer new insights (Cassell, 2009; Yin, 2008; Holstein & Gubrium, 2004). So with teaching being participants' everyday life world, the focus was on their lived experience as regards to their teaching intentions and strategies. In so doing, open, vibrant and nuanced descriptions of different aspects of how they delivered their courses were obtained (Kvale, 1996). Since

interviews were focused on teaching strategies, a semi-structured interview protocol/guide (Appendix II) was used to ensure that questions were neither strictly standardized nor completely non-directive.

Development of the interview protocol for this study greatly depended on the understanding gained from the preceding analysis of radiography documents as well as the review of literature on theory-practice integration and teaching strategies in higher education (Scott, Pachana & Sofronoff, 2011; Blaxter, Hughes & Tight, 2006; Norton *et al.,* 2005; Kember, 2001; Prosser & Trigwell, 1999; Trigwell & Prosser, 1993, 1996; Trigwell, Prosser & Taylor, 1994). Although it is here acknowledged that the framework of Trigwell and Prosser (1996) on approaches to teaching formed the critical source of ideas in developing the interview protocol, yet their framework was subjected to series of modifications to make it suitable for the study context. Also, even though the interview guide was not piloted, the information gathered from the literature was used to ensure the content validity of the interview guide. Nevertheless, it, however, became apparent during discussions with the supervisor that some of the questions were leading questions, which if not properly structured, could probably get the answers which participants think the researcher wants to hear. For instance, a prompting question such as "should teaching be aimed at the transmission of knowledge or facilitation of learning?" was discussed and found to be giving interviewees a dichotomous choice. Hence a better prompt was developed such as "What is your teaching philosophy or what do you believe the role of a teacher should be?" Similarly, discussions with the supervisor led to inclusion and exclusion of questions considered relevant and irrelevant respectively. These changes in the interview protocol evidence the researcher's strive for open-ended rather than leading questions. This is because unlike their close-ended counterparts, open-ended questions allow participants to provide more information, including feelings, and understandings of the subject (Foddy, 1993; Schuman & Presser, 1979).

Sequencing themes of interview protocols can assume several formats including funnel protocol, inverted funnel protocol, tunnel protocol and Quintamensional protocol (Harrell & Bradley, 2009; Lawrence, 2006). For this study, an inverted funnels protocol

scheme was adopted. An inverted funnel is a protocol scheme that often begins with background questions about the interviewee, and then gradually advances with more prompting questions enabling the researcher to gain more profound insights (Harrell & Bradley, 2009; Lawrence, 2006). Typical of this protocol scheme was an introduction phase, permitting an introduction of oneself to interviewees and in turn asking interviewees also to do likewise. This helped gathered important background information on interviewees before the interviewing and concluding phases followed (Harrell & Bradley, 2009). Given this protocol scheme, questions were sequentially tailored to research questions, findings from documentary analysis and literature review. A copy of the interview protocol is available at Appendix II.

Contrary to some other interviews wherein interviewers determined the venue, date and time for their interviews, the interviewees in the case of this study were instead determinants of the venue as well as date and time. This was just because all the interviewees were senior colleagues and for which interviews were scheduled to take place at their conveniences (venues, dates and time). This was also a process of ensuring an atmosphere in which interviewees would feel comfortable enough to share information about their lived experiences. Doing enabled a demonstration of the researcher's "ethic of care" (Gibbs & Costley, 2006, p.244; Oliver, 2003; Morse, 2001). Of course, keeping with interview schedules was quite challenging for most participants, owing to their busy schedules and for which some interviews had to be postponed and canceled severally. Initially, the mere thought of conducting interviews in their respective offices gave the researcher a sense of discomfort and lack of control over the interview process. Although such nervous feelings arose from time to time, these were, however, overcome after a few minutes into the interview process.

Reflections on the interviewing phase further added to the understanding that interview is an embodied process (Ezzy, 2002) and similarly brought to mind the importance of establishing rapport with respondents during interviews (Miller & Glassner, 2004). The researcher's introduction which was followed by interviewees' self-introduction was a strategy to ascertain whether the interviewees were going to be informative, expressive or reserved. This informed the researcher's interviewing strategy

and led to an adoption of a more listening approach. With such a listening approach, it was realized that respondents were better enabled to provide detailed spontaneous descriptions of their opinions and lived experiences as academic instructors, hence signifying the importance of a listening approach (Kvale, 1996). Of course, a researcher's ability to form a relationship with interviewees is very much fundamental because interviews most often yield better results when the process is characterized by shared respect and cultural understanding (Ezzy, 2002).

Though at certain times some respondents were not willing to open up, some too, on the contrary, was seen to be over elaborative. With reserved interviewees, it was felt they were intimidated by the fact that the researcher was an insider-researcher and despite several attempts at reassuring them of their confidentiality, some still chose to be reserved owing to their fear that the interview might uncover information that could cause problems for them (Oliver, 2003). Alternatively, perhaps, their fear was because the interview process might challenge their practices, thereby resulting in changes which might affect their professional practices (Modell, 2003). Moreover, for over elaborative participants, a conscious effort was made by the researcher to refrain from interrupting them and instead used such opportunities to avoid asking some prompting questions which seemed already addressed by them. On one occasion, unfortunately, the digital audio-recorder failed to function correctly and for which the notes which were taken alongside this digital recording were used as complementary.

The researcher’s reflection on actions and previous interview processes sometimes led to a need to refine interviewing strategy for subsequent interactions with interviewees. According to Ezzy (2002), an interviewer's reflexive awareness of all aspects of the performed dimensions of an interview is what makes the interviewer a good researcher.

The concluding phase of the interview also revealed the importance of allowing interviewees opportunities to express opinions on areas not covered during an interview process. Surprisingly, this request prompted interviewees in widening the scope of the interview to several other factors contributing to undesired teaching approaches being

adopted by academic instructors. Although interviews varied in duration, they all lasted approximately between 25-40 minutes.

### 3.2.4 Analysis of Interview data:

Each digital audio-recording obtained from the interviews was transcribed manually. Transcribed data were anonymized, using participants' codes (ITF1, ITF2, ITF3, ITF4, ITF5, ITF6 and ITF7), generated in the order of the interviews. Transcripts were carefully read for identification of similar patterns of responses relating to each question. Similar patterns were then grouped into the same categories and then given the same color codes.

Utilizing Trigwell and Prosser's five differentiated approaches to teaching (outlined in chapter 2) as a guide, the teaching intentions of academic instructors, as indicated under the category ‘teaching philosophy' were identified either as imparting knowledge or guiding and supporting student learning. Based on Trigwell and Prosser's framework, teaching intentions were then described either as teacher-centered or student-centered. Following this criterion, academic instructors who taught with the intention of imparting knowledge were considered as teacher-centered while those who taught with the intention of guiding and supporting learning were classified as student-centered. For instance, is teaching characterized by student-student interactions, lecture notes or demonstrations? This was then followed by a determination of how these teaching strategies reflected academic instructors' teaching philosophies. Also, matching academic instructors' teaching strategies with their teaching philosophies enabled the determination of which teaching philosophies informed the use of a narrower or wider repertoire of teaching strategies. Academic instructors' perceptions on what entails effective teaching strategy were finally determined by examining their structure of instruction (e.g., the planning, sequencing, scaffolding, and integration of lessons) and the strategies they used in ensuring that their students integrate learning from the classroom with clinical situations.

Once data from academic instructors had been gathered and analyzed it became equally crucial that teaching in the clinical area be investigated, to ascertain whether or not, the roles being played by clinical supervisors support theory-practice integration.

### 3.2.5 Clinical observations

Following the acquisition of clinical placement rota for final year student radiographers, a schedule was drawn covering the ten clinical areas where radiography students go for the practical experience. The schedule covered 2½ months (10 weeks) period, suggesting one week allocated for observations at each clinical setting. In fact, observation at each setting was three days per week and for 4-6 hours per session, depending on the type of radiographic procedures being performed at individual imaging units. Unfortunately, however, imaging equipment in 2 clinical settings was down throughout the data collection period and which resulted in observations being limited to 8 clinical settings.

Clinical observations were conducted based on a structured observational approach involving two observation schedules (Burns & Grove, 1993). The schedules outlined what was to be observed and how these observations were to be recorded (Burns & Grove, 1993). The first observation schedule (Table 3.3) was a criterion for assessing the qualities of clinical supervisors in the eight imaging rooms. This observation schedule was developed based on readings (review of literature and radiography documents) on the basic qualities needed for the assumption of the role of a clinical supervisor in radiography education. This observation schedule was intended to help ascertain clinical supervisors' suitability for clinical supervision.

**Table 3.3: Observation schedule for measuring supervisory qualities**

| | SUPERVISORY QUALITIES | CLINICAL SUPERVISORS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RM1 | | RM2 | | RM3 | | RM4 | | RM5 | | RM6 | | RM7 | | RM8 | |
| | | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B |
| 1 | Clinical credibility | | | | | | | | | | | | | | | | |
| 2 | Up-to-date with new imaging techniques | | | | | | | | | | | | | | | | |
| 3 | Collaborates with academic instructors | | | | | | | | | | | | | | | | |
| 4 | Consistency in clinical practices and classroom description of such procedures | | | | | | | | | | | | | | | | |
| 5 | Negotiates a balance between professional duties and supervisory duties | | | | | | | | | | | | | | | | |
| 6 | Sensitive to contextual variables of students | | | | | | | | | | | | | | | | |
| 7 | Adheres to the professional code of conduct | | | | | | | | | | | | | | | | |
| 8 | Good interpersonal relationship with students | | | | | | | | | | | | | | | | |
| 9 | Keeps students' interest at the center of work | | | | | | | | | | | | | | | | |
| 10 | Treats students with respect | | | | | | | | | | | | | | | | |

Footnote:

- RM1 – RM8: Imaging rooms one to eight
- A & B: Clinical supervisors present in each imaging room

A second observation schedule (Table 3.4) was also developed based on readings (review of literature and radiography documents) on clinical supervision, although not restricted to radiography education. This schedule was however intended to help assess clinical supervisors' support models. The outcome of this assessment was then used to determine whether or not the observed actions/inactions of clinical supervisors in the eight clinical study sites are supporting students in integrating theory and practice.

**Table 3.4: Clinical teaching and support for students**

| OBSERVATIONS | | CLINICAL SUPERVISORS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RM1 | | RM2 | | RM3 | | RM4 | | RM5 | | RM6 | | RM7 | | RM8 | |
| | | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B |
| 11 | Open to discussions on radiographic procedures | | | | | | | | | | | | | | | | |
| 12 | Provides constructive and clear feedback to students | | | | | | | | | | | | | | | | |
| 13 | Offers students opportunity to evaluate and reflect on processes of work | | | | | | | | | | | | | | | | |
| 14 | Encourages students to ask questions | | | | | | | | | | | | | | | | |
| 15 | Assists students in exploring developmental ideas | | | | | | | | | | | | | | | | |
| 16 | Gives students the opportunity for safe experimentation and discovery of solutions | | | | | | | | | | | | | | | | |
| 17 | Explains and demonstrates procedures to students | | | | | | | | | | | | | | | | |
| 18 | Allows students to participate in clinical activities actively | | | | | | | | | | | | | | | | |
| 19 | Encourages a face-to-face interaction between students and patients | | | | | | | | | | | | | | | | |
| 20 | Remains at the background while students work independently | | | | | | | | | | | | | | | | |

Footnote:

- RM1 – RM8: Imaging rooms one to eight
- A & B: Clinical supervisors present in each imaging room

The structured observational approach adopted in this data collection stage is similar to ethnography which often is used when the researcher's focus is primarily to understand cultural rules or practices of a group of people (Curtise & White, 2005). This method is further based on the explanation that the central data collection technique in ethnography is mainly observation, characterized by some degree of participation/involvement by the researcher (O'Connor & O'Neill, 2004). In the case of this study, the researcher's participation took the form of observing what was going on in each clinical setting. Secondly, ethnographic researchers employ data collection tools such as note-taking, documentation and recording (Hancock, 2002), which were similar techniques employed by the author in this thesis. Also, the researcher found his immersion into the clinical settings a useful technique in gaining in-depth and accurate

descriptions of the supervisory practices within these settings. Observed challenges with this technique, however, had to do with: (1) time-consumption (2) difficulty with simultaneous observation and documentation of observed practices. During one of the sessions, it was noticed that the act of taking notes during the process of observing was placing fear on one of the clinical supervisors and for which his curiosity arose on finding out what the researcher was documenting. Given this, such feelings of discomfort were avoided subsequently by ensuring that notes and documentation were made outside the clinical area, after the close of work.

Although efforts were made to remain neutral (trying not to interfere with normal activities) within the study settings, the researcher, however, admit being compelled to interfere on two different occasions, to protect the patients from incurring unnecessary ionizing irradiation. In one particular instance, an exposure of a patient was negligently about to be made while an image receptor (cassette) hadn't been slotted into the machine. On the other occasion, a female patient's preparation (removal of brassieres) for chest radiography was not adequately done such that the patient was about to be exposed while her brassieres were on. Not for the timely interventions on such occasions, these patients would have been irradiated twice for the same procedure, hence putting these patients at risk of increased radiation dose.

### 3.2.6 Analysis of clinical observations data:

The first observation schedule was aimed at assessing the qualities of clinical supervisors. To help estimate how many clinical supervisors exhibited the observed qualities, qualitative data from this schedule was converted into quantitative data. The rationale for quantifying qualitative data was primarily to make data easily analyzed. Moreover quantifying quality is one effective way of generating empirical data to solve problems (Leckey & Neill, 2001). With this in mind, all observed qualities were quantified by counting the number of plus (+) representing observed quality and minus (-) for qualities not observed. This was then followed by a conversion of these frequencies to percentages as shown in Table 3.5 below.

**Table 3.5: Analysis of supervisory qualities**

| | SUPERVISORY QUALITIES | No. | | % | |
|---|---|---|---|---|---|
| | | + | – | + | – |
| 1 | Clinical credibility | | | | |
| 2 | Up-to-date with new imaging techniques | | | | |
| 3 | Collaborates with academic instructors | | | | |
| 4 | Consistency in clinical practices and classroom description of such procedures | | | | |
| 5 | Negotiates a balance between professional duties and supervisory duties | | | | |
| 6 | Sensitive to contextual variables of students | | | | |
| 7 | Adheres to the professional code of conduct | | | | |
| 8 | Good interpersonal relationship with students | | | | |
| 9 | Keeps students' interest at the center of work | | | | |
| 10 | Treats students with respect | | | | |

Footnote:

- No.: Frequency of qualities
- %: Percentage

The second observation schedule was aimed at assessing clinical teaching and support in the eight imaging rooms. First, each of the observed actions and inactions of clinical supervisors was grouped under one of the four phases of Bogo and Vayda's (1998) four phased (retrieval, reflection, linkage and professional response) ITP loop framework, as shown in Table 3.6. The number of times these actions were observed in each imaging room were tallied and represented in descriptive statistics (percentages), as shown in Table 3.6. The rationale for quantifying qualitative data was only to convey the observed actions in digital form just for easier analysis (Leckey & Neill, 2001). These percentages were thus used in determining the overall level of clinical support to students, hence helping to ascertain the extent to which clinical teaching/support is allowing students to integrate classroom with clinical learning.

**Table 3.6: Analysis of observed actions based on Bogo and Vayda's model**

| | OBSERVED ACTION | ITP LOOP PHASE | No. | | % | |
|---|---|---|---|---|---|---|
| | | | + | _ | + | _ |
| 11 | Open to discussions on radiographic procedures | Reflection | | | | |
| 12 | Provides constructive and clear feedback to students | Retrieval | | | | |
| 13 | Offers students opportunity to evaluate and reflect on processes of work | Reflection | | | | |
| 14 | Encourages students to ask questions | Retrieval | | | | |
| 15 | Assists students in exploring developmental ideas | Linkage | | | | |
| 16 | Gives students the opportunity for safe experimentation and discovery of solutions | Linkage | | | | |
| 17 | Explains and demonstrates procedures to students | Linkage | | | | |
| 18 | Allows students to participate in clinical activities actively | Linkage | | | | |
| 19 | Encourages a face-to-face interaction between students and patients | Professional response | | | | |
| 20 | Remains at the background while students work independently | Professional response | | | | |

The data from the observation schedule on clinical supervisors' level of support was summarized under Bogo, and Vayda's (1998) four phased categories below:

1. Retrieval
2. Reflection
3. Linkage
4. Professional response

Summaries from these categories were then used in combination with interview data and documentary analysis to develop the online survey instrument. In other words, the three data collection stages and analysis of their data gave an understanding of radiography curricula designs, the teaching strategies of academic instructors and clinical instructors. Since answering the primary research question required a holistic approach, it became necessary to investigate student radiographers' views on how

academic and clinical instructional practices were supporting their integration of theoretical knowledge with clinical practice.

### 3.2.7 Online survey

Surveys are extensively used in health professions education research (Gehlbach *et al.,* 2010; Dillman *et al.,* 2009). They are considered to be essential tools used in supporting data from other data collection methods and can be valuable in collecting new data, capturing opinions of larger numbers of people (Harrell & Bradley, 2009). To, therefore, obtain data useful in support of results from the three previous data collection stages, an online survey instrument which was a fixed set of questions was administered as a Google Web form to students.

The primary aim of using a combination of qualitative and quantitative data was to ensure that the limitations of one data type are balanced by the strength of the other data type (Almalki, 2016). Given this aim, an online survey was considered relevant. The other rationale is that an online survey was helpful in accessing students' relative emphasis on teaching approaches experienced both in the classroom and clinical settings (Harrell & Bradley, 2009).

The design of the survey instrument was guided by a flowchart, presenting seven steps to facilitate the development of a valid and reliable survey questionnaire (Artino, La Rochelle, Dezee & Gehlbach, 2014). This flowchart was followed with the intention of developing a questionnaire that would help measure students' relative emphasis on teaching approaches experienced both in classroom and clinical settings. The initial documentary analysis, interviews, and observations helped addressed the first four steps of this flowchart by helping identify survey items relevant to this study as well as giving a clue as to the possible ways in which teaching strategies and theory-practice integration can be conceptualized. By submitting an initial draft of the questionnaire to the primary supervisor, the fifth step of expert validation was addressed. The review by the primary supervisor led to the questionnaire being upgraded from 25 to 27 items. Piloting the study helped in addressing the sixth and seventh steps as this exercise (cognitive pretesting) revealed that some of the items still appeared ambiguous. This

feedback thus led to a series of restructuring, omission, and addition of further items. The final questionnaire was then developed into a Web form containing 29 items.

Out of the 29 itemized Google Web form, 27 items were related to teaching strategies experienced by students both in classrooms and clinical practice areas while two items related to students' views on how to improve theory-practice integration. Fourteen statements (items 1-10 and 24-27) focused on students' academic learning experiences while 13 statements (items 11-23) focused on students' clinical learning experiences. For each of these statements, students were required to indicate their level of agreement or disagreement. The last two statements (items 28-29) were open-ended questions requiring short answers from students. These last two open-ended questions were aimed at probing to learn more about respondents' views on ways in which teaching could be enhanced to support theory-practice integration. Again, this is necessary to identify responses that respondents give spontaneously and also to help to avoid possible bias that may result from suggesting responses to individuals (Reja, Manfreda, Hlebec, & Vehovar, 2003). A copy of the online survey questionnaire can be found in Appendix III.

The Google Web form was created using the researcher's University of Liverpool student email account (derick.sule@online.liverpool.ac.uk). A week before the distribution of Web forms, Participant Information Sheets (PIS) were sent by email to students, explaining the details of the study, the voluntary nature of the study and the role required of them. Web forms were then sent out a week later to participants, and their responses were obtained accordingly.

### 3.2.8 Analysis of online survey data:

The Google Web form used for the online survey offered the added advantage of summarizing students' responses to all close-ended questions. By the aid of the Google Web form software, students' response to all close-ended questions (leading to quantitative data) was retrieved, already analyzed and presented in percentages, pie-charts and bar charts. This level and type of the quantitative data were considered

sufficient because looking at the nature of the primary research question; descriptive statistical analysis was more likely to provide an answer than an inferential statistical analysis. Open-ended questions (Q28-29) were however analyzed in a similar pattern as interview data, using a thematic analytical approach in which similar patterns of responses were categorized into two main groupings of the classroom and clinical instruction.

## 3.3 Blending

So far, this chapter has shown that even though each data set was collected separately, data analysis followed a progressive manner (data 1>data 2>data 3>data 4) in which each stage of analysis was informed by previous data. It is also acknowledged at this point that clinical observations and online surveys exhibited elements of both quantitative and qualitative data. The mixing of qualitative and quantitative data, however, occurred at the analysis and interpretation phases (results and discussion sections – chapters 4 & 5) of this thesis. For instance, results from the four data collection methods were cross-matched to determine the key findings of this study.

## 3.4 Ethical considerations

Ethical approval was obtained from the EdD Virtual Program Research Ethics Committee (VPREC) of University of Liverpool through the completion and submission of an ethics application form. In addition to this, an authorization letter was obtained from the Head of the Radiography Department, SBAHS, permitting the use of institutional documents and subjects (academic instructors and final year radiography students). Also, an authorization letter was obtained from the Chief Radiographer, Radiology Department, Korle-Bu Teaching Hospital permitting the conduct of observations at the clinical sites. A copy of the ethical approval letter can be found in Appendix I.

Attempts at mitigating different risks during the study, as shown in the ethical approval application form for this study, included:

- Making available participant information sheet (PIS) detailing the purpose, objectives, intentions of digital recording and notes taking during interviews. Consent forms seeking informed consent of participants (academic instructors, and clinical supervisors) were sent.
- Informing participants of their rights, voluntary nature of their participation and freedom to withdraw at any time.
- Reassuring the participants of their anonymity and confidentiality.

Although the participation of the researcher's students in this study raised some power distance concerns, it was however ensured this had no significant implication on the study because their fear of victimization and intimidation overcome by reassuring them of their anonymity and confidentiality. Additionally, students were recruited by sending them an online survey tool (Google Web form), meaning their completion and submission of the Web form constituted their consent to participate. Also, with this approach, the researcher could not determine who completed the online survey or not, since email addresses of respondents were not required during submission of surveys. Additionally, participants' data was not required for the study and was therefore not collected at any of the four stages of data collection. Also, provision of an independent contact address in the PIS was to enable participants to contact someone else for further clarification.

With the researcher’s position as an insider researcher, there was the risk of falling into organizational politics which could have had a negative influence on data collection, but the researcher, however, overcame this challenge by providing a detailed explanation of the study to participants.

Confidentiality procedures used included: ensuring that all electronic correspondence was channeled through the researcher’s student e-mail address (derick.sule@online.liverpool.ac.uk) and since this email address required a username and password, access could be made only by me. Also, a process of blanket

anonymization was achieved by ensuring that interview and observation data were anonymized at the point of transcription. All electronic data were stored on the researcher's laptop computer which is password protected.

To conclude this this section, it is also worth acknowledging that maintaining quality standard in an educational program through evaluation of its curriculum (design and implementation) is an exercise usually resisted by higher education institutions (Modell, 2003). Moreover, having considered oneself an insider-researcher, it was long understood that revealing any adverse finding was likely to pose some ethical issues (Blaxter, Hughes, & Tight, 2006). Nevertheless, rather than concealing such adverse finding, the researcher intends to make such findings available to policymakers for the improvement of practice.

# CHAPTER 4

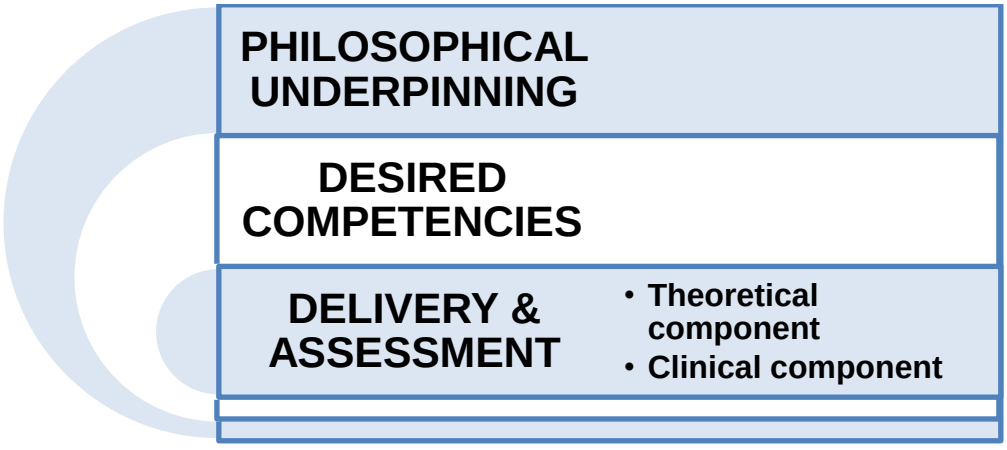
# RESULTS

This chapter outlines findings from the documentary analysis, interviews, observations and the online survey, demonstrating how one set of findings led to the other.

## 4.1 Documentary analysis

This section responds to the first sub-question by comparing the conceptual framework of the Radiography Department, School of Biomedical and Allied Health Sciences (SBAHS) with frameworks of other institutions listed initially in Table 3.2. Similarities and differences identified in the design and structure of radiography education have been summarized into three main groupings presented in Figure 4.1 below.

**Figure 4.1: Groupings emerging from the documentary analysis**




### 4.1.1 Philosophical underpinning

Radiography education in SBAHS is aimed at creating an employable workforce capable of meeting the needs of the job market. In line with this, its radiography curriculum places value on:

> ….producing qualified radiographers that meet both local and international demands through quality teaching which provides a sound knowledge base in radiography, enabling students to use this knowledge, and integrate underlying

theoretical concepts with the radiography professional practice based skills (UG Handbook, 2012).

By comparing above objectives with those of other radiography institutions, it was noted that they all shared similar philosophical foundation which is mainly to give radiography students a solid foundation of the core knowledge and practice of radiography, enabling them to become competent entry-level radiographers for the healthcare and global communities (SCCC, 2016; TCC, 2014; GWCC, 2014; UP, 2014; SHU, n.d.; UL, n.d.; NMSR, 2013).

Having identified documents of Joint Review Committee on Education in Radiologic Technology (JRCERT), International Society of Radiographers and Radiological Technologists (ISRRT) and American Society of Radiologic Technologists (ASRT) as blueprints (standards) for the design of radiography programs, it was not surprising to find out that the aims and objectives of radiography programmes, as evidenced in their respective documents concurred with these internationally accepted standards of practice for radiography education. For instance, commonly identified was their aim to ensure that radiography education meets accreditation standards and prepares students for professional practice (SCCC, 2016; TCC, 2014; GWCC, 2014; UP, 2014; SHU, n.d.; UL, n.d.; NMSR, 2013)

### 4.1.2 Desired competencies

It was noted that espoused values at varying levels of each document strived at teaching theories, behaviors, and skills that can help radiography students qualify to become professional radiographers. ‘Professionalism' was a fundamental concept identifiable in their expressions of desired learning outcomes. Three particular documents (SCCC, 2016; TCC, 2014; GWCC, 2014) went further to highlight critical technical proficiencies and competencies which also resonate with those in the researcher’s context. Table 4.1 below shows a summary of these technical proficiencies and competencies.

**Table 4.1: Key technical proficiencies and competencies**

| Technical proficiencies and competencies |
|---|
| • Proper application of radiation protection knowledge to ensure the safety of patients, staff, and public. |
| • Justification and optimization of radiation dose |
| • Ability to operate a variety of imaging modalities (CT, MRI, USG, fluoroscopy, conventional X-ray. |
| • Ensuring effective patient care and management during radiologic procedures. |
| • Recognition and adhesion to the professional code of ethics, the scope of practice, continuous professional development, and registered membership in the professional regulatory body. |
| • Exhibition of problem-solving skills, interpersonal skills, communication skills and critical thinking skills in relationships with colleagues, referring physicians, patients, and the general public. |

### 4.1.3 Delivery and assessment

Embedded in each document was a combination of theoretical and clinical elements. The extent to which theoretical elements were interwoven with clinical elements however varied, bringing about institutional uniqueness. Keynotes from the content analysis include:

- All documents evidenced similarities in theoretical elements (such as theoretical content structuring, lesson pacing, and sequencing of learning materials). Further, SCCC and SBAHS shared closest similarities in the structure and sequencing of specific learning objectives. In both cases, each particular objective was understood to have been targeted at specific institutional desired learning outcomes.

- With regards to how theoretical elements are interwoven with clinical elements, NMSR relatively demonstrated a more clinical-based delivery approach to its curriculum, focusing more on clinical skills developments of student radiographers (Northwestern Medicine, 2013). Added to this, NMSR starts clinical education at the 3rd week of the programme, unlike SBAHS and others which start clinical radiography obligations at the end of 2nd year of the programme. Aside from its affiliated clinical sites, NMSR goes the extra mile to own a health facility for clinical education, thus giving it added advantages over others (SBAHS and GWCC) which solely rely on affiliated clinical sites.
- SCCC demonstrates an outstanding commitment to clinical education through its emphasis on final stage students being assigned to clinical areas for weekend and afternoon rotations, thereby allowing students to handle patients under both direct and indirect supervision of clinical instructors. Similarly, clinical practices for students in GWCC are sometimes extended into weekends, evenings, and vacation periods. Students from such institutions are relatively more likely to gain clinical competence owing to more clinical hours of experience.
- SHU and SBAHS shared similarities in their use of multi-roomed diagnostic imaging departments for clinical placements. SHU's uniqueness was however based on the use of a monitoring team which ensures that each department is offering students the experience that matches learning requirements.
- With UP, core knowledge is imparted through a series of practical classes and integrated practical workshops within the University's digital imaging suite, which helps in the development of students' competencies and skills before qualification. The current unavailability of a digital imaging suite in SBAHS, however, raises the question of how core knowledge is being delivered. Additionally, unlike in UP where tutorials are carried out both at the University and clinical departments, tutorials in SBAHS are classroom-based.
- Although radiography blueprints recommend appropriate clinical practice pathway and approximately 50% of the time for clinical practice, the exact duration for clinical practice, however, was not specified in any of the institutional documents analyzed.

- One commonality evidenced is that assessments evaluate both practical skills and theoretical knowledge acquired by students, taking the forms of written assignments, examinations, staged tests, MCQs, OSCE (Objective Structured Clinical Examination) and clinical assessments. Uncommon amongst institutions, however, was the use of competency-based clinical assignments recommended by ASRT in evaluating clinical competence of students.
- Common with some of these institutions (TCC, BCU & GWCC) was their well-established links with affiliate hospital imaging departments. Although there is evidence to indicate well-established links with affiliated imaging departments, the effectiveness of such links in enhancing students' clinical competence, however, was ill-defined.
- TCC uses various instructional approaches to support students' diverse learning styles, empowering them to own and be responsible for the learning process (Tidewater Community College, 2014). Moreover, TCC uses guidance and mentoring to help students achieve educational goals and to succeed in passing the ARRT Certification exam. Regarding the clarity of instruction, this practice gives TCC an added advantage over SBAHS.

### 4.1.4 Themes developed from documentary analysis

The findings from the documentary analysis are further summarized under the five themes below:

1. **SBAHS shares with other institutions the philosophy that radiography students should be given a solid foundation of core knowledge and practice enabling them to accomplish competency to work in their communities.** Examples include:
    - Preparing students for professional practice by giving them a solid foundation of the core knowledge and practice of radiography (SCCC, 2016; TCC, 2014; GWCC, 2014; UP, 2014; SHU, n.d; UL, n.d; NMSR, 2013).

- Enabling radiography students to become competent entry level radiographers for the healthcare and global communities (SCCC, 2016; TCC, 2014; GWCC, 2014; UP, 2014; SHU, n.d; UL, n.d; NMSR, 2013).

2. **The design of the radiography program at SBAHS and other institutions meet requirements of international standards for accreditation.**

3. **Gross similarities are evidenced in the content and structure of the theoretical element.**

4. **There is great variation in timing and duration of clinical experience for students thus accounting for SBAHS's radiography curriculum being relatively classroom-based.**

5. **Failure to display what the key responsibilities of instructors are and how their roles should support students in integrating theory and practice.** For example:
    - There was a lack of clarity on standard instructional practices amongst institutions and radiography education blueprints (ASRT, 2016, 2012; JRCERT, 2014; ISRRT, 2014).

By viewing these themes through Bernstein's three levels, it is clear that the first three themes fall within his content level while the last two themes are noted to fall within his infrastructural level. These are revisited in the discussion section.

Given these findings and also having stated earlier on that there are some reports on poor-theory practice integration amongst student radiographers at SBAHS, the next sections (interviews and observations) sought to evaluate delivery approaches of academic and clinical instructors respectively.

## 4.2 Interviews

Following an overview of the demographic information of faculty members of the Radiography Department, School of Biomedical and Allied Health Sciences (SBAHS), this section reports on participants' responses to the second sub-question outlined in Chapter 2.

Table 4.2 below illustrates demographic information of seven academic instructors concerning the number of courses they teach; their teaching experience; and whether or not teacher training was received since their engagement.

**Table 4.2: Academic instructors' demographic information**

| Participant code | No. of Courses | Teaching experience | Formal teacher training |
|---|---|---|---|
| ITF1 | 2 | 3 YEARS | NO |
| ITF2 | 1 | 3YEARS | NO |
| ITF3 | 3 | 9YEARS | NO |
| ITF4 | 4 | 19YEARS | YES |
| ITF5 | 1 | 3YEARS | NO |
| ITF6 | 1 | 14YEARS | YES |
| ITF7 | 2 | 1YEAR | NO |

Table 4.2 above indicates that a majority (n=5, 71%) haven't been given a formal teacher training. Although responses of four participants initially gave an impression of having had some sort of teacher training, a further probing question to determine which type of training was given however revealed that with the exception of two participants, the training claimed by the other two participants was actually not on how to teach but was somewhat focused on how to set examination questions (Multiple choice questions - MCQs). It thus leaves a result of five participants not having received any formal teaching training. Through the lens of Bernstein's three levels, this result falls within the infrastructural level.

The interview responses of academic instructors were categorized into five main categories as shown in Table 4.3.1 below:

**Table 4.3.1: Main categories emerging from the interview**

| Teaching philosophy | Instructional strategies | Structure of instruction | Theory-practice integration | Effectiveness of curriculum delivery |
|---|---|---|---|---|
| - Imparting knowledge<br>- Guiding & supporting learning | -Lecture notes<br>-Group discussions<br>-Classroom demonstrations<br>-Case studies<br>-Graphics and videos | -Planning, sequencing & scaffolding<br>-Integrating lessons &learning objectives<br>-Effective student engagement<br>-Learning resources | -Clinical demonstrations<br>-Case studies<br>-Theory-practice dichotomy | -Proposed change<br>-Barriers |

### 4.2.1 Teaching philosophy

The first core question was mainly to find out participants' philosophy of teaching. Responses revealed that participants held quite different ways in which teaching in the context of radiography education was conceptualized. Their responses reflected two categories of beliefs on who a teacher was and in what form teaching should be. To some of them, teaching is more of imparting knowledge, and to others, teaching is more of guiding and supporting learning.

#### 4.2.1.1 Imparting knowledge

Four participants (ITF1, ITF2, ITF5, and ITF7) held similar views that teaching is meant to either impart or give knowledge to students. For instance, one participant (ITF1) held the view that

> ….teaching has to do with impacting knowledge into people. Sometimes it has to do with oral presentation, practical presentation, demonstrations or teacher-student questioning and answering. ITF1

From their point of view, the teacher has the responsibility of getting some knowledge on the subject area, share the knowledge or give the students the salient points. According to Trigwell and Prosser's (1993; 1996) framework, this reflects a teacher-centered approach to teaching because academic instructors in this category teach with the intention of imparting knowledge.

#### 4.2.1.2 Guiding and supporting learning

Three participants (ITF3, ITF4, and ITF6) also held the views that teaching is a facilitative role which is usually aimed at guiding and supporting students' learning. For example, one of the participants (ITF6) held the view that

> ….teaching is to guide students by identifying their weaknesses and then capitalize on that to help the students achieve what needs to be learned.
>
> ITF6

In viewing their responses through the lens of Trigwell and Prosser (1996, 1993), academic instructors with such intention are classified as student-centered.

One of the participants further held a unique view which was quite informative and seemed to have evolved from his several years of teaching experience and training on how to teach. This philosophy was seen to combine elements of knowledge impartation and facilitation of learning.

> ….in the context of radiography, it is necessary as a teacher that I find out my students' vision towards health and quality healthcare delivery. Students must be made to understand that they are rendering services, not for personal benefits but for the benefit of patients. So as a teacher, I lead that exemplary life that students can follow, that is, I'm a role model to them. I let students know the benefits of being radiographers and significance of their role in the healthcare system. So in fact, in teaching, things are holistic, meaning it is not only about imparting knowledge but also the need to nurture students into professionals.
>
> ITF4

Here, the academic instructor's effort to find out the students' vision about quality healthcare delivery signifies some level of interaction between this instructor and the students Following this feedback, the instructor's next attempt at making the students

understand the real meaning of quality healthcare delivery in their profession clearly reflects Trigwell and Prosser's (1996; 1993) notion on teacher/student interaction strategy which is intended to help students acquire the key concepts of the discipline. Through the lens of Bernstein's three levels, the findings in this section fall within the delivery level.

### 4.2.2 Instructional strategies

Four different instructional strategies were predominant in participants' responses to the question of what teaching strategies usually are adopted in the delivery of their respective courses. The strategies included (1) Lecture notes (2) Group discussions (3) Classroom demonstrations (4) Graphics

#### 4.2.2.1 Lecture notes

With no exception, all participants claimed that knowledge was most often delivered through lecture notes in the forms of power-point presentations, using laptops and projectors and sometimes in the forms of notes dictation. For example, participant ITF3 claimed that

> I normally use power-point presentations for lectures and also give them handouts.
>
> ITF3

> What I do is that I present students with the necessary subject learning area, in the form of power-point and then I explain it as much as possible to students.
>
> ITF1

Here, the lecture notes/handouts are merely for information giving instead of handouts that are presented in the forms of worksheets or power-points that contain problems to be solved.

#### 4.2.2.2 Group discussions

Two participants (ITF4 and ITF6) explained how they went about delivering their courses through group discussions.

> ….I employ interactions in the forms of debates, group discussions or questions and answers, to find out what they have been able to read based on the assignment given, and there I am able to determine where I can also come in to assist. ITF6

> ….my teaching is very interactive because I hold the notion of "student-centered learning," so I try to encourage student-to-student interactions as they go along.
>
> ITF4

#### 4.2.2.3 Classroom demonstrations

Comments from two participants (ITF4 and ITF6) indicated that they have been employing classroom demonstrations and with one further briefly explaining how such demonstrations were carried out.

> ….I engage students in physical demonstrations by getting students to volunteer so as to demonstrate procedures.
> ITF6

#### 4.2.2.4 Graphics and videos

Similarly, the use of graphics and videos was limited to only two participants (ITF4 and ITF6) and with one of them indicating that;

> I sometimes show them graphics as well as add videos (audio-visuals) on topics I want them to learn
> ITF6

Viewing the above responses through Trigwell and Prosser's framework, it is easy to deduce that the above mentioned instructional strategies are aligned with instructors'

teaching philosophy (conceptions, intentions, and beliefs about teaching). Moreover, through the lens of Bernstein's three levels, the findings in this section fall within the delivery level.

### 4.2.3 Structure of instruction

#### 4.2.3.1 Planning, sequencing & scaffolding

Although comments from all participants indicated some level of planning before teaching, they however acknowledged that sequencing was dependent on the subject, context and learning objectives:

> ….content structuring is diverse, depending on the subject matter, set objectives and topic to be treated. I however first build background and then advance. So content structure varies based on what needs to be taught. ITF7

> ….I use the systematic approach, and it is quite good because it ensures that I do not leave anything out.
> ITF5

> ….sometimes, sequencing depends on the area that is being treated. Sometimes the theory is given first and then followed by practical. Sometimes too the two are dealt with simultaneously by teaching and demonstrating to them.
> ITF3

> With my approach, theoretical component comes before the practical part ITF1

It is however evident that they mostly teach theory first before the clinical element. Through the lens of Bernstein's three levels, the findings in this section fall within the delivery and infrastructural levels. By Bernstein's re-contextualizing principle, the way in which knowledge (theory and practice) has been selected and distributed is a possible reflection of how knowledge has been classified and framed.

#### 4.2.3.2 Integrating lessons and learning objectives

To find out how courses complemented each other and clinical situations, the researcher asked participants to describe how their courses were interrelated with other courses. Participants' responses indicated a consensus that radiography courses are never treated in isolation but always interconnected like the sides of a pyramid which finally end at the peak. One of the participants explained how courses are interrelated by giving an illustration that;

> …radiography involves the use of ionizing radiation, so when I teach Radiobiology, I focus on educating students on what happens between the radiation we use and our biological systems. Here, I let the students know the connection between Radiobiology and Radiographic anatomy. Similarly, by teaching students how to handle patients, taking into consideration the working environment and clinical conditions of patients, I let them see the connection between Radiobiology and Patient management. Moreover, by so doing they can fuse theoretical knowledge into practical situations. ITF7

The responses of participants however didn't indicate that their interconnectedness involved any form of collaboration with other colleagues or with clinical supervisors either. However, from their feedback it can be deduced that individual instructors work in isolation but yet study what other colleagues teach so as to identify any possible areas where courses/subjects/topics interconnect. Through the lens of Bernstein's three levels, the findings in this section fall within the delivery and infrastructural levels.

#### 4.2.3.3 Learning resources and level of student engagement

To determine how teaching approaches engage students in the learning process, the participants were asked whether learning materials are presented to students or students are usually tasked to find their learning resources. Even though six participants (ITF2, ITF3, ITF4, ITF5, ITF6, and ITF7) responded that learning materials were usually presented to students, two of these participants (ITF6 & ITF4) however added that students were additionally tasked to search for learning materials and tasked to read on their own. For example;

> Sometimes, to effectively engage students, I let them go and search for information and then ask them to come and do presentations. At times too, I give them assignments whereby they are required to look for information in order to answer the questions. ITF6

> Well because radiography books are readily not available what I do is that I give students comprehensive notes, but I also advise them to search the internet for materials. However, since not all students may carry out the assignment, I give them some form of comprehensive notes. I also direct them to sources (textbooks). I give them materials both as power points or some may be fully worded notes that I get from the internet. Sometimes what I do is that I do not print for them but instead send the materials to them through their emails.

> ITF4

One of the participant's (ITF1) comment indicated that learning resources were never presented to students, stating that;

> Students are not given learning materials as at now. What happens is that students are tasked to go and get their learning materials. What I do is that I present them with the necessary subject learning area. Then in terms of textbooks and reading materials, students are tasked to go to the library or other sources ITF1

Generally, the responses of participants have so far shown that there is a minimal level of student engagement in the learning process. Moreover, as students get used to the teaching practice of being spoon-fed by their instructors, this may limit their ability to undertake personal searches and studies outside what has been presented to them. Through the lens of Bernstein's three levels, the findings in this section fall within the delivery level.

### 4.2.4 Theory-practice integration

Since students are expected to apply theoretical knowledge to clinical practice, it was prudent to find out how theory and practice are integrated into teaching strategies of academic instructors. Responses of two participants (ITF3 and ITF4) indicated that they usually used clinical demonstrations while one participant's (ITF6) comment also

revealed that case studies were being used to interweave theoretical knowledge with clinical practice.

#### 4.2.4.1 Clinical demonstrations

> ..what I do is that I teach the students in the classroom the theory, procedures and steps, and then after, we set days aside when we go to the clinical room to demonstrate what we have learned. That is, "I teach and demonstrate for students to appreciate better."
>
> ITF4

> ….I usually engage students in hands-on practical and as much as possible I work with colleagues in the clinical area so that they can supervise and support the students in the clinical area.
>
> ITF3

#### 4.2.4.2 Case studies

> ….I sometimes give students case scenarios or case studies. For instance, in interim assessments, I use practical illustrations to assess them, and by so doing I'm able to find out how they relate classroom knowledge to the practice. By so doing I'm able to prevent them from memorizing facts.
>
> ITF6

Interestingly, the other four participants (ITF1, ITF2, ITF5, and ITF7) were not clear about how their teaching strategies helped students integrate classroom learning with clinical situations. It can be deduced from these results that not all instructors use instructional strategies which support students' effective integration of classroom with clinical learning. Again, these results have helped confirm Trigwell and Prosser's notion that instructors who adopt a student-focused approach tend to use a wider repertoire of teaching methods which are more student engaging than the teacher-focused approach. Through the lens of Bernstein's three levels, the findings in this section fall within the delivery level.

Table 4.3.2 below provides a summary of academic instructors' teaching philosophies and their teaching strategies.

**Table 4.3.2: Academic instructors' teaching philosophies and strategies**

| MAIN CATEGORIES | PATTERNS | ITF1 | ITF2 | ITF3 | ITF4 | ITF5 | ITF6 | ITF7 |
|---|---|---|---|---|---|---|---|---|
| **TEACHING PHILOSOPHY** | Imparting knowledge | X | X | | | x | | x |
| | Guiding & supporting learning | | | X | x | | x | |
| **INSTRUCTIONAL STRATEGIES** | Lecture notes | X | X | X | x | x | X | x |
| | Group discussions | | | | x | | X | |
| | Classroom demonstrations | | | | | | X | |
| | Case studies | | | | | | X | |
| | Graphics & videos | | | | x | | X | |
| **STRUCTURE OF INSTRUCTION** | Planning, sequencing, and scaffolding | X | X | X | x | x | X | x |
| | Integrating lessons | | | | | | | x |
| | Student engagement | X | | | x | | X | |
| | Provision of learning resources | | X | X | x | x | X | x |
| **THEORY-PRACTICE INTEGRATION** | Clinical demonstrations | | | X | x | | | |
| | Case studies | | | | | | X | |

Having also identified from the above responses that teaching approaches evidenced a gap in how classroom learning should be applied to the clinical learning situation, participants were asked to express their views on theory-practice dichotomy.

Two participants (ITF1 and ITF4) revealed that such problems were attributable to the existing knowledge gap between academic instructors and clinical supervisors. For example;

> Feedback from students sometimes has been that when they go to the clinical areas, clinical supervisors' practices sometimes don't align with what has been taught in the classroom.
>
> ITF4

One participant, however, saw the problem as emanating from the curricular structure

> Radiography is both theoretical and practical, so there should not be a dichotomy between them. Hence there should always be a point where we can relate the two such that whatever we do in class can be applied in the practical field. We need to structure the curriculum such that the two will merge.
>
> ITF7

Two others also blamed the problem on the unavailability of imaging facilities and resources.

> As at now our school depends on imaging facilities of other teaching hospitals and this sometimes prevents students from gaining full opportunity to practice what they have learned in the classroom. Also, the absence of simulation centers also contributes to the problem
>
> ITF5

### 4.2.5 Effectiveness of curriculum

There was a divided opinion with regards to the effectiveness of current radiography curriculum. Some participants (ITF3, ITF4, and ITF2) felt the curriculum was quite effective and for which one participant's statement includes;

> Well, the current curriculum being run is quite effective but…….. I think it needs to be reviewed to meet some of the emerging international trends, so we are in the process of reviewing the curriculum that is currently being run.
>
> ITF3

Others (ITF1, ITF6 and ITF7) too held the opinion that current curriculum was not effective. One of the participant's submissions was that

> I think that it is not very effective. My opinion is that because the school doesn't have its own dedicated labs for training and simulations, the theory is most often given to the students. The best way I think clinical practice can be learned is through simulations and practice on phantoms so that after the students have acquired the necessary skills, they can then be moved on to the clinical area to handle patients. So I think our delivery is not the best until we get dedicated areas for clinical practice so that confidently students can get the skills and thus bridge the theory-practice gap. ITF1

The above quotation by participant ITF1 signals a 'know-that vs. know-how' situation which though practical, has a theoretical dimension which informs the design of the simulation. This finding highlights the linkage between delivery and infrastructural levels of Bernstein's integration code typology (Bernstein, 1971, 1975, 2000).

Either way, there was however a consensus that the current curriculum needed improvement and for which one participant's submission includes;

> I think it still needs improvements because things are changing. There must be continuous development.
>
> ITF5

#### 4.2.5.1 Proposed change

Given the above submissions on the need for curriculum improvement, participants were asked to propose aspects of the curriculum that might need such improvement or change. Participants' proposed change evolved around these thematic categories below:

- the use of audio-visuals and computer-based simulators in teaching to enable students to relate classroom knowledge with clinical practice (ITF7 & ITF4);
- the use of problem-based learning approach to condition students' minds in solving clinical problems (ITF2)
- exchange or collaborative or partnership programs with other international universities to enable both staffs and students get the needed exposure to international standards for radiography education (ITF6 & ITF4)

- use of dedicated labs for practical teaching purposes (ITF1)
- mentorship training for clinical supervisors to enable them to know educational needs of radiography students (ITF5 and ITF1)
- modification or exclusion of irrelevant courses (ITF4 and ITF3)
- a 6-year training period instead of the current four years' time duration and with more period allocated for clinical education (ITF4)
- allowing academic instructors to be responsible for clinical education of students so as to avoid the theory-practice gap in which the practices of clinical supervisors are inconsistent with classroom learning descriptions (ITF1)
- ensure substantive contract between clinical supervisors and the university such that they will feel obliged to teach and supervise students in the clinical area (ITF1)

#### 4.2.5.2 Barriers

Participants were of the opinion that proposed changes for effective curriculum delivery are more likely to be impeded by the thematic categories below:

- demanding institutional bureaucratic processes (ITF7)
- unavailability of funds and resources (ITF5, ITF2, ITF1 and ITF3);
- increasing student enrolments (ITF3)
- lack of a substantive contract between clinical supervisors and SBAHS (ITF5)

The above-listed barriers depict the infrastructural aspects of Bernstein's typology.

In summary, it was evident in the interview results that:

- Teaching philosophies and instructional approaches of academic instructors reflected both elements of teacher-centered and student-centered approaches but teaching strategies being characterized by power-point lectures and dictation of lecture notes suggests a dominance of didactic teacher-centered approach

- There is the good sequencing of learning based on subject, context and learning objectives as well as a good integration of lessons with learning objectives
- Although most academic instructors claimed to have adopted various strategies in classroom teaching, the results however evidence that few (2) participants actually ensured that the practical aspect of their courses were integrated into the teaching process.
- Students' ineffective transition from classroom to clinical learning situations was partly attributed to the existing knowledge gap between academic instructors and clinical supervisors; and partly due to unavailability of imaging facilities and resources.

Having identified the teaching strategies of academic instructors and determined how these strategies support theory-practice integration, the next section provides an analysis of data from clinical observations made in eight imaging rooms.

## 4.3 Clinical observations

This section responds to the third sub-question by revealing how the teaching strategies of clinical supervisors were supporting theory-practice integration. It thus summarizes the observations made on the clinical supervision of student radiographers during their clinical rotations.

Table 4.4 below summarizes the observed qualities of clinical supervisors in the eight imaging rooms.

**Table 4.4: Qualities of clinical supervisors**

| OBSERVATIONS | | CLINICAL SUPERVISORS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RM1 | | RM2 | | RM3 | | RM4 | | RM5 | | RM6 | | RM7 | | RM8 | |
| | | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B |
| 1 | Clinical credibility | + | + | + | _ | + | + | + | + | + | _ | + | + | + | + | + | + |
| 2 | Up-to-date with new imaging techniques | _ | _ | _ | _ | _ | _ | _ | _ | + | _ | _ | _ | _ | _ | + | _ |
| 3 | Collaborates with academic instructors | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | + | _ |
| 4 | Consistency in clinical practices and classroom description of such procedures | + | _ | _ | _ | _ | _ | _ | _ | _ | _ | + | _ | + | + | + | + |
| 5 | Negotiates a balance between professional duties and supervisory duties | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ |
| 6 | Sensitive to contextual variables of students | + | _ | _ | _ | + | _ | _ | _ | _ | _ | _ | _ | + | + | + | + |
| 7 | Adheres to the professional code of conduct | + | + | _ | _ | + | _ | _ | _ | + | + | _ | _ | + | + | + | + |
| 8 | Good interpersonal relationship with students | + | + | + | + | + | + | + | _ | _ | _ | + | + | + | + | + | + |
| 9 | Keeps students' interest at the center of work | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ |
| 10 | Treats students with respect | + | _ | _ | _ | _ | + | _ | + | _ | _ | + | _ | _ | _ | + | + |

Footnote:

- RM1 – RM8: Imaging rooms one to eight
- A & B: Clinical supervisors present in imaging rooms
- (+): Observed presence
- (-): Observed absence

Table 4.4 above illustrates observations made on the supervisory roles of clinical supervisors in eight (8) imaging rooms (RM1-RM8) and with each imaging room having two clinical supervisors (A & B). The plus (+) and minus (-) signs represent observed presence and absence of behavior made respectively about each action numbered 1-10.

**Table 4.5: Summary of supervisory qualities**

| | SUPERVISORY QUALITIES | No. | | % | |
|---|---|---|---|---|---|
| | | + | – | + | – |
| 1 | Clinical credibility | **14** | **2** | **87.5** | **12.5** |
| 2 | Up-to-date with new imaging techniques | **2** | **14** | **12.5** | **87.5** |
| 3 | Collaborates with academic instructors | **1** | **15** | **6.3** | **93.7** |
| 4 | Consistency in clinical practices and classroom description of such procedures | **6** | **10** | **37.5** | **62.5** |
| 5 | Clearly negotiates balance between professional duties and supervisory duties | **0** | **16** | **0** | **100** |
| 6 | Sensitive to contextual variables of students | **6** | **10** | **37.5** | **62.5** |
| 7 | Adheres to the professional code of conduct | **9** | **7** | **56.2** | **43.8** |
| 8 | Good interpersonal relationship with students | **13** | **3** | **81.2** | **18.8** |
| 9 | Keeps students' interest at the center of work | **0** | **16** | **0** | **100** |
| 10 | Treats students with respect | **6** | **10** | **37.5** | **62.5** |

Table 4.5 above is a summary of the conversion of qualitative data to quantitative data so as to determine the extent to which these qualities were evident among clinical supervisors. With regards to clinical credibility (item 1), the minus (-) indicated in RM2 and RM5 was as a result of the personnel in those rooms not being qualified radiographers to assume the role of clinical supervisors but finding themselves in those rooms, were assuming such a role.

With regards to item 2 (imaging technique of clinical supervisors), it was observed in RM1 to RM5 (general purpose imaging rooms) that skull radiography, for instance, was being done by some clinical supervisors without the required angulations of the x-ray tube and this observation was contradictory to the $10^0$-$20^0$ tube angulations we teach students during the description of skull radiography in the classroom.

Again, unlike what is being taught in the classroom that creatinine levels of patients ought to be checked before an intravenous (IV) injection of any radiological contrast medium, it was however observed in RM6-RM8 (specialized imaging rooms)

that the outmoded practice of not checking patients' creatinine levels before administering such radiological contrast media was still being practiced.

Moreover, as observed in items 3 & 4, a lack of collaboration between the clinical supervisors and academic instructors can be used to explain why there are inconsistencies between clinical and classroom description of radiographic procedures.

With regards to the negotiation of professional and supervisory duties, it was observed in items, 5, 6, 9 and, that clinical supervisors were mostly committed to their professional duties of attending to patients than spending enough time on individual student's learning needs. For example, it was observed that each time clinical supervisors were attending to patients they failed to respond to questions asked by students.

Through the lens of Bernstein's three levels, these findings fall within the delivery and infrastructural levels.

**Table 4.6: Data on clinical teaching and support for students**

| | **OBSERVATIONS** | **CLINICAL SUPERVISORS** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **RM1** | | **RM2** | | **RM3** | | **RM4** | | **RM5** | | **RM6** | | **RM7** | | **RM8** | |
| | | **A** | **B** | **A** | **B** | **A** | **B** | **A** | **B** | **A** | **B** | **A** | **B** | **A** | **B** | **A** | **B** |
| 11 | Open to discussions on radiographic procedures | _ | _ | _ | _ | _ | _ | _ | _ | + | _ | + | + | + | _ | _ | + |
| 12 | Provides constructive and clear feedback to students | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ | + | + | + |
| 13 | Offers students opportunity to evaluate and reflect on processes of work | + | + | + | _ | _ | _ | _ | _ | + | + | _ | _ | _ | _ | + | + |
| 14 | Encourages students to ask questions | _ | _ | _ | _ | _ | _ | _ | _ | + | _ | _ | _ | _ | _ | + | + |
| 15 | Assists students in exploring developmental ideas | + | + | + | _ | _ | _ | _ | _ | _ | + | + | _ | + | + | + | + |
| 16 | Gives students the opportunity for safe experimentation and discovery of solutions | _ | _ | + | + | + | _ | _ | _ | + | + | _ | _ | _ | _ | _ | _ |
| 17 | Explains and demonstrates procedures to students | _ | + | + | _ | _ | _ | _ | + | + | _ | _ | _ | _ | + | + | + |
| 18 | Allows students to participate in clinical activities actively | _ | _ | + | + | + | _ | _ | _ | + | + | _ | _ | + | + | + | + |
| 19 | Encourages a face-to-face interaction between students and patients | + | + | + | + | + | _ | _ | _ | + | _ | _ | + | + | + | + | + |
| 20 | Remains at the background while students work independently | _ | _ | + | + | + | + | _ | _ | _ | _ | _ | _ | _ | _ | _ | _ |

Footnote:

- RM1 – RM8: Imaging rooms one to eight
- A & B: Clinical supervisors present in imaging rooms
- (+): Observed presence
- (-): Observed absence

Table 4.6 above illustrates observations made on clinical teaching and supportive roles of clinical supervisors in eight (8) imaging rooms (RM1-RM8) and with each imaging room having two clinical supervisors (A & B). The plus (+) and minus (-) signs observed presence and absence of behavior made respectively concerning the items numbered 11-20.

**Table 4.7: Summary of observed actions based on Bogo and Vayda's model**

| | OBSERVED ACTION | ITP LOOP PHASE | No. | | % | |
|---|---|---|---|---|---|---|
| | | | + | _ | + | _ |
| 11 | Open to discussions on radiographic procedures | Reflection | 5 | 11 | 31.3 | 68.7 |
| 12 | Provides constructive and clear feedback to students | Retrieval | 3 | 13 | 18.8 | 81.2 |
| 13 | Offers students opportunity to evaluate and reflect on processes of work | Reflection | 7 | 9 | 43.8 | 56.2 |
| 14 | Encourages students to ask questions | Retrieval | 3 | 13 | 18.8 | 81.2 |
| 15 | Assists students in exploring developmental ideas | Linkage | 9 | 7 | 56.2 | 43.8 |
| 16 | Gives students the opportunity for safe experimentation and discovery of solutions | Linkage | 5 | 11 | 31.3 | 68.7 |
| 17 | Explains and demonstrates procedures to students | Linkage | 7 | 9 | 43.8 | 56.2 |
| 18 | Allows students to participate in clinical activities actively | Linkage | 9 | 7 | 56.2 | 43.8 |
| 19 | Encourages a face-to-face interaction between students and patients | Professional response | 11 | 5 | 68.7 | 31.3 |
| 20 | Remains at the background while students work independently | Professional response | 4 | 12 | 25 | 75 |

Table 4.7 above shows observed actions of clinical supervisors given Bogo and Vayda's (1998) ITP loop model and a further summary of the conversion of qualitative data to quantitative data to determine the extent of clinical teaching and support.

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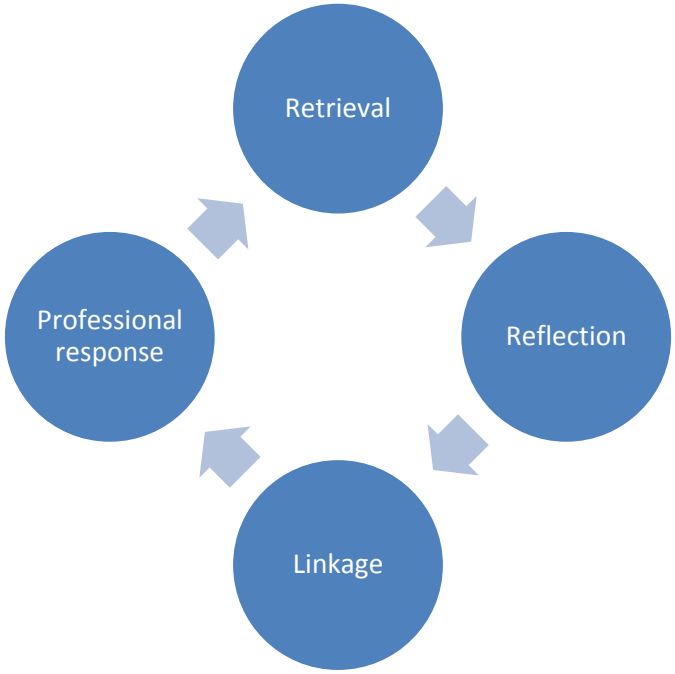
**Figure 4.2: Summary of clinical supervisors' actions given Bogo & Vayda's (1998) loop model**




Findings from the observations on clinical teaching and support, as initially tabulated in Table 4.7 are summarized under four categories presented in Figure 4.2 above and further elaborated on below:

### 4.3.1 Retrieval

Bogo and Vayda's framework talks about the use of the student's observing ego - a 'mind's eye' phenomenon wherein the student recalls a professional situation as both an observer and a participant. At this phase of the loop, the clinical supervisor's role is to

help frame students' random observations and in turn, influence their definition of what constitutes relevant data. Limited opportunities given to students to ask questions (Item 14) and a failure to provide constructive feedback to questions when asked (Item 12), as indicated in Table 4.7 suggests that clinical supervisors are not helping student radiographers through the process of retrieval because student radiographers are not being challenged to recall and question previously observed radiographic procedures. Also, when clinical supervisors fail to provide constructive feedback, they indirectly are failing to influence students' definition of what constitutes the acceptable practice for radiographic procedures. Through the lens of Bernstein's three levels, this finding falls within the delivery level.

### 4.3.2 Reflection

According to Bogo & Vayda's (1998) framework, reflection is considered as a thoughtful consideration of the practice activity in which the teacher's focus is primarily on exploring students' subjective meanings (personal values, beliefs, assumptions, and attitudes) attached to observed facts within the practice context and in accordance with the students' internalized notions of what is right or wrong. In Table 4.7, it is evident (Item 11) that a minority 31.3% (n=5) of the clinical supervisors showed openness to discussions on radiographic procedures, with a majority (56.2%, n=9) of them failing to offer students opportunities to evaluate and reflect on the processes of work (Item 13). According to Bogo and Vayda's framework, such supervisory practices do not help students advance through the reflection phase because it is by activities such as discussions that clinical supervisors can explore and identify students' internalized values, help them subject these values to critical thinking to elicit associations and consequently help these students appreciate the challenges, new knowledge and changes that can or do occur in the clinical context.

### 4.3.3 Linkage

Bogo and Vayda (1998) refer to ‘linkage' as the conscious application of theory to practice, in which acquired knowledge is used to help explain observed practice and ultimately used in planning a professional response. Bogo and Vayda's framework suggests that teachers should use specific techniques such as task-centered approaches and group development approaches to help students develop this skill. The results (as indicated by Item 15 in Table 4.7) show that clinical supervisors do assist students in exploring developmental ideas, with further evidence that the majority (n=9) of clinical supervisors encouraged students to read more and do more research on radiographic procedures. They however didn't give students the freedom to safely experiment (Item 16), thus denying students the opportunity to use their pieces of knowledge in a seemingly intuitive fashion in interacting with practical situations.

### 4.3.4 Professional response

Bogo and Vayda's framework suggests a constant evaluation and monitoring of how students ground their acquired ideas, knowledge, and insights in developing specific plans and behaviors. It is to help teachers ensure that students are employing acquired skills in dealing with new situations. According to Bogo and Vayda's explanation, the evaluation and monitoring of the professional response of students can be effective only when these students are allowed to have direct contact with clients.

On the one hand, the clinical observation results (as shown in item 19 of Table 4.7) revealed that a majority (n=11, 68.7%) of clinical supervisors do encourage face-to-face interaction between students and patients. But on the other hand, the results (as shown in item 20, Table 4.7) also revealed that a minority (n=4, 25%) of clinical supervisors remained at the background, allowing students to work independently. These contradictory observations suggest that despite the opportunities for face-to-face communication with patients there is still a lack of direct practical opportunities for students, regarding the performance of radiographic procedures.

### 4.3.5 Keynotes from clinical observations:

- Out of the eight clinical sites used for the observations, it was observed in 6 of them that clinical supervisory sessions spanned the stipulated duration. The other two imaging units had varying durations owing to special radiographic procedures (such as Hysterosalpingography - HSG and Barium studies) in those rooms and for which the presence of performing radiologists often determined the duration of clinical sessions.
- With a mixture of two different student levels (3$^{rd}$ & 4$^{th}$ years) in the same imaging unit, it was noticed that clinical supervisors at times were confused, finding it quite difficult to determine students' needs since the experience levels of these students vary. Going by Bernstein's three levels, this finding is an infrastructural level issue, with consequent impact on delivery because the collection code tendency away from integration, such as the delivery of knowledge and skill without the recognition of what the different groups of students need to know may seem as creating an artificial dichotomy at the delivery level. This recognition is important because students in the clinical context need first to understand the knowledge being received before any effective transition could be made to other learning situations.
- It was observed that available spaces in most of the clinical areas were limited, thus contributing to compromises in safety and comfort guidelines for clinical education.
- Activities within some of the imaging units also indicated that some clinical supervisors were either ignorant or unclear about SBAHS's supervisory expectations regarding the students' developmental progress and the areas needing further learning. For instance, SBAHS expects clinical supervisors to engage students in the performance of radiographic procedures, but on some occasions, students were seen to be running errands outside the purpose for which they were sent to the clinical area. Through the lens of Bernstein's theorization, this could be considered as an infrastructural level issue, and this is possibly related to the initial finding from interviews (ITF5) that the system is not engaging clinical supervisors properly.

- The observed number of students placed in some of the imaging units made it impossible to achieve a 1:1 student to clinical supervisor ratio which is recommended by radiography blueprints (ASRT, 2016; JRCERT, 2014). Existing student to clinical supervisor ratio (3:1) also suggests that not all students might have access to a sufficient volume and practical experience of radiographic procedures. Here again, this finding is an infrastructural level issue, with consequent impact on delivery because the collection code tendency away from integration, such as the limited access to practical learning situations may seem as reducing student's confidence level in transitioning from classroom to clinical learning.
- Although students were observed to be actively involved in clinical practice, their highest level of participation, as observed, was mostly related to the pre and post-procedural preparation of patients. This finding confirms Bernstein's (2000) notion that students' access to disciplinary knowledge depends on how well pedagogic practices are framed to give such students control over their learning process.
- Clinical supervisors were noted to be playing dual roles as clinical radiographers and supervisors so in several situations of high patient turnout clinical supervisors were noted to prioritize their role as clinical radiographers over their role as clinical supervisors. Through the lens of Bernstein's theorization, this could be considered as an infrastructural level issue, and this is possibly also related to the initial finding from interviews (ITF5) that the system is not engaging clinical supervisors correctly and for which we see its subsequent effect on delivery.

### 4.4 Online survey

A total of 33 student radiographers were invited to complete a Google Web form. A total of 31 Google Web forms were completed and submitted, representing a response rate of 94%.

Table 4.5 below illustrates the respondents' level of agreement and disagreement with statements on academic instruction and clinical supervision.

**Table 4.8: Student radiographers' views on academic instruction and clinical supervision**

| Item | Students' opinion | | |
|---|---|---|---|
| | Agree | Neutral | Disagree |
| Q1. Academic instructors demonstrate deep knowledge of the subject | n=25, 83.3% | n=2, 6.7% | n=3, 10% |
| Q2. Academic instructors make the content of taught courses relevant to clinical practice | n=24, 90% | n=3, 10% | n=3, 10% |
| Q3, Content of taught courses are appropriately planned and sequentially delivered by academic instructors | n=16, 53.3% | n=9, 30% | n=5, 16.6% |
| Q4. Classroom learning is most often interactive. | n=19, 63.4% | n=6, 20% | n=5, 16.7% |
| Q5 Course delivery approaches utilized by academic instructors are aligned with my preferred learning style | n=3, 10% | n=6, 20% | n=21, 70% |
| Q6 I feel empowered to be responsible for my learning | n=21, 67% | n=2, 6.7% | n=7, 23.3% |
| Q7 Teaching strategies of academic instructors empower me to link and apply classroom knowledge to clinical practice | n=18, 60% | n=8, 26.7% | n=3, 10% |
| Q8 Academic instructors provide learning materials and determine what should be learned | n=22, 73.4% | n=3, 10% | n=5, 16.6% |
| Q9 Students are tasked to find learning materials and resources | n=15, 50% | n=12, 40% | n=3, 10% |
| Q10 Academic instructors at times allow me to assume an instructors' role in the learning | n=17, 56.7% | n=6, 20% | n=7, 23.3% |
| Q11 I get the involvement of academic instructors during my clinical rotations | n=6, 20% | n=9, 30% | n=15, 50% |
| Q12 I get the support of clinical supervisors during my clinical rotations | n=18, 60% | n=6, 20% | n=6, 20% |
| Q13 Clinical supervisors often allow me to apply acquired knowledge from the classroom to actual patients in clinical areas | n=17, 56.7% | n=5, 16.7% | n=8, 26.6% |
| Q14 Clinical supervisors demonstrate good clinical credibility in playing their roles as mentors, role models and coaches | n=14, 46.6% | n=8, 26.7% | n=8, 26.7% |
| Q15 Practices of clinical supervisors as observed in clinical areas are very consistent with classroom descriptions of such procedures | n=6, 20% | n=7, 23.3% | n=17, 56.7% |
| Q16 Collaboration is observed between academic instructors and my clinical supervisors during learning activities in the classroom and clinical area | n=5, 16.7% | n=10, 33.3% | n=15, 50% |
| Q17 In the clinical area, my Clinical supervisor(s) remain(s) in the background while I work independently | n=10, 33.3% | n=10, 33.3% | n=10, 33.3% |
| Q18 Clinical supervisors present me with clinical situations based on my previous experiences | n=18, | n=2, | n=9, |

| | | | |
|---|---|---|---|
| | 62% | 6.9% | 31% |
| Q19 Clinical supervisors encourage a face-to-face interaction between myself and patients | n=25, 83.3% | n=2, 6.7% | n=3, 10% |
| Q20 Clinical supervisors often offer me the opportunity for safe experimentation and discovery of solutions in the clinical area | n=17, 56.7% | n=5, 16.7% | n=8, 26.7% |
| Q21 Clinical supervisors expose me to existing relationships between patients' clinical | n=22, 73.4% | n=3, 10% | n=5, 26.7% |
| Q22 Clinical supervisors are more focused on training me than rendering radiographic services to patients | n=5, 16.7% | n=7, 23.3% | n=18, 60% |
| Q23 I am legitimately accepted and allowed to actively participate under close supervision through interactive and collaborative activities with my clinical supervisors | n=21, 70% | n=5, 16.7% | n=4, 13.3% |

Table 4.8 above illustrates the views held by student radiographers on academic instruction and clinical supervision. Questions (Q1 – Q11) are focused on academic instruction while questions (Q12 – Q23) are focused on clinical supervision. Students' responses in this table were intended to be used in support of previous findings from the interviews and observations.

In the order of priority, Table 4.9.1 below illustrates a list of instructional technologies which, from the students' point of view are mostly used, less used and recommended.

**Table 4.9.1: Student radiographers' views on the frequency of instructional technologies**

| **Instructional technologies** | | |
|---|---|---|
| **Mostly used** | **Less used** | **Mostly recommended** |
| Laptops | Audio (Podcast) | Laptops |
| Email | DVD | Computer-based models |
| eBooks | Online discussions | eBooks |
| Search engine | Online Chats | Audio (Podcast) |
| | Wireless classrooms | Email |
| | MP3 players | Wireless classroom |
| | Web CT | Online discussions |
| | Computer-based models | |

In the order of priority, Table 4.9.2 below shows respondents' responses to question 26 and 27. Question 26 was aimed at finding out teaching strategies mostly and less used by academic instructors while question 27 was focused on teaching strategies mostly recommended by respondents.

**Table 4.9.2: Student radiographers' views on the frequency of teaching strategies**

| Teaching strategies | | |
|---|---|---|
| **Mostly used** | **Less used** | **Mostly recommended** |
| Lectures by power-point | Use of simulations | Use of phantoms/models |
| Taking notes | Use of concept maps | Clinical demonstrations by academic instructors |
| Memorizing facts | Debates and peer reviews | Debates and peer reviews |
| Student research | Use of phantoms/models | Seminars and workshops |
| Student-to-student collaboration | Seminars and workshops | Lectures by power-point |
| | | Team-based learning |

Table 4.9.3 below shows two broad groupings of the findings emerging from respondents' responses to Q28 which is an open-ended question aimed at gaining a more in-depth understanding on why respondents agreed or disagreed to initial closed-ended questions (Q1 – Q23).

**Table 4.9.3: Groupings emerging from student radiographers' views on classroom and clinical instruction**

| Classroom instruction | Clinical instruction |
|---|---|
| • Structured delivery<br>• Theoretical bias | • Interrelations & collaborations<br>• Clinical teaching and support |

### 4.4.1 Structured delivery

Respondents revealed that academic instructors assumed different classroom instructional approaches which were very much structured and satisfactory, but there is still more room for improvement. A few of their statements include

> ….courses outline are well structured.
> ….teaching approaches are okay, but there's still room for improvement.

The statements above support the findings from the interview which similarly suggests that there is good structuring, sequencing, and scaffolding of learning, concerning context.

### 4.4.2 Theoretical bias

Respondents also revealed that learning was sometimes too theoretical thus making it difficult to appreciate its practical relevance. For instance, a few respondents revealed that

> ….academic instructors make use of more classroom work instead of blending practical sessions during lecture periods.
>
> ….learning is not interactive. Some academic instructors fail to seek the view of students to ascertain their understanding, and thinking on the topic.
>
> ….learning verbatim makes learning frustrating and sometimes it's just memorization of facts.

Some respondents also felt that the dictation of notes to students during lectures tend to compel students to concentrate more on listening to get the right words than to understand the content of the lecture. These statements buttress initial findings from the interviews that some academic instructors make less use of teaching strategies (e.g., demonstrations & case studies) that enable students to appreciate the practical application or relevance of classroom knowledge.

### 4.4.3 Interrelations and collaborations

Respondents also revealed that there was little collaboration between academic and clinical instructors and for which there were disparities between the classroom and clinical learning, which in turn influenced integration of classroom knowledge with clinical practice. For example,

….there is little or no collaboration between instructors, students were never taken to the clinical rooms to be taught by academic instructors. Also, what we have learned in the classroom sometimes appears to be different from what is applied in the clinical field.

### 4.4.4 Clinical teaching and support

Some of the respondents' feedback on clinical teaching and support was consistent with findings from the observations, indicating that most clinical supervisors do not understand their responsibilities towards student radiographers. For instance, one student responded that.

> ….radiographers in the clinical areas does not respect and appreciate students' efforts. Radiographic procedures are not explained to students; instead, students are asked to run errands which are not part of the whole radiography course. Students are sometimes bullied, intimidated and spoken to harshly, to the extent that they barely even ask questions.

Another student also revealed that:

> Some of our clinical supervisors would not just accept the fact that we are students and are bound to make mistakes or errors as we learn to become professionals. Even though our mistakes are expected to be corrected, some of them just would not tolerate it.

The findings in sections 4.4.1 – 4.4.4 have so all indicated a collection code tendency away from integration at the delivery level. Moreover, it can be deduced from previous findings (interviews) that a lack of integration at the infrastructural level was accounting for this pedagogic tendency away from integration and possibly students' transition from classroom to clinical learning could be affected as teaching assumes a more didactic approach.

Participants' recommendations for enhancing theory-practice integration are summarized into four key categories listed below:

- Course restructuring
- Collaborations
- Instructional technology
- Demonstrations and hands-on

Through the lens of Bernstein's three levels, the first recommendation falls within the content level; the middle two recommendations fall within the infrastructural level. The last recommendation falls within the delivery level.

### 4.4.5 Course restructuring

Some respondents held the opinion that theory and practice can better be integrated if radiography course system is restructured such that:

> …there are more practical sections (hands-on) than ordinary lectures
>
> …classroom courses are aligned with clinical knowledge and vice versa
>
> …final year students spend almost all their time in the clinical areas, with just a little classroom sessions

### 4.4.6 Collaborations

Some respondents were also of the view that theory-practice dichotomy can be minimized if:

> …clinical supervisors and lecturers are simultaneously updated through workshops on current teaching models and clinical practices
>
> …academic instructors are allowed to serve as clinical instructors

### 4.4.7 Instructional technology

Some students too held the opinion that instructional technology can be used to bridge the theory-practice gap if….

> …academic instructors update their knowledge in computer skills
>
> …computer-based simulations are used for demonstration of radiographic procedures rather than verbal explanations
>
> …videos on radiographic procedures are shown to students during lecture periods to enable students to appreciate and understand without just memorizing them

### 4.4.8 Demonstrations and hands-on

Some respondents were also of the view that effective transition from theoretical knowledge to clinical practice can be improved by demonstrations such that

> …practical sessions are incorporated during lecture periods so that topics do not sound too abstract
>
> …Clinical supervisors are charged to allow students perform some examinations independently with little supervision during clinical rotations

This section has demonstrated significant data from four different data collection methods. Table 4.9.4 summarizes the key findings from these four data sources with

respect to specific sub-questions addressed. These key findings were noted to have emerged from more than one data source.

**Table 4.9.4: Key findings based on cross-matching of results from the four data collection methods**

| Key findings | | Reference | | | |
|---|---|---|---|---|---|
| | | **Documentary analysis** | **Interviews** | **Clinical observations** | **Online survey** |
| 1 | **Classroom-based radiography curriculum** | Section 4.1.3<br>Section 4.1.4 | Section 4.2.5 | | Section 4.4.2<br>Table 4.9.3 |
| 2 | **Teacher-centeredness vs. student-centeredness** | | Section 4.2.2.1<br>4.3.1<br>4.3.2<br>4.2.1<br>4.2.2 | | Table 4.9.2 |
| 3 | **Failing clinical support** | | | Table 4.5 (Items 5 & 9) | Table 4.8 (Q22) |
| 4 | **Absence of collaborative partnership** | | Section 4.2.3.2 | Table 4.5 (Item 3) | Section 4.4.3 |

In the next Chapter, a discussion of these key findings is made about the primary research question mentioned in Chapter 2.

# CHAPTER 5

# DISCUSSION

This chapter discusses the four key findings outlined in Chapter 4 and how the study addressed the primary research question:

- ***How are teaching strategies and radiography curriculum design at SBAHS supporting the effective transition from classroom to clinical learning?***

## 5.1 Classroom-based radiography curriculum

As indicated in Table 4.9.4, the conceptualization of SBAHS's radiography curriculum as being classroom-based or too theoretical emerged at three different levels (documentary analysis – Sections 4.1.3, 4.1.4; interviews – Section 4.2.5.1; and an online survey – Section 4.4.2, Table 4.9.3) of this study. Given these, a discussion is made on how the design of the radiography curriculum at SBAHS is supporting student radiographers' integration or effective transition from classroom to clinical learning.

The literature on health professions education and other educational enterprises recognize the design of curriculum as an essential feature in theory-practice integration (Williamson *et al.,* 2004; Helitzer & Wallerstein, 1999; Ferguson & Jinks, 1994; McCaugherty, 1991). Moreover, since curriculum describes what is intended to be learned by students and also is a crucial determinant of when and how theory is applied to practice, literature recommends that the curriculum of any professional training program must be appropriately designed and well structured (De Swardt *et al.,* 2012). In other words, the design of curriculum plays a crucial role in improving student outcomes (Winston, 2015).

With regards to how theoretical and clinical elements are interwoven in the design of SBAHS radiography curriculum, the results (as depicted at Section 4.1.3) indicate that clinical radiography obligations for student radiographers start at the end of

the 2nd year of the programme. In comparing this design with that of other radiography curricula, it was revealed that such sequencing of theoretical and clinical elements was accounting for the considerable variation in timing and duration of clinical experience for radiography students at SBAHS (as indicated in Section 4.1.4) and for which the radiography curriculum at SBAHS was noted as being conceptualized as relatively classroom-based.

### 5.1.1 Timing of clinical learning

With regards to the timing of clinical learning experience for student radiographers, the results in Section 4.1.3 show that, to some extent, the relationship between theory and practice in the radiography curriculum of SBAHS is hierarchical, in the sense that the theoretical element is seen as leading the clinical element. In other words, theoretical underpinnings are delivered first and probably intended to guide the practice by providing the framework for understanding observations later made in clinical learning. Again, with such timing of clinical experience, theoretical and clinical elements are noted to be divided into two parts (study blocks) and delivered sequentially, which in itself carries the assumption that these two elements are separate (McCaugherty, 1991). Also, going by Bernstein's (1971) classification and framing, the content tendency away from integration, such as sequencing or timing of clinical experience may be seen as creating an artificial dichotomy at the delivery level. Also, the collection code tendencies (elements standing closed to each other, clearly and strongly bounded) somehow signal a didactic theory of learning which often is known to resist integration (Bernstein, 1971). Moreover, going by Bernstein's (2000) knowledge classification, we see ‘knowledge' being classified here as vertical. Vertical in the sense that knowledge is sequential, explicitly and systematically structured with rules of acquisition and transmission.

Generally, the sequential or hierarchical structuring of theory (classroom learning) and practice (clinical learning) in SBAHS's and other radiography curricula resonates with the traditional model on theory-practice integration which, according to

literature, is the most common in professional education structure (Dillon *et al.,* 2014; Falkenberg, Goodnough, & MacDonald, 2014; Scully, 2011; Allen, 2009; Wrenn & Wrenn, 2009; Choi & Lee, 2008; Phelan, 2005; Korthagen, 2001; Wideen *et al.,* 1998; Leinhardt, McMarthy, & Merriman, 1995; Ferguson & Jinks, 1994; McCaugherty, 1991). The sequencing of classroom and clinical modes of provision, as explained earlier, is usually supported by the argument that theoretical and practical contents of an educational curriculum need to be organized systematically to make learning more accessible for students (Mahmud, 2013; Ornstein & Hunskins, 2009). However, in recent times, this traditional model has been criticized because modern learning theory indicates that expertise is developed within specific domains and learning is situated within specific contexts where it needs to be developed and from which it must be helped to transfer (Darling-Hammond & Hammerness, 2005, p. 403). Again, this traditional model has been challenged because the integration of knowledge acquired in the academy with knowledge acquired in practice is neither trivial nor is it obvious how such integration is achieved (Falkenberg, Goodnough & MacDonald, 2014; Leinhardt, McMarthy, & Merriman, 1995). Perhaps the problem here has got to do with compartmentalization of the two modes of provision such that clinical learning in radiography education is conceptualized as the only place where academic knowledge is applied, which modern learning theory (Darling-Hammond & Hammerness, 2005) on the contrary, points out to be wrong. Rather, practice should be seen as the place where students can develop expertise, and this could happen both in the classroom or clinical setting, depending on the pedagogic approach (Darling-Hammond & Hammerness, 2005).

The latter statement above thus suggests that theoretical and clinical elements of a curriculum should be viewed as complementary and not as separate entities. Moreover, as far as the integration of classroom and clinical learning are concerned, this point of view further is suggestive that the relationship between theoretical and clinical elements does not necessarily have to be sequential but should instead be seen as reciprocal and dynamic. Moreover, any curriculum subscribing to this type of theory-practice relationship will not only see theory as something that underpins all practice but also sees practice experiences as feeding back into academic course learning where

the practice is theorized (Falkenberg, Goodnough & MacDonald, 2014). Adopting this perspective in the context of radiography education would imply that practice should necessarily not occur only in clinical settings but in classroom settings as well. In other words, radiographic expertise should be developed by theorizing practical radiographic experiences. Also, should such perspective be used in designing and structuring radiography curriculum, the theory and practice dichotomy which exists between academic and clinical learning environments may perhaps be reduced because learning experiences are integrated at both academic and clinical learning settings. Moreover, students are encouraged to make sense of professional experiences during both academic coursework and clinical practice when there is an integration of learning experiences in the two learning sites (Dillon *et al.,* 2014, p.99). Further drawing from the literature (Falkenberg, Goodnough & MacDonald, 2014; Dillon *et al.,* 2014; Korthagen, 2001), classroom and clinical learning can be conceptualized as ways of knowing (modes of provision) which need to be integrated with a reciprocal influence to form the kind of 'practical knowledge' that is developed by helping students theorize (make sense of) practice experiences and not by 'applying theory in practice'.

The argument above may further be explored by deliberating on the postulation of Wrenn and Wrenn (2009) that the best learning environment is created when theoretical and clinical elements are integrated rather than partitioned throughout multiple stages in the curriculum. For instance, ideas on just-in-time learning delivered spontaneously during clinical radiography practice as explained by Williamson *et al.,* (2004) and Morgan (1990) suggest that students need not necessarily learn theoretical concepts before carrying out the practice in clinical settings. Hence even if clinical elements are constructed in line with theoretical contents, the sequence of learning in clinical practice may vary when there is a need to resolve practical problems. This line of argument, for instance, does support problem-based learning in which students in the clinical area are often presented with practice-based problems at the beginning of the learning process even before any theoretical/classroom knowledge is provided. Moreover, from this perspective, theoretical and clinical elements don't necessarily have to be sequential because, with guidance, the self-directed learning by the students in the clinical area can help them gain new knowledge to solve practice-based problems

without a prior theoretical basis (Gijbels *et al.,* 2005; Taradi *et al.,* (2005). In comparison with the previous arguments by Mahmud (2013), Ornstein and Hunskins (2009), this latter approach to the design and delivery of theoretical and clinical elements is also suggestive that learning ought to be done in context and with students being encouraged to become responsible for their learning.

### 5.1.2 Duration of clinical learning

Some health professions education like in nursing, physiotherapy and Occupational therapy recommend that all students involved in their programmes of study for professional qualification be required to spend a significant proportion of their programme time, often not less than 50% learning in clinical settings (Redmond, 2004; Chartered Society of Physiotherapy, 2003; CoR, 2002, 2003; College of Occupational Therapists, 2003; Nursing & Midwifery Council, 2002). Similarly, the blueprints for radiography education have also highlighted the importance of sufficient clinical education in clinical skills acquisition and theory-practice integration, but unfortunately, these blueprints fail to highlight the duration of the clinical element of radiography curriculum (JRCERT, 2014; ASRT, 2012; CoR, 2002).

As was revealed in the interviews (Section 4.2.5.1), one academic instructor proposed an extension in the duration of SBAHS radiography programme from a 4-year to a 6-year period to enable the restructuring of curriculum for more time allocation to clinical experience. It is perhaps a genuine concern and possibly a conceptualized intervention to improve the current classroom-based radiography curriculum, but given the current resource challenge confronting SBAHS and the massively increased cost to every one of extending the study by another two years, its practicality cannot be guaranteed. Moreover, the documentary analysis evidences other radiography programmes that have managed to increase clinical education without increasing overall duration of their programmes, so a similar approach could be adopted in solving the identified challenge of clinical learning duration in SBAHS.

However, as mentioned earlier in this section, the implication of a non-specified duration for the clinical element in the blueprints of radiography education is that radiography institutions, based on their learning objectives may either adopt a clinical-based or classroom-based radiography curriculum. Either way, each institution's focus, as reflected in its curriculum design will determine the extent to which students develop clinical skills and subsequently, confidence in integrating classroom learning with clinical learning.

For example, with clinical radiography exposure within SBAHS's radiography curriculum being designed to start at the end of 2$^{nd}$ year of the programme, it is possible that radiography students' clinical exposure at SBAHS cannot be equaled to that of other students whose clinical exposure start from the 3$^{rd}$ week of their four year programme. This study thus agrees with the proposed changes (as indicated in Section 4.2.5) by some of the study interviewees that the current classroom-based radiography curriculum needs to undergo some modification to exclude irrelevant courses/contents and to create more room for a possible increase in the duration of clinical exposure for students. Further, their proposed exclusion of irrelevant content from the curriculum draws attention to the fact that radiography practice across the globe is undergoing rapid technological advances and for which some topics in the existing curriculum may no longer be relevant to current radiographic practices. For instance, currently in Ghana, the practice of radiography has advanced to digital and computed radiography in which darkroom practice and its associated principles on the wet chemical development of X-ray films and safelight practice have faded out in clinical practice. The researcher therefore also agrees that the implementation of his institution’s radiography curriculum containing such outmoded topics only results in students’ acquisition of academic knowledge which cannot be transferred to clinical practice. When this continues, it may eventually lead students to the feeling that the curriculum is too abstract. Also in such situations where students consider classroom learning or academic knowledge as not forming a part of their clinical practice, a codification vs. action dichotomy emerges, simply because students see academic practices as only of a temporary nature that are lost when transitioning from one community of practice to another (Wenger-Trayner, & Wenger-Trayner, 2015; Hornsby, 2012). Through

Bernstein's (1971) codification and framing, the above-discussed issue on timing and duration of radiography curriculum at SBAHS may be seen as a collection code tendency away from integration at the content level and could indirectly be affecting students' transition from classroom to clinical learning.

The critical issue of concern here is that low exposure to clinical practice reduces students' confidence in practice-related skills (Johanson, 2013). Moreover, since healthcare cannot be learned solely in the classroom or from textbooks and laboratories, the interactions with real people within clinical settings are very much necessary for clinical acuity and judgment (Moorhouse, 1991). Interestingly, this notion not only signifies the importance of combining appropriate proportions of academic and clinical elements in the design of radiography curriculum but also suggests that classroom and clinical learning must complement each other such that educational programs aimed at preparing healthcare professionals for academic award and license to practise ensure a reasonable exposure of students to academic and clinical elements of training (Mulholland *et al.,* 2005; Moorhouse, 1991). Alternatively, perhaps, in classroom situations in which learning is restricted by infrastructure, a larger proportion of the learning should take place in the clinical setting where clinical instructors can help these students integrate the two forms of provision.

Moving towards the end of this section, it also worth acknowledging that although the blueprints (ASRT, 2016; JRCERT, 2014; ISRRT, 2014) for radiography education do provide frameworks guiding the scope of content in the design of curriculum, it is however argued that the breadth and depth of curriculum content are sometimes influenced by the national workforce needs of individual countries within which these training institutions are situated (Ornstein & Hunskins, 2009). For instance, in a country like Ghana in which radiographers are not mandated to write radiological reports on the radiographs produced, it would not be a surprise to find out that the scope of content in SBAHS's radiography curriculum has been limited to helping students become skilled only in the production of diagnostic radiographs. But assuming there was a demand for radiographers to extend their roles into areas like film reporting, interventional radiology, and ultrasonography, then the scope and structure of both theoretical and clinical

elements within the curriculum would probably have been designed to help these trainees to acquire both theoretical knowledge and technical competencies in these areas before the completion of their training. Viewing through Bernstein's (1971) construction, we can see here that there is indeed a relationship between boundaries of a school (classification) and the control over what is and is not taught (strength of framing). However, in the case of this study, it is evident (Section 4.1.1) that an outside agency (e.g., national workforce needs in Ghana) probably has also influenced what curriculum content (breadth and scope) is being relayed (transmitted) to student radiographers.

To summarize this first section, it is worth re-iterating that this section set out to discuss how the relationship between theoretical and clinical elements of the radiography curriculum of SBAHS was supporting the effective transition from classroom to clinical learning. The study has so far evidenced a separation between theoretical and clinical aspects in the design of SBAHS radiography curriculum. This separation is discussed as creating an artificial dichotomy which according to literature does not support the integration or the transition of learning from classroom to clinical situations. Again the relatively shorter duration for clinical experience was a possible restriction to development of clinical skills. The variation in the timing and duration of clinical practice, though depicting intrinsic institutional values, was, however, accounting for the radiography curriculum in SBAHS being classified as relatively classroom-based. Here, it is seen that the content level tendency away from integration could be affecting the delivery of the curriculum. Moreover, since pure educational identities (i.e., the separation of classroom and clinical elements), according to Bernstein's collection code tendency, are possible restrictions to integration, this issue perhaps could be addressed both at the content/curriculum and infrastructural levels through connective specialization (interweaving classroom and clinical elements) and infrastructural relations.

## 5.2 Teacher-centeredness vs. student-centeredness

As indicated in Table 4.9.4, the results emerging from two different data sources (interviews – Section 4.2.2; and the online survey – Section 4.9.2) suggest that academic instructors at SBAHS deliver their courses using a variety of teaching strategies. By the aid of Trigwell and Prosser's (1993, 1996) 'approaches to teaching,' a discussion is first made on the teaching intentions of academic instructors, then followed by how these intentions are reflected in their teaching strategies to support student radiographers in effective transition from classroom to clinical learning. The latter part of this section then draws from the results to further explain possible factors influencing the use of such teaching strategies.

Viewing the interview results (as depicted at Table 4.3.1 and Section 4.2.1) through Trigwell and Prosser's (1993, 1996) approaches to teaching framework, two main orientations or beliefs on teaching are identified amongst radiography instructors at SBAHS. While one group of academic instructors (n=4) held the belief that teaching was mainly to impart knowledge, another group also held the belief that teaching was to guide, facilitating and supporting learning. The two categories of findings do illuminate instructors' philosophy or theoretical orientation (beliefs) on what entails teaching and learning. As mentioned earlier in the literature, Trigwell and Prosser (1993, 1996) raised a controversial issue on whether teachers' conceptions and intentions towards teaching do have any direct impact on their teaching approaches (teacher-centered, student-centered, teacher-student interaction).

As indicated in Section 4.2.2, the evidence drawn from academic instructors' instructional strategies suggest that the theoretical orientation of instructors do reflect on their teaching approaches. For instance, amongst the four instructional strategies (lecture notes, group discussions, classroom demonstrations, and graphics) mentioned by these instructors, it was noted that instructors who held the belief that teaching is mainly for imparting knowledge were noted to use less of the other instructional strategies apart from lecture notes. In other words, instructors with the intention to impart knowledge prove to be more teacher-centered and for which their teaching was mainly focused on giving these students radiography information (e.g., concepts or facts

about radiographic procedures and the set of principles guiding the profession) or telling students what they need to know. Similarly, the few instructors who used classroom demonstrations and group discussion were noted as being student-focused, owing to their intention to guide students through the learning process. These established links between instructors' intention, teaching approach and consequently their teaching strategy, therefore, does confirm Trigwell and Prosser's (1993, 1996) postulation that teaching approaches are differentiable based on teachers' intentions. Also this result supports Ajzen and Fishbein's (1980, 2000) theory of reasoned action and planned behavior that behavioral intentions are a function of beliefs about the likelihood that performing a particular behavior will lead to a specific outcome, hence the teaching strategies and approaches of academic instructors can best be predicted from their intentions for teaching.

Again, it is noted from the same results (as indicated in Table 4.3.2 and Section 4.2.2) that academic instructors who had the intention to facilitate learning were the ones using group discussions, classroom demonstrations, graphics and videos in their delivery of curricular content. Again, the results in this category further confirm Coffey and Gibbs's (2002) notion that teachers who adopt a student-focused approach tend to use a wider repertoire of teaching methods which are more student engaging than those who are teacher-centered.

Having cross-matched the two categories of results which emerged from the interviews and survey, it was evident that lecture note instructional strategy – characterized by power-point presentations and notes dictation, was the most common teaching strategy. However, based on Bernstein's (1971) classification and framing, the relationship between teacher-centered instructors and their students indicates that students in such learning situations have less control over the selection and pacing of their learning. Also, the transmission of contents (structure of pedagogy) in this approach is showing a strong framing, owing to reduced options being offered to students in the learning process (Bernstein, 1971).

In viewing the two categories of results through Trigwell and Prosser's framework, it is deducible that teaching strategies of academic instructors at SBAHS fall

within both teacher-centered and student-centered approaches. The dominance of lecture type delivery of curriculum amongst academic instructors, however, depicts didactic teacher-centered approach which is frowned at by modern learning theory frowns. It is merely because a teaching strategy such as dictation of notes during lectures tends to compel students to concentrate more on listening to get the right words than to understand the content of the lecture (Goh *et al.,* 2014). Instead, modern learning theory argues in favor of student-centered teaching strategies (simulations, demonstrations, peer reviews, and case studies) because their use in academic learning processes does encourage students in becoming active learners and explorers of problems (Cleland, 2017; McGaghie, Issenberg, Barsuk, & Wayne, 2014; Wrenn & Wrenn, 2009; Fuller & Kuhne, 2008; Campbell, 2007). Moreover, when students are challenged to handle complex situations through such teaching strategies, they gradually develop the ability to integrate theoretical concepts with realities of practice (Fuller & Kuhne, 2008).

The findings in this study also buttress arguments in the literature (Amoah, 2011; Akyeampong *et al.,* 2006) that prescriptive instructional behaviors in the classroom exist amongst Ghanaian lecturers and these tend to prevent students from appreciating the practical application or relevance of classroom content. Also, in viewing these findings through the lens of the aforementioned Standards of Practice (SOP) for the teaching profession in Ghana, it is quite convincing that teaching by notes dictation is archaic and genuinely does not reflect these standards of practice.

In summary, the responses from academic instructors generally indicated the use of teaching strategies ranging from teacher-centered to student-centered approaches. Doubtlessly, the use of power-point lecture delivery style was the commonest amongst academic instructors and with a few (n=2) academic instructors using case studies and classroom demonstrations to help students integrate classroom learning with clinical situations. So in the first place, the evidence that some academic instructors use some form of activities (case studies and demonstrations) in their course teaching process thus suggests that teaching strategies at SBAHS, to some extent, were supporting student radiographers in integrating the two modes of provision. However, the overall

conclusion that teaching strategies of most academic instructors are not supporting student radiographers at SBAHS in transitioning from classroom to clinical learning is qualified by the evidence that amongst the numerous strategies by which academic instructors could have helped radiography students develop practical wisdom or transfer from classroom learning to clinical situations, only a relatively small number (n=2) of academic instructors were noted to be student-centered.

### 5.2.1 Factors influencing teaching practices of academic instructors

This study revealed critical factors noted as influential on how teaching strategies of instructors support the proper integration of classroom and clinical learning. This section thus discussed these factors as follows:

#### 5.2.1.1 Teacher training

As indicated in Table 4.2, the comments by a higher number of academic instructors (n=5, 71%) revealed that they were never given formal training on teaching and instructional practices, either before or post their engagement as instructors of SBAHS radiography program. Clearly, this evidence shows that SBAHS is not complying with the requirement that those who help in the training of healthcare professionals must be trained (DoH, 2001). Again, this finding not only confirms the postulations that only few health educators have the requisite formal background in higher education (Williamson *et al.,* 2004; Wilkerson & Irby, 1998) but also buttresses several other authors' postulation that teaching approaches of teachers is influenced by several factors of which training is no exception (Zhang & Sternberg, 2002; Gibbs & Coffey 2001; McKeachie 1997). These are skills a well-tailored teacher training programme can help teachers develop.

With the higher number of our academic instructors teaching without prior formal training in teaching, it is possible that their teaching competencies are being derived from their innate qualities or even perhaps, by observing other senior colleagues (Williamson *et al.,* 2004) or by the prevailing societal, cultural dimensions in their

practices (Amoah, 2011; Oduro, 2008). And the significance of this finding is based on the evidence (as indicated in Table 4.3.2) that the two academic instructors (ITF4 & ITF6) who had teacher training were the only ones identified with student-centered approaches and a broader repertoire of teaching strategies, thus signifying the role of teacher training on instructors' instructional strategies. The evidence from this study (as indicated in Section 4.2.1.2) also shows that the only interviewee whose teaching philosophy reflected combined elements of knowledge impartation and facilitation of learning was one of the two academic instructors who had undergone formal training in teaching. Moreover, this instructor's effort to find out the students' vision about quality healthcare delivery and the added conscious effort to make students understand the real meaning of quality healthcare delivery in radiography clearly show how well aligned this instructor's teaching conception was with Trigwell and Prosser's (1993; 1996) postulation on the use of teacher/student interactive strategies to support effective learning. From the discussions so far, it may then be argued that some of our instructors are still operating under limited theoretical background and consequently employing outmoded teaching strategies (e.g., notes dictation) because they have not undergone any training on how to teach.

At the institutional level, it can be assumed that the appointment system of SBAHS does guarantee the engagement of only experts in their respective radiographic fields of specialization for teaching purposes. Moreover, this, of course, resonates with the postulation that one of the most significant features of university instructors is their expertise in their disciplines (Postareff *et al.,* 2007). Also, it is however, worth noting as well that we still stand the risk of some instructors adopting inappropriate instructional strategies because being an expert in one's professional discipline does not guarantee one's expertise and efficiency in teaching (Long *et al.,* 2014). Nevertheless, aside from the findings of this study, there has been inadequate research and evidence to support the fact that teacher training impacts teaching efficiency. For this reason, there is a need for further research to evaluate the impact of teacher training on improvement of instructional strategies of radiography instructors.

#### 5.2.1.2 Single role lecturer:

As discussed earlier, the design of radiography curriculum into two parts (theoretical and clinical elements) does give the impression that these two elements are separate and for which the delivery of theoretical element has exclusively been by lecturers (academic instructors) while the delivery of clinical element has been exclusively by clinical radiographers. Such situations can make it difficult for students to integrate classroom learning with clinical learning especially when academic instructors involved in the delivery of theoretical content of curriculum are not allowed to teach, supervise or get involved in students' learning during clinical practice (Cardin & Mcneese-smith, 2005; Corlett *et al.,* 2003; Landmark *et al.,* 2003). Viewing through Bernstein's (1971) concepts of framing and classification, we can see how this design of curriculum is influencing students learning. The picture here also fits well with Bernstein's infrastructural level (collection code tendency) because we see more of pure educational identities (i.e., academic instructors being separated from clinical supervisors) with resultant restricted pedagogy and organizational relationship.

The study results (as indicated in Section 4.2.4) also show that the teaching strategies of lecturers place less emphasis on practical skills in the classroom, thus signaling a restricted pedagogy. Here, we see that infrastructural level organization, paradoxically, turns out to restrict pedagogy of academic instructors and such restricted pedagogy (i.e., the single role of academic instructors and their non-participation in clinical practice) might have long-term implications on their clinical credibility (Steele, 1991). Also, when this happens, it might well be difficult for academic instructors to become active role models for students. Moreover, when academic instructors do not participate in clinical practice, there is the fear that some of the knowledge they deliver in the classroom might be insignificant to students in the clinical area, thus contributing to the ineffective integration of classroom learning with clinical practice. Similarly, when clinical supervisors' support models fail to help students reflect on clinical observations, there is the higher possibility that their students might fail to integrate clinical learning with classroom learning situations. So in short, it is here argued that given the constant technological advancements emerging in medical imaging, it is essential that academic

instructors participate in clinical practice so as gain competence in the clinical as well as the academic aspects of radiographic procedures and vice versa.

#### 5.2.1.3 Instructional technology:

Computer-assisted instruction (Martino & Odle, 2008), simulation-based education – SBE (Cleland, 2017) and computer-based models (Martino & Odle, 2008; Hsu *et al.,* 1993; Harper *et al.,* 1984) are effective instructional strategies depicting explorative learning environments that allow students to practice clinical skills and become familiar with much of the techniques they will encounter later on in professional practice.

The interview results (as outlined in Section 4.2.5.1) revealed academic instructors' recommendation for the use of audio-visuals and computer-based simulators in teaching to enable students to relate classroom knowledge with clinical practice. Similarly, the survey result (as indicated in section 4.5.3) supported this view with a recommendation for the use of instructional technology as one of the key measures for enhancing the proper integration of the two modes of provision. The survey results (as depicted at Table 4.9.1) indicating the use of instructional technology in delivery of radiography curriculum being very much limited to the use of laptops (basically for power-point presentation), email, ebooks and search engines is however suggestive that SBAHS is failing to meet the GES and NTC Standards of Practice (SOP) which emphasize the need for instructors to use appropriate pedagogy, resources, and technology in attending to learning needs of students.

The import of instructional technology in the delivery of radiologic science programme is that course management systems such as discussion boards can help educators effectively communicate with their students, manage their classes and encourage students to learn at their own pace (Britt, 2006). Again, in the context of radiography education, the use of such innovations can allow virtual access to the class from any place at any time, tailor instruction to match students' diversity and further strengthen the teacher-student relationship (Martino & Odle, 2008). It is however

understood that the extent to which technology is used in teaching depends on the availability of the instructional technology and inherent ability of the teacher to use such instructional technology (Martino & Odle, 2008). Moreover, this is where professional training institutions ought to make conscious efforts to acquire such instructional systems and have their instructors trained in using them.

## 5.3 Failing clinical support

Clinical education in radiography is usually aimed at enabling students to have a consistent and intensive clinical exposure that allows them to competently and independently perform radiographic procedures over time. In the clinical setting, clinical supervisors facilitate this learning through a daily face-to-face approach. Based on Bogo and Vayda's (1998) explanation to field instruction, clinical supervision is more than a structural arrangement between the academy and a clinical setting in which student radiographers are expected to follow a set of activities, practices or procedures. The fundamental principle in clinical supervision, going by Bernstein's (1975) code theory is that clinical supervisors should demonstrate a distinctive blend of values, knowledge, and skills that students can understand, learn and help in shaping their identity. Therefore in conjunction with Bernstein's typology, Bogo and Vayda's (1998) four phased (retrieval, reflection, linkage and professional response) ITP model are used in discussing the results from clinical observations as follows:

### 5.3.1 Retrieval:

As shown by Item 17 of Table 4.7, a higher number (81.2%) of clinical supervisors were observed to provide students with limited opportunities to ask questions on observed radiographic practices and again, the same majority of clinical supervisors (as depicted in item 12, Table 4.7) failed to provide constructive feedback to questions even when they were asked. These results, contrary to what was expected, point to the fact that clinical supervisors were not adequately helping student

radiographers through the process of retrieval in which student radiographers ideally were supposed to be challenged to recall, and question previously observed radiographic procedures.

According to Bogo and Vayda's (1998) framework, the entry point in the loop for the process of clinical supervision is the recall of information, which in the context of radiography education, the facts describing radiographic practice experiences are retrieved. Also, the clinical supervisor's role at this phase of the ITP loop is to help frame students' random observations and in turn influence their definition of what constitutes acceptable practice for radiographic procedures. So when clinical supervisors fail to provide constructive feedback, they prevent these students from entering the first (retrieval) phase of the ITP model. Also, when this continues, Bogo and Vayda (1998) explain that the use of the learner's observing ego - a mind's eye paradox wherein the learner recalls a professional situation as both an observer and a participant may be suppressed and not operationalized. Moreover, when students ask questions during clinical practice, this may be due reactions to known facts of a clinical event or due to recall of previous classroom description of such clinical event. So when these students, in an attempt to get clarification, find their clinical supervisors turning them down, they may find it difficult to ask for more information, and this attitude eventually affects their definition, selection, and recall of what constitutes good radiographic practice. Through the lens of Bernstein's typology, we can picture that the collection code at this level makes it difficult, because of the strong framing, to recall

### 5.3.2 Reflection:

Dwelling upon Bogo and Vayda's (1998) framework, reflection refers to a thoughtful consideration of the practice activity in which the clinical supervisor's focus is primarily on exploring students' subjective meanings (personal values, beliefs, assumptions, and attitudes) attached to observed facts within the clinical practice context whilst taking cognizance of students' internalized notions of what is right or wrong. In Table 4.7, it is evident (as indicated by Item 11) that a lesser number (n=5,

31.3%) of the clinical supervisors showed openness to discussions on radiographic procedures and with majority (56.2%, n=9) of them also failing to offer students opportunities to evaluate and reflect on the processes of work (as indicated by Item 13).

In radiography, the personality of student radiographers exerts a powerful influence on how they interpret and react to observed radiographic procedures in the clinical context (Cunningham, Wright, & Baird, 2015; Burchell *et al.,* 1999). But unfortunately, the results above do imply that the dynamics of students' personality is receiving less attention from clinical supervisors. Such limited attention to students' personality dynamics may emerge from several factors prevailing in the clinical context, although this was not the focus of this study. A clue from Cunningham, Wright, and Baird (2015) however suggests that such attitudes may surface when clinical supervisors do not have a sense of ownership of the training program and therefore consider the presence of students as interference to normal workflow. In such clinical situations, the gap between students' development and clinical education may become widened and viewing this through Bernstein's typology they can be categorized as a restriction arising from the infrastructural level. Moreover, such clinical situations fail to support students to advance through the reflection phase because it is activities such as discussions that enable clinical supervisors to explore and identify students' internalized values (Bogo & Vayda, 1998). And following the identification of students' internalized values, clinical supervisors can then help these students subject their values to critical thinking to elicit association which consequently can be used to help these students appreciate the principles of radiographic procedures being carried out in their clinical contexts. Again, analyzing this finding through Bernstein's typology, it is clear that although the finding falls within his delivery/pedagogy level (collection code tendency), arguably, the infrastructural issue is the cause of the failing.

In this study, the category of radiography students being referred to are all final year radiography trainees and therefore must have had previous experiences/observations of similar radiographic procedures in different clinical situations. So even though such previous experiences may help students' understanding of new procedures, it is also important that clinical supervisors recognize

how such experiences might influence these students' performance of new radiographic procedures. Scully's (2011) discussion on the nature of theory-practice gap and skill acquisition, throws more light to this phenomenon by demonstrating the importance of reflection on the improvement of competency in nursing and its role in narrowing the gap between classroom and clinical modes of provision. Judging from Scully's (2011) personal experience, as an undergraduate nursing student, reflection reduces student nurses' anxiety levels and improves their sense of responsibility to become accountable for their education. Moreover, the description of Jerlock *et al. (*2003 cited in Scully, 2011) shows that competency in clinical instruction is revealed by the instructor's capability to initiate conditions in a practical situation, where theoretical/classroom and practical/clinical learning experiences are integrated and become obvious through creative and practical actions. Subsequently, it is equally important that such instructors facilitate effective transition from one form of learning to another through the interaction of classroom education, clinical supervision and the constant feedback and reflection aimed at specific needs of students (Scully, 2011). Also, clinical supervisors may help promote students' ability to reflect by ensuring that the clinical practice situation stimulates and illuminates students' subjective experiences.

Since clinical supervisors are believed to have more clinical experiences than their students, it is emphasized here again that the interactive process between students and their clinical supervisors (e.g., through discussions and open opportunities to reflect on the processes of work) in clinical settings can help these radiography students gain personal-knowledge and to compare their beliefs and assumptions about specific radiographic practices with those of their supervisors. This argument is further supported by Cardin and Mcneese-smith, (2005) who posit that discussions at the clinical placement enable students to connect the knowledge gained in the classroom with clinical practice. Also, such an interactive process enables students to reflect on their practical experience and can better relate their experiences in a more meaningful way (Bogo & Vayda, 1998). Further, such interactive processes can encourage student radiographers to identify the extent to which some of their personal beliefs about radiographic practices are right or wrong, thus signaling a change in their concepts if need be. And further, by Bernstein's (2000) horizontal knowledge (knowledge that is

every day, verbal and has features such as context, tacit nature, and locality), it is expected that an instructor applies professional and past experiences in promoting students' reflection. In viewing this through Bernstein's (1971) conceptualization, this finding is purely an infrastructural level issue with a consequent impact on delivery because the collection code tendency away from integration makes clinical supervisors feel their work is only to deliver practical knowledge, thus failing to help these students reflect on the theoretical/classroom aspect which is presumed to be the responsibility of academic instructors. Again this finding buttresses another important aspect of Winston's (2015) suggestion on the need for collaboration in any educational process to create a sense of ownership that is beneficial to the delivery of any course.

The extent to which clinical supervisors should interact (i.e. discuss and share experiences) with students is however beyond the scope of this study and may need future studies to elaborate further on. But when a clinical supervisor notices that certain students whom he or she is supervising are unable to understand a radiographic procedure either because such students lack personal experience or are unwilling to relate with their previous experience, it may be necessary, according to Bogo and Vayda's framework, that the clinical supervisor use his or her own experience to assist such students, through interactive processes, in making a linkage. However, the clinical supervisor must as well decide on what and the extent of personal experience that needs to be revealed (Bogo and Vayda, 1998). For instance, a clinical supervisor revealing personal feelings about performing a radiographic procedure for a female patient who is pregnant and the consequences of irradiating a developing fetus may stimulate the student to think and reflect on the importance of previously acquired knowledge on radiobiology and radiation protection in clinical practices. Of course, with such interactive processes in clinical situations students might be encouraged to reflect and voice out their thoughts and in so doing further improve the bond between clinical supervisors and their students in clinical supervision (Bogo & Vayda, 1998). Moreover, according to Scully (2011), when students are given such opportunities to combine clinical experiences with reflection, it helps develop their decision-making processes (practical wisdom) needed for effective transition from one form of learning to another.

### 5.3.3 Linkage:

Bogo and Vayda (1998) refer to linkage as the conscious application of academic learning to field work, in which acquired knowledge is identified, used to explain observed practice and finally used to plan a professional response. In other words, linkage addresses the way in which a knowledge base finds expression in practice, and is reconstructed as a result of practice (Bogo & Vayda, 1998). Also further explained by Bogo and Vayda, the process of linkage must encourage students to select, from competing concepts, what is needed to construct a cognitive system of understanding that fits what has been retrieved and subjected to reflection. Deducing from Bogo and Vayda's framework, clinical supervisors are expected to use specific techniques such as task-centered and group development approaches to help students achieve linkage in clinical situations.

On the one hand, results in Table 4.7 (as indicated by item 15) reveal that a higher number (n=9, 56.2%) of clinical supervisors do assist students in exploring developmental ideas. For instance, encouraging students to read more and do personal research on how radiographic procedures are performed is one of the possible ways of helping students broaden their knowledge base of the practice. However, on the other hand, the results in Table 4.7 (as depicted by item 16) suggest that a majority (n=11, 68.2%) of clinical supervisors are failing to give students the freedom to safely experiment.

Again, viewing the above results through the lens of Bogo and Vayda's (1998) framework, the understanding gained is that although clinical supervisors are offering different ideas by which the principles of radiographic procedures can be understood, they, however, are denying these students the opportunity to use their pieces of knowledge in a seemingly intuitive fashion to interact with practical situations. When this occurs, a gap is created between what is learned in the classroom and what is being practiced in reality (Bogo & Vayda, 1998). Students in such situations may then be forced to bear the burden of abstract content from the classroom that they have a problem transferring to clinical practice, thus limiting the student's confidence in drawing the connection between these pieces (Bogo & Vayda, 1998).

With the task-oriented nature of linkage, it is important that clinical supervisors not only practice linkage but also monitor it by constantly ensuring that students can pinpoint how similar elements relate to a specific knowledge base. The clinical supervisor's task in the linkage phase of the ITP loop is thus not only to draw students' attention to abstract knowledge but also to help these students relate and apply this abstract knowledge to clinical practice contexts. This argument, however, is also not to say that clinical supervisors ought to teach again the classroom knowledge already taught by academic instructors but rather to help these students link how prior knowledge relates to the phenomena of clinical practice.

### 5.3.4 Professional response

Bogo and Vayda's framework suggests that teachers need to constantly evaluate how students ground their ideas, knowledge, and insights in developing specific plans and behaviors for dealing with new situations.

As shown in the results (item 19 of Table 4.7), a majority (n=11, 68.7%) of clinical supervisors were observed as encouraging a face-to-face interaction between students and patients. In radiography clinical practice, face-to-face interactions usually involve activities such as proper identification of patients (e.g. asking patients' name and age), preparation of patients (e.g. helping patients change into a hospital gown, the removal of artifacts, explaining the procedure to the understanding of the patient) and aftercare (telling the patient what to do after the procedure). During such interactive processes, clinical supervisors can monitor how their students' acquired skills (especially in radiation protection, patient care, and management) are being used in response to the varied clinical conditions with which patients come to the imaging unit. Here also, the acts of adaptation in which students can improvise to suit clinical conditions of different types of patients are evaluated.

The results (as shown in item 20 of Table 4.7) also reveal that only a minority (n=4, 25%) of clinical supervisors remained at the background, allowing students to work independently. The above result was further confirmed by the survey (as shown by Q17 in Table 4.8) in which only 33% (n=10) of students agreed that their clinical

supervisors allowed them to work independently. It is however expected that final year students in radiography, having gone through the four-year training period should at this stage be allowed to work (perform radiographic procedures) independently or with the limited interference of clinical supervisors. This expectation is in view of the argument that they are assumed to have acquired all the theoretical knowledge and clinical practice exposure for independent and competent radiographic practice. This result, therefore, is misaligned with Dreyfus and Dreyfus's (2005) model of skills acquisition in which the instructor is expected to offer the necessary student support from the onset, and as the student reaches the independent stage of skill acquisition, the support is gradually withdrawn. In other words, clinical supervisors are expected to be at the background monitoring how students' response of action is varied in response to different clinical situations. And by relegating themselves to the background, supervisors can indirectly facilitate their students' theoretical comprehension of the learning situation, and hence make it easier for such students to give a more knowledgeable response to practical situations as the contact with clients go on (Bogo & Vayda, 1998). Also, this result means that students are not being enabled to develop a sense of control over the unpredictable circumstances which emerge during clinical practice. Viewing this through Bernstein's (1975) code theory, the above results create the picture that those clinical settings which ideally are supposed to be the main places where student radiographers frame their practice, values, and perceptions of the profession are not serving this purpose at SBAHS.

Again, the results (as shown in Section 4.4.4) revealed students' submission that some of their clinical supervisors would not just accept the fact that they are students and are bound to make mistakes or errors in their transition to become professionals. Moreover, even though their mistakes are expected to be corrected, some of the clinical supervisors would not tolerate it at all. The attitude of clinical supervisors, in terms of their intolerance for mistakes, in a way, can perhaps be justified based on the consideration that ionizing radiations have harmful effects on the human body and for which some clinical supervisors may be concerned that granting students total independence to experiment with these harmful rays on patients might give rise to medico-legal issues which in turn may have serious implications for the students,

clinical supervisor and the health facility. For this reason, perhaps some clinical supervisors may decide to restrict students' freedom in clinical areas. However, going by Bernstein's (1975) code theory, the learning environment is supposed to help students develop their values through contradictory and paradoxical practices, so any action restricting these practices is indirectly creating oppositional discourse within the learning environment.

Arguably though, the extent to which students' mistakes in clinical areas are tolerated goes a long way to influence the development of such students' ability in putting to action what has been learned in the classroom (Williamson *et al.,* 2002, 2004). On this basis, it is important that clinical supervisors encourage students to reflect on mistakes and learn from their mistakes through close monitoring and mentorship. This argument is further grounded on the postulation that clinical support models which focus on students' gradual progress (wider tolerance latitude) are preferable to those that focus on students' absolute level of knowledge because the former builds the student's confidence level in reaching the mastery level (Williamson *et al.,* 2002, 2004). So perhaps our clinical supervisors need knowledge and development of skills on how to promote reflective learning irrespective of the constraints within the clinical area. This notion further concurs with a report in pediatric physical therapy practice that mentorship roles by academic faculty and clinical instructors ought to gradually build the confidence level of young therapists (Kenyon, Dole, & Kelly, 2013).

Interestingly, none of the submissions by students (as indicated in Section 4.4.4), with regards to disrespect, hostility, bullying, and intimidation by clinical supervisors, was evidenced during the clinical observations. Instead, there was evidence of good interpersonal relationship (as indicated by Item 8 in Table 4.5) between clinical supervisors and students. Could this be, probably, because they were being observed? However, since hostility in the clinical area can lead to clinical stress, discomfort, and reduction in self- confidence amongst students, these findings thus call for a further investigation focusing on the hidden curriculum to identify any possible factors contributing to such attitudes amongst clinical supervisors. This argument is being made given the argument that the hidden curriculum describes the language and strategies

utilized in helping students develop professional socialization skills in the clinical learning environment (Allan, Smith, & O'Driscoll, 2010). Also, since student radiographers spend some portion of their training period in these clinical practice environments, it is important to concentrate on the hidden curriculum and other factors in the clinical learning environment because the level of support in this environment influences the development of students' confidence and practical wisdom.

Moreover, these submissions on clinical supervisors' failure to establish a cordial relationship with students are clear evidence of a violation of the Standards of Practice (SOP) requirement of NTC and GES which emphasize the need for instructors to be sensitive to students' learning needs, dedicated in their commitment to and respect for individual students. And since students' ability to attain predetermined competencies greatly depends on the clinical supervisor's skill in identifying student's uniqueness (intrinsic needs) through the facilitation of students active participation in clinical activities, it is thus essential that clinical supervisors take responsibility in establishing cordial relationship with students, construct a positive learning setting and know when to push thoughtfully (Caldwell, Tenofsky, & Nugent, 2010; Duffy, 2004; Eraut, 2003; Duffy & Watson, 2001).

In summary, this section has shown that quality clinical supervision is founded on a positive supervisor-student relationship in which the professional development of the student lies on a process of retrieval, reflection, linkage and professional response. Also, so far, the discussion of results from the clinical observations have shown that since clinical supervisors have a primary responsibility of supporting student radiographers' transition from classroom to clinical learning, it is important that they start reflecting on their supervisory roles. This is to enable them to identify their weaknesses and strengths, hence the areas of their practice which need to be changed or refined. Further, drawing from the framework of Bogo and Vayda (1998), it is also clear that anyone who assumes the role of a clinical supervisor makes a transition from a competent radiographer to an educator. Also, as an educator, it is essential that one understands the basis of one's practice as a radiographer and as a supervisor to attain the skill needed to guide students through the fundamental processes of analytical

thinking and interventions required for integrating classroom learning with clinical learning.

### 5.3.5 Factors influencing the clinical teaching and supportive role of supervisors

Given the findings from the interviews and an online survey, an attempt was made to discuss the possible reasons why some of the results in the clinical observations emerged.

#### 5.3.5.1 Absence of substantive contract:

Aside from clinical supervisors' stage of training and working experience, the level of clinical supervision experienced by students can also be influenced by clinical supervisors' level of motivation, sense of ownership of the training program and sense of responsibility towards the mentoring of students (Hall, 2006). Of course, clinical supervisors can affect learning in a positive sense if they start seeing their supervisory role as not only for the development of students but also for self-development and the development of radiography profession. Nevertheless, one of the factors influencing clinical supervisors' motivation to supervise or mentor students is the type of contract mandating them to assume such roles (Hall, 2006).

Interestingly, the study results (as outlined in Section 4.2.5.2) revealed that there was no substantive contract between clinical supervisors and SBAHS. In such situations clinical supervisors cannot be held accountable for not being committed to students' supervision because aside from the primary mandate to provide clinical services to patients, the evidence above shows that these clinical supervisors have formally not been mandated to supervise or mentor student radiographers. Based on this finding, this study cautiously suggests that this might well be an explanation for the low level of commitment and unacceptable attitudes of clinical supervisors reported by students during the survey. Again, with the feeling of being accountable to a different community of practice, it is here appreciated that clinical supervisors will always face difficulties in

aligning their clinical activities with the supervisory requirement of SBAHS. Going by Bernstein's (1971) three levels, this issue of supervisors not being committed to students' supervision can be viewed as an infrastructural level issue which needs to be tackled by considering possible ways of motivating these supervisors and help them feel a sense of ownership of the training programme so that they can assume their expected responsibilities towards students.

Given the standards for quality clinical education, the prevailing situation of not officially engaging these clinical radiographers for the role of clinical supervision is exclusively unacceptable because it is a requirement that HEIs engage, prepare and support professionals involved in clinical education (Mulholland *et al.,* 2005). The issue of preparation also stems from the fact that not all experts in their respective health professions are equally expert educators. Moreover, for this reason, there is the need to continually educate/sensitize clinical supervisors on their responsibility and also remunerate them accordingly. Only then can HEIs hold such professionals responsible and accountable as clinical supervisors. Also, this process of contract substantiation may require a redefinition of clinical supervisors' dual identity as clinical radiographers (providing clinical services to patients) and as educators (supervising students).

#### 5.3.5.2 Problems during accompaniment of students:

Accompaniment involves the purposeful and conscious support for students based upon their specific needs by constructing favorable learning circumstances that make it possible for them to develop from passive observers, through active involvement, to independent critical practitioners (Davhana-Maselesele *et al.,* 2001). Furthermore, through such supportive and mentorship role, clinical supervisors can help students to develop critical reasoning and clinical judgment skills crucial for professional practice and socialization (Cameron, Millar, Szmidt, Hanlon & Cleland, 2014; Hall, 2006). However, it must not be forgotten that clinical supervisors encounter different problems during accompaniment of students, especially if their supervisory role is being performed simultaneously with other clinical duties (Ferguson & Jinks, 1994). For

instance, in the context of this study the identified problems during accompaniment of students (as evidenced in Section 4.3.5) included: increasing workload, overcrowding of clinical areas (due to increased student to clinical supervisor ratio) and a mixture of two different student levels (3rd & 4th year groups) in the same imaging unit which was making it difficult for clinical supervisors to determine students' needs. Given these problems and the initially stated absence of a substantive contract for supervisors, it was not surprising that the quality of clinical teaching and support was being compromised. For instance, the results from clinical observations (as indicated in Table 4.5, Q5 & Q9) provide evidence suggesting that clinical supervisors were less committed to students' supervision. Moreover, this was later confirmed by survey results (as indicated in Table 4.8, Q22) in which a higher number of students (n=18, 60%) claimed that their clinical supervisors were more focused on their clinical duties (rendering radiographic services to patients) than on student supervision.

And with regards to individual learner support in clinical practice, some professional standards (Mulholland *et al.,* 2005; DoH, 2000) and Quality Assurance Agencies (QAA, 2001) for higher education recommend a 1:1 relationship where clinical supervisors facilitate clinical learning on a one-to-one basis. Contrary to this, the results from the clinical observation (as indicated in Section 4.3.5) revealed a student-to-supervisor ratio of 3:1. This finding is entirely different from some other health professions like Medicine where a student is allocated to consultant teams or in physiotherapy where reports show that two students are allocated to one clinical physiotherapist (Mallik & Aylott, 2003, Baldry & Currens, 2000, 2003; Mallik, 1998)

Although the recommendation of one student working alongside and learning from one clinical supervisor is a brilliant idea, the issue of increasing student enrollment may perhaps be used to explain why the standard student-supervisor ratio may be difficult to implement in various institutional and professional education contexts. However, as cautioned by the Department of Health (DoH, 2000) in the UK, such changes in which one clinical supervisor assumes responsibility for many students at a time could, to some extent, affect the quality of clinical education negatively. Aside from this, the limited available spaces observed in most of the clinical areas and coupled with the 3:1

student-clinical supervisor ratio may lead to compromises in safety (radiation protection) and comfort guidelines for clinical education. Moreover, since the ethos of the clinical area does influence students' ability to learn (White & Ewan, 1991), it can be explained that in such strained clinical learning atmosphere, not all students might have access to a sufficient volume and practical experience of radiographic procedures. Such situations might leave some students better equipped than others, as far as clinical education is concerned.

### 5.4 Absence of collaborative partnership

Results from the clinical observations (as indicated by Item 3 of Table 4.5) revealed that clinical supervisors were not collaborating with academic instructors. Moreover, as opposed to the initial claim (as indicated in Section 4.2.4.1) by some academic instructors that they often took students to clinical areas for clinical demonstrations of radiographic procedures, the survey results (as indicated by Section 4.4.3) revealed that there was no such collaboration between academic instructors and clinical supervisors. Further confirmation of an absence of collaboration was later revealed by academic instructors' failure (as indicated in Section 4.2.3.2) to provide any evidence to suggest the form of collaboration amongst themselves or even with clinical supervisors. Going by Bernstein's (1971) three levels, this evidence of lack of collaboration between academic and clinical instructors is an infrastructural level issue which needs to be tackled by making conscious efforts to bring together two somewhat separate/independent workforces to collaborate purposefully. Again, although the practices of the two groups may seem to be diverse, with each having its own culture and mode of provision, this however doesn’t dispute the argument that no single one of these groups (communities of practice) can represent the provision of knowledge as a whole. Consequently, crossing boundaries or boundary partnerships becomes necessary for the integration of landscapes of practice (Wenger-Trayner & Wenger-Trayner, 2015, p.18). However, although boundary-crossing could enable the development of knowledgeability, it is also not automatic or a guarantee that knowledge can be shared across the boundaries of these communities of practice (Wenger-Trayner

& Wenger-Trayner, 2015). With this in mind, a monitoring and support system is therefore necessary to facilitate such collaborations. In terms of monitoring, perhaps, the notion of systems convener (a person or people who forge new learning partnerships in complex landscapes of practice) can be employed such that these landscapes are reconfigured by bringing/forcing together new learning across these traditional boundaries (Wenger, 2007; Wenger-Trayner *et al.,* 2015; Wenger-Trayner & Wenger-Trayner, 2015).

Again, as further confirmed by the survey results (Section 4.4.2 & Table 4.9.3), the curriculum was classified as being too theoretical simply because academic instructors often made use of more classroom work instead of blending practical sessions during lecture periods. Viewing through Bernstein's (1971) conceptualization, this finding is purely an infrastructural level issue because the collection code at this level, such as each camp keeping to themselves in their different locations, makes it hard for each camp to think usefully about what the students now in one setting need for linkage to their experience in the other setting, so it is easier just to do their teaching job in a collection code mode. In other words, the initial separation between theoretical and clinical elements noted in the design of SBAHS's radiography curriculum may perhaps make academic instructors feel their work is only to deliver theoretical knowledge, thus leaving the practical aspect for clinical supervisors to tackle. It is, however, important to note that so long as it remains compulsory that students apply abstract knowledge to professional practice, it is also obligatory that both academic knowledge and clinical skills be integrated into teaching strategies of academic instructors (Wrenn & Wrenn, 2009). Good instructional practices, therefore, are those who help students better appreciate the practical value of theoretical concepts being taught (Dewey, 1974).

With the above-established evidence on the absence of collaboration, it could be possible that this was contributing to the identified problem of theory-practice dichotomy initially revealed by interview results (as indicated by 4th category in Table 4.3.1) and also accounting for the inconsistencies (as indicated by Item 4 in Table 4.5) identified in classroom descriptions of radiographic procedures and actual practices of clinical supervisors. Similarly, the survey results (as indicated by Q15 in Table 4.8) confirmed

this, as the students' responses (n=17, 56.7%) indicated that the practices of their clinical supervisors were very much inconsistent with what was being taught in the classroom.

Also, as was further revealed by the results that a gap in knowledge existed between academic instructors and clinical supervisors. It was later confirmed by results from clinical observations (item 2 in Table 4.5) indicating that the majority (n=14, 87.5%) of clinical supervisors were not up-to-date with new imaging techniques. Of course, a knowledge gap may emerge when academic instructors, on the one hand, are not up-to-date with current practices within clinical settings or when clinical supervisors, on the other hand, are not up-to-date with new classroom information or principles guiding the practice. These findings evidence a violation of the earlier outlined Standards of Practice (SOP) of NTC and GES which emphasize the need for instructors to endeavor to be current in their professional knowledge and appreciate its interconnection with practice.

With regards to the evidenced gap in knowledge between academic instructors and clinical supervisors, Kilminster and Jolly (2000) report the dangers associated with students having to learn from academic and clinical instructors who are not current (up-to-date) with the current trend of practice. The authors' explanation indicates that practice know-how is a crucial element in aiding effective learning and therefore efforts must be made to ensure classroom information is consistent with new practices in clinical settings and vice versa. To therefore ensure that what is learned in the classroom relates to what is practiced in the clinical setting, Webster (1990) suggests that it is necessary for both academic and clinical staff to keep up to date through collaborations and continuous professional development (CPD) which may come in the form of conferences, workshops and short courses for both academic and clinical instructors.

# CHAPTER 6

# CONCLUSION

This chapter evaluates the discussions in Chapter 5 to conclude the study.

## 6.1 Summary of the study

This study set out to primarily evaluate how radiography curriculum design and teaching strategies are supporting student radiographers' transition from classroom to clinical learning at SBAHS. It considered the curriculum content and model alongside the teaching strategies of both academic and clinical instructors as playing a significant role in the student radiographer's ability to apply knowledge acquired to professional practice effectively.

A sequential mixed-method research design was adopted. Data collection involved a documentary analysis of radiography curricula, interview of academic instructors, observations of clinical supervisors and an online survey of final year student radiographers. The works of Trigwell and Prosser (1993, 1996) and that of Bogo and Vayda (1998) were used as theoretical foundations for the study. Analysis of the four sets of data resulted in key findings which guided the discussion.

From the findings, it is quite evident that the infrastructural tendency away from integration was somehow contributing to lack of integration at the delivery level and this consequently was obstructing the students' capacity in their transition from classroom to clinical learning. In other words, in their physical relocations back and forth from one learning environment to the other, these students start to associate one learning environment as an entirely different world to the other, as if they were learning two separate curricula. The collection code at this level, such as each camp (academic instructors and clinical supervisors) keeping to themselves in their different locations, makes it hard for each camp of instructors to think usefully about what their students in one setting need for linkage to learning experiences in the other setting. Teaching in a

collection code mode coupled with teacher-centered approaches and strategies are thus not supporting the effective transition from classroom to clinical learning.

## 6.2 Authenticity of the study

The sequential mixed-method research design of this study not only strived to give a multidimensional view of the critical role played by both academic and clinical instructors in students' transition from classroom to clinical learning but has also provided rich data which have been interpreted with an acceptable degree of assurance. More importantly, the between-method triangulation characterized by both qualitative and quantitative data collection methods (as in the documentary analysis, interviews, clinical observations and online survey) utilized in this study has helped minimize the possible shortcomings and biases that could have emerged, if any singular method were to be used (Mitchell, 1986). The cross-matching of key findings from the four different sources of data was a useful exercise in counterbalancing any unexpected flaws that possibly could have emerged had a single method been used. Again, cross-matching of findings to determine the relationship among data from the four sources was one fundamental way of assessing the reliability and internal consistency of findings, thus increasing confidence in the research data (Thurmond, 2001). Through this approach, not only has a clearer picture of the integration problem in radiography education been obtained but it has also helped identify the possible ways of supporting student radiographers to integrate classroom and clinical learning.

## 6.3 Answering the research question

This study set out to answer the question of how radiography curriculum design and delivery at SBAHS were supporting the effective transition from classroom to clinical learning.

Concerning how radiography curriculum design was helping students integrate classroom and clinical learning, the study evidenced a classroom-based radiography

curriculum with characteristic features of theoretical and clinical elements being separated (strongly bounded), thus consequently accounting for a hierarchical relationship between theory (classroom learning) and clinical practice. The evidenced separation between theoretical and clinical elements in the design of SBAHS radiography curriculum was seen as creating an artificial dichotomy between theory and practice, and for which it is cautiously concluded that although the content of SBAHS radiography curriculum conforms to international standards, the artificial dichotomy between its theoretical and practical elements was not supporting students' effective transition from classroom to clinical learning. This statement depicts an issue at the level of content/curriculum, rather than delivery. Moreover, since by Bernstein's collection code tendency the pure educational identities (separation of the classroom and clinical elements) are possible restrictions to this integration, the issue can better be tackled both at the content/curriculum and infrastructural levels through connective specialization (interweaving classroom and clinical elements) and infrastructural relations respectively.

Concerning how teaching strategies in the academic context were supporting student radiographers' integration of classroom and clinical learning, the responses from academic instructors generally indicated that teaching strategies ranged from teacher-centered to student-centered approaches. Doubtlessly, the use of power-point lecture delivery style was the commonest amongst all academic instructors, although a small sub-group of academic instructors use case studies and classroom demonstrations to help students integrate classroom learning with clinical situations.

Generally, the use of teacher-centered teaching strategies (such as lecture notes and dictation of notes) has been frowned upon by Goh *et al.,* (2014) as drawing students further away from effective learning while on the contrary, the use of student-centered teaching strategies (e.g. reflective writing; referencing clinical experiences, case studies; discussion of what theories underlie the various clinical practices; classroom demonstrations; clinical demonstrations; group discussions and presentations; modeling; simulations; guest speakers from clinical settings) are well supported by literature (Cleland, 2017; McGaghie, Issenberg, Barsuk, & Wayne, 2014;

Wrenn & Wrenn, 2009; Fuller & Kuhne, 2008; Campbell, 2007) as drawing students closer to effective learning. So in the first place, the evidence that a small sub-group of academic instructors use some form of activities (case studies and demonstrations) in their course teaching thus suggests that some teaching strategies at SBAHS were supporting student radiographers' transition from classroom to clinical learning. However, the overall conclusion that teaching strategies of most academic instructors are not supporting student radiographers at SBAHS to integrate classroom learning with and clinical learning is qualified by the evidence that amongst the numerous student-centered teaching strategies/activities by which academic instructors could have helped radiography students in their transition from classroom to clinical learning, only a relatively small number (n=2) of academic instructors were noted to be student-centered.

With respect to how teaching strategies in the clinical context were supporting the transition from classroom to clinical learning, the observations made on clinical supervisors generally indicated that their clinical teaching and support was failing to help radiography student transit through the processes of retrieval, reflection on practice, linkage of academic and clinical knowledge, as well as the development of professional responses to clinical situations. Literature however well supports it that clinical supervisors who help students reflect on practice actually help draw these students closer to developing practical knowledge (Falkenberg *et al.,* 2014; Winston *et al.,* 2012, 2013; De Swardt *et al.,* 2012; Wrenn & Wrenn, 2009; Darling-Hammond, 2006; Eraut, 2004; Redmond, 2004; Korthagen, 2001; Bogo & Vayda, 1998; Mallik, 1998). Therefore, with the evidence that only a relatively smaller number of clinical supervisors did offer students opportunities to work independently and to reflect on practice, the clinical teaching strategy (or better phrased as clinical support) of most clinical supervisors were noted as encouraging student radiographers to become more of observers than active participants, thus implying that their development of practical knowledge was being restricted. These findings, therefore, led to the cautious conclusion that the teaching strategy of most clinical supervisors was not supporting students in their transition from classroom to clinical learning.

## 6.4 Contribution of the study

Although the original contribution of this study started with the researcher's personal experience with the problem of improper integration of classroom learning with clinical learning amongst student radiographers, he believes this study contributes to the literature in the following ways:

- This study is the first Ghanaian mixed-method study to have inquired into radiography curriculum design and its delivery, contributing to the general discourse on the need to integrate classroom and clinical modes of provision in health professions education.
- On the grounds of representation, this study has narrowed the specific gap in the literature (i.e., a gap based on the lack of critical studies) on how the design and delivery of educational programmes promote the integration of classroom and clinical modes of provision in radiography education.
- This study reveals that the setting up of classroom learning on one hand and clinical learning on the other, which need integrating, was creating an artificial dichotomy between the two forms of provision in SBAHS. So with regards to the issue on how to improve the integration of classroom and clinical modes of provision, this study adds that it comes down to forcing two somewhat independent workforces to collaborate purposively. Moreover, rather than it being just about restructuring the curriculum content or re-envisaging delivery (how to teach), there is a need for coherence across curriculum components; an initiative at the infrastructural level, such that health facilities helping in the delivery of the clinical component of professional education programmes will have to collaborate/partner with higher education institutions so as to develop innovative curriculum delivery approaches that can support effective integration of classroom and clinical knowledge as well as teaching strategies that help bridge together theory-focused academic learning with practice-focused clinical experiences. Aside from these, a series of recommendations have been presented on the ways by which the integration of classroom and clinical modes of provision can be achieved.

- It was also evident in discussions of the key findings from this study that an additional question had been answered. Although this study was mainly focused on evaluating radiography curriculum design and teaching strategies of instructors, the study data further revealed that contextual variables at the infrastructural level do have a direct impact on teaching strategies of instructors and subsequently this influences the extent to which they can help students develop practical knowledge.
- Contrary to the highlighted limitation of other studies - regarding the focus and usage of theoretical framework, this study has not only shown the applicability of three different theoretical frameworks in researching theory-practice integration but has also demonstrated the importance of drawing on different perspectives (broader focus) when researching health professions education.
- In relation to the earlier mentioned controversy on the issue of whether or not the call for a change in teaching practices/methods at various levels of Ghana's educational system was worth giving attention to, this study adds to the argument that classroom practices characterized by prescriptive and autocratic teaching strategies fail to promote students' active involvement in the learning process and subsequently fail to help students' transition from classroom to clinical learning; hence the call for a change in the teaching practices of Ghanaian academic instructors, more especially in radiography education needs to be responded to immediately. But here again, it is cautiously suggested that even though didactic teacher-centered approaches (e.g., power-point lectures and dictation of lecture notes) have in recent times given way to student-centered approaches, the identified barriers to effective teaching, as outlined in this study, however might make it practically impossible for a complete write-off of teacher-centered approaches until perhaps the existing barriers (unavailability of facilities, limited resources, bureaucratic processes and increasing students' population), as identified by this study are first and foremost resolved at the infrastructural level.

## 6.5 Suitability of theoretical frameworks

As mentioned in Chapter 2, the use of the theoretical framework of Trigwell and Prosser as well as that of Bogo and Vayda was mainly to serve as guides in the processes of data analysis, and explanation of the research findings. The researcher also saw the use of the two theoretical frameworks as uniquely effective in their respective manner (Trigwell & Prosser – Academic instruction, Bogo & Vayda – Clinical supervision). However, the use of Bernstein's classification and framing as the overarching framework was most effective in trying to draw connections between content, pedagogy (academic & clinical teaching/delivery) and infrastructural levels. With each theoretical framework helping to show that instructional practices in both academic and clinical settings were not supporting the effective transition from classroom to clinical practice, Bernstein's framework helped in the further analysis of the situation, in terms of explaining the possible causes and solutions to the integration problem. Having used these frameworks separately, a brief assessment of their suitability for the study is as follows:

### 6.5.1 Trigwell and Prosser's framework

The framework of Trigwell and Prosser was useful in evaluating how the teaching strategies of academic instructors influenced radiography students' effective transition from classroom to clinical learning. As a guide, it has helped to better understand both the teaching intentions and classroom practices of academic instructors. By using the framework to process data collected from interviews the researcher was able to establish that there truly exists a connection between teaching intentions of academic instructors and their teaching approaches. However, unlike the five differentiated teaching intentions depicted by the framework, it was established in this study that teaching intentions are primarily categorized into two – imparting knowledge and facilitating/guiding learning. As compared to the quantitative inventory of Trigwell and Prosser (1993, 1996), the qualitative research (interviewing) approach to this framework

was better posited for this thesis because it enabled a deeper exploration of academic instructors' subjective views on the phenomenon.

### 6.5.2 Bogo and Vayda's ITP loop model:

Clinical supervision plays a central role as far as student radiographers' integration or transition from classroom to clinical learning in radiography education is concerned. The four-phase loop model adopted from Bogo and Vayda (1998) therefore served as a supervision manual by which the observed clinical actions of clinical supervisors were examined. Its application in this study has helped determine the extent to which the interactions between students and their clinical supervisors were helping these students achieve the primary objective of integration. Moreover, by using this framework in examining the actions of clinical supervisors, it was established that their failure to draw a balance between their clinical duties and their supervisory responsibilities subsequently affected the extent to which they helped students through the processes of retrieval, reflection, linkage and professional response. In other words, they were not sharing their responsibility for the transition from being clinical radiographers to educators (clinical supervisors), and for this reason, the learning progression of student radiographers in the clinical areas was being hampered. It was also noted that due to the research context within which this framework was employed, the researcher could not explore the views and feelings of clinical supervisors because they were too busy for that.

### 6.5.3 Bernstein's classification and framing of educational knowledge

The real significance of Bernstein's framework emerged with the study findings, in that it shed particular light on the sets of data. Moreover, given everything the researcher has learned, he sees Bernstein’s theorization as an effective framework for analyzing theory-practice integration. It is, in the sense that Bernstein's framework considered the classification and framing of educational knowledge at the content,

pedagogy and infrastructural levels. Again, the overarching usefulness of Bernstein's framework at the various levels of this study was a clear signal that no one theoretical framework can explain everything about a complex phenomenon such as theory-practice integration.

## 6.6 Reflexivity

This section recognizes the processes of development and mutual shaping by which the researcher's whole-person-researcher had affected and had been affected by the research. In other words, the researcher reports on how his positionality before, during and after the research process had affected his identified research problem, approaches to data collection and analysis of results.

Undeniably, the researcher's position as a clinical tutor had helped him understand better the importance of integrating classroom and clinical modes of provision and its implication on student radiographers' effective transition from classroom to clinical learning at SBAHS. It is, in the sense that his role in supporting student radiographers to develop into professionals regularly left him with the desire to watch out for possible challenges students might be confronted with in their learning process. With a personal feeling that he had an agency to challenge or change the status quo, the researcher's transformation from the position of a clinical tutor to the status of an insider-researcher thus gave rise to his interest in investigating the identified research problem and topic. For instance, the primary research question which drove this study was as a result of reflections on his knowledge and values about what radiography education stood for in quality health care delivery. The researcher's decision to analyze radiography related documents (e.g., radiography curricula and handbooks) was thus commensurate with his feelings about the design of radiography education in the local and global healthcare communities.

Although the researcher acknowledges that his position as insider-researcher was a potential contaminant, as in terms of bias and loss of objectivity, he, however, believe that this at the same time offered him the opportunity to balance the choices of data collection methods and analytical lenses through which his identified research

problem was investigated. For instance, the use of two different data collection instruments for two different groups of participants may be seen as contradicting the traditional norm of using the same instrument to measure two different study groups. Of course, the use different instruments as in the case of this study would have been a methodological flaw if he had intended to perform a comparative analysis on the data obtained from the study groups to determine say - which of the groups had a better teaching strategy. In the context of this study, however, there was no such intention to compare but rather to use the data of each preceding stage to inform the approach to the next stage. Also, the researcher wish to acknowledge that identity and power played a significant role in facilitating and shaping the pattern of this research, especially in his context where these two factors (identity and power), more often than not, determine how superiors treat the control of access and interests of researchers lower in the social hierarchy. Already knowing about the high power distance cultural background of his superiors (academic instructors) whom he was about to engage in this study, the researcher approached a few of them with his initial intentions of conducting an observational study on them but some among them were sincere to let him know that they would prefer participating as interviewees rather than being observed in the class. The experienced influence of identity and power on his methodology is however acknowledged by literature, postulating that location or place (identity and power) really matters in what is known theoretically and what is done practically (Hawick, Kitto, & Cleland, 2016; Bleakley, Bligh & Browne, 2011; Agnew, 2011). So even though theoretically, it is thought that the two groups could have been studied using the same approach, the location, context and place (identity and power) of this research, did not make this practically feasible. Having also considered his practice his research, the use of structured clinical observations instead of interviews for collecting data on clinical supervisors fitted well with his daily routine practice as a clinical tutor. However, here also, the researcher acknowledges that the infrastructural barrier between academic and clinical settings in his study contexts had affected his research practice too, in that his routine duties as Clinical had confined him too much to the clinical side.

The decision to analyze two different data with two different models was also because, as an insider researcher, his experiences with the two study groups

(University-based academic instructors and Hospital-based clinical supervisors) informed him that their pedagogic practices were different (due to the infrastructural level dichotomy created between academic and clinical teaching). Unlike Trigwell and Prosser's model which is purposely designed to explore university (academic) teachers' intentions and approaches to teaching, Bogo and Vayda's ITP model, on the contrary, is purposely designed for evaluation of field (practice) learning in Social work. So relatively, the use of Trigwell and Prosser's model in analyzing data from clinical supervisors may not have been as effective as with that of Bogo and Vayda's model and vice versa.

Also, during the triangulation of study results, the researcher continually stood back and asked himself whether or not the findings at one stage were confirmed or reflected in the results of the other three stages. Moreover, based on his belief that authenticity of results is based on how well they are confirmed by other data sources, he was prompted to cross-match results, and this was characterized by constant movement between findings from the four data collection methods. This exercise finally led to the emergence of four key findings which were termed as such, owing to their emergence in more than one data source. Also, through the cross-matching of results, a few of the factors influencing both academic and clinical instructors' level of support to students were identified. For instance, even though the structured clinical observation approach adopted in investigating clinical teaching could not offer an explanation as to why clinical supervisors were less committed to students supervision, the preceding results from interviews however helped the researcher gain the understanding that clinical supervisors were more focused on their clinical duties than clinical supervision possibly because they had no substantive contract with SBAHS.

The researcher also acknowledges that his background had influenced how he tried to analyze some of his qualitative and quantitative data. For instance, his attempts at transforming qualitative to quantitative data made him realize that he had been influenced by his scientific background which often is characterized by the use of numbers and mathematical formulas in segmenting, comparing and analyzing data.

One significant impact the researcher has had from this study relates to how it helped him in developing the critical reasoning ability to reflect on his daily activities both as a researcher and also as a clinical tutor. For instance, having gone through the conceptual framework of Trigwell and Prosser, it dawned on the researcher to keep asking himself what his teaching intentions and strategies were. Similarly, his engagement with the framework of Bogo and Vayda (1998) constantly challenged him to also reflect on his practice, in terms of findings ways he could improve in performing his daily duties as a clinical tutor. The research process had also shown him that an in-depth understanding of a phenomenon is better achieved when the phenomenon is viewed from different subjective perspectives.

Before this thesis, the researcher had a professional preference for positivism owing to similarities in research values shared by positivists and his professional background (radiography). This preference was reflected in his initial desire to conduct an experimental study. This urge was however later silenced by the understanding gained from the literature on disciplinary enculturation and based on the understanding gained the researcher was better positioned to appreciate the epistemologies of different disciplines. Having however identified that his disposition correlated with his community of practice, he began to question the nature of different disciplinary epistemologies and methodologies; their merits/demerits; and the consequences of assuming a biased or skeptical stance towards any of these worldviews. For instance, with the literature review revealing to him that his disciplinary epistemological perspectives were potential sources of bias in addressing his research question, the researcher resorted to compromising his epistemology by way of becoming a bit more pragmatic. Later in the course of the thesis, the researcher, however, discovered that his decision to embrace alternative ways of seeing the world (i.e., embracing epistemological diversity) had enabled him to develop new insights into researching the identified practice-based problem.

## 6.7 Limitations of the study

- Although clinical demonstrations and case studies have been identified in this study as the strategies used by academic instructors to support students' effective transition from classroom to clinical learning, this study, however, could not prove that such transition was being supported by these teaching strategies.
- Owing to the fact that the results from documentary analysis were obtained from radiography documents of twelve (12) different institutions, this aspect of the results and discussions can be generalized but with the interviews, clinical observations and online survey involving only one institution (SBAHS), it might be difficult generalizing these results to other contexts.
- Another limitation of this study relates to the fact that Bogo and Vayda's (1998) ITP loop model was used in this study to examine only the practices/actions of clinical supervisors, without recourse to the thoughts, values, and feelings that informed their actions. Moreover, the issue of different methods for different groups, owing to culture, was a possible limitation.
- Another limitation is, of course, the self-report nature of both the interview and survey data, both of which are not always necessarily reflective of actual behavior or experience.

## 6.8 Recommendations for practice

Following the discussions on the results from the documentary analysis, interviews, clinical observation and online survey, this thesis finds it necessary to make the following recommendations:

**Curriculum restructuring:** The comparative study of radiography programmes' features shows that the design of SBAHS's radiography curriculum gives priority to classroom learning and for which SBAHS's radiography curriculum model is described as being relatively abstract or classroom-based, which was further noted to be a form of weakness in its design. Also, coupled with this, some of the findings from the interviews conducted on academic faculty also suggest that the existing radiography curriculum

does not support the effective integration of classroom and clinical learning, owing to the separation between theoretical and clinical elements in its design. As a matter of fact, the dichotomous conception of knowledge (separation of theoretical and practical modes of provision) is having an indispensable effect on students' development of professional expertise. Perhaps the challenge is primarily because it is deduced from the design of curriculum that the purpose of each (theoretical or practical) mode of provision is to provide a different kind of knowledge. First, with such assumption, we lose sight of the important sense in which both kinds of provision should contribute to the student's development of professional competence. Second, to lose sight of this is to risk theoretical provision drifting into irrelevance where theory (classroom learning) is provided by academic instructors only for theory's sake and practical provision by clinical supervisors just for the purpose of instilling rote behaviors. To therefore improve students' learning experience there is a need for curriculum restructuring such that (1) equal attention is given to both modes (theoretical and clinical elements/provisions) of the training programme; (2) rather than wait until the end of 2$^{nd}$ year before sending students for clinical radiographic placements, practicum needs to be timed right in a way that clinical element would be integrated throughout the four years so as to enable students to get a longer practicum experience. These recommendations are in view of the notion that an extension in students' clinical exposure is more likely to enhance not only their confidence level but also help in their development of practical wisdom. Another suggestion is to consider re-examination of courses and possibly eliminating those that do not meet students' needs for development in current technologically advanced practices of the profession.

**Teacher training:** The uniqueness of teachers is such that apart from acquiring their professional knowledge (knowledge of their chosen subject) they, in addition to this, have to acquire the knowledge of how to teach their specialist subject. In other words, an academic/clinical instructor might be able to perform an MRI protocol and yet not know how to teach his/her students how to do it. Therefore, there is a need to first acquire specialist knowledge, and through teacher training, pedagogic knowledge is acquired to teach the specialist subject. According to Bernstein (2000), the manner in which this 'sequential approach' to the acquisition of specialist and pedagogic

knowledge is handled has serious implications for training programmes. So having viewed the evidence in this study that the lack of teacher training was partly contributing to the limited teaching strategies of academic instructors, it is therefore recommended that a faculty development need assessment (FDNA) be conducted as recommended by radiography education blueprint (ASRT, 2004). Following the outcome of this assessment, teacher training can then be organized for these teachers (irrespective of their professional backgrounds and working experiences) to help them develop their conceptual understandings of education, teaching, learning and how these apply to their teaching practices in radiography education. This recommendation is further supported by the postulation that when instructors have a sound understanding of how students learn and also understand the different approaches to teaching, they are better positioned to teach well (Wilkerson & Irby, 1998).

**Instructional technology:** The evidence in this study has shown that the limited use of instructional technology was actually as a result of unavailability of instructional technologies. Also, since instructional technology does complement classroom teaching, its unavailability could partly be a contributor to radiography students' ineffective transition from classroom to clinical learning. It is thus recommended that instructional technologies, more especially, course management systems and computer-based simulators be acquired alongside dedicated labs for practical teaching purposes. Given the initial emphasis on restricted clinical exposure and that clinical supervisors may perhaps be restricting students in the clinical areas on the grounds that they owe patients the responsibility of protecting them from unnecessary harm (ionizing radiation), perhaps computer-based simulation or simulation-based education could be a timely intervention to enhance learning and prepare these students for actual practice in such situations. In other words, this study suggests that it will be easier for students to use computer-based simulations to experiment with their skills in a more relaxed setting before handling actual patients in the clinical area.

**Dual role lecturer/clinical radiographer:** It is recommended that academic instructors be allowed to teach, supervise and perform radiographic procedures at the clinical area so that their role in all these three aspects can well support students' transition from

classroom to clinical learning. For instance, how would we know that an academic instructor who no longer practices but yet teaches Magnetic Resonance Imaging (MRI) actually knows how to perform a certain MRI protocol? Presumably, we might suppose, because he/she can evidently teach the students how the MRI protocol is performed. Definitely, this is not an issue of lacking or having know-how of the MRI protocol but rather, a case in which it is important to appreciate the difference between knowing how to teach the MRI protocol and knowing how to actually do/perform the MRI protocol on the machine. That is, what the academic instructor knows is how to instruct his/her students on how the MRI protocol is performed, and this knowledge is different from the knowledge required to practically perform the MRI protocol. The idea that different kinds of knowledge are required to teach and to practice in specific professional domains does have very real consequences for faculty engagement. It is therefore important that for some specific technical/specialist courses, only academic instructors with such technical/specialist knowledge should be engaged or allowed to teach those specialist courses. Alternatively, academic instructors who teach technical/specialist courses should be allowed to participate/engage in clinical duties so as to ensure their acquisition of specialist knowledge on those courses. Similarly, clinical supervisors should also be allowed to have such a dual role by letting them participate in classroom instruction. Such dual roles by both academic and clinical instructors let them know better about the level of knowledge possessed by their students in one learning situation and therefore are better able to make this consistent with learning in the other situation.

**Substantive contract:** So far, discussions have pointed to the need for formal engagement or substantive contract between SBAHS and clinical radiographers who are expected to play the added role of supervising student radiographers. Establishing such a contract is recommended to help clinical radiographers start having a sense of ownership and feeling obliged to teach or supervise student radiographers and to give these students the opportunity to transit to professional radiographers. It is only after this that SBAHS can communicate its supervisory role expectations to these clinical supervisors, then decide the level to which clinical supervisors ought to help in achieving congruence between the classroom content and what is being practiced in

reality and finally hold them accountable for any evidence of inappropriate supervision of its students.

**Collaboration:** Given the challenges associated with the identified absence of collaboration, this study recommends Bernstein's (1975, 2000) "team teaching" strategy in which both hospital-based and university-based instructors can work together as a team to achieve greater uniformity. Yes, the two groups belong to different domains but are, at the same time, connected through a shared interest/practice (the training of student radiographers), so as Wenger (1988) as well as Lave and Wenger (1991) posits, the regular interactions between these groups opens up potential for learning, competence development and enables them to move from legitimate peripheral participation to full participation.

Although it is true that heavy research agendas and teaching loads may restrict academic instructors from following up on their students to clinical settings, such collaborations, to mention the least, can be achieved in the form of periodic contact between the two groups of instructors. So unlike Bernstein's "collection code" in which emphasis is laid on professional identity (e.g., lecturers being separated from clinical radiographers) an adoption of his "integrated code" is recommended such that an interpersonal negotiation will be created between university-based and hospital-based instructors. As postulated by Gough (2014), an establishment of stronger linkages between higher education and the respective profession helps introduce and contribute to the maintenance of more (individually and societally) supportive frameworks of lifelong learning for students of a programme of professional knowledge and training. Establishing such collaborations can help both parties articulate what goes on both in the classroom and clinical areas, thus ensuring consistency/synchrony in classroom knowledge and clinical practice experience. Along the same lines, a collaboration between the two groups of instructors will encourage good communication such that the evidenced problematic incidents of clinical supervisors being confused about different grade levels of students and the associated confusion about their respective learning needs can be avoided.

**University-based/School-based clinical laboratories:** If implementing the above recommended substantive contract for clinical supervisors and collaboration between the two groups of instructors are going to be a challenge, then an alternative recommendation to resolve the evidenced lack of coherence and consistency between instructors of academic and clinical settings is for SBAHS to take immediate initiatives to create school-based clinical laboratories that can be used by academic instructors for demonstrations and hands-on practice. These school-based clinical laboratories could be designed such that all the imaging modalities needed for radiographic practice (e.g., conventional X-ray machine, ultrasound, fluoroscopy, CT scanner, MRI scanner) are housed within these laboratories. Again, depending on how this is designed and structured, academic instructors teaching technical courses without direct experience could take advantage of these laboratories to maintain their clinical credibility and sharpen their skills by performing radiographic procedures. Also, if commercialized, academic instructors could equally take the dual advantage of supervising their students and at the same time earn extra income from revenue generated for services being rendered to patients. The main thrust of the argument here is not about creating the platform for academic instructors to earn extra income but rather the need to know what kind of instructors/educators/institutions we wish to create that can meet the students' learning needs.

## 6.9 Recommendations for future studies

- To help improve knowledge transfer, literature from varied perspectives have proposed the adoption of a multi-dimensional curriculum model (Ferguson & Jinks, 1994), problem-based curriculum model (Helitzer & Wallerstein, 1999) and community-based curriculum model (Davhana-Maselesele *et al.,* 2001). However, capitalizing on the notion that not all models of curriculum are suitable for proper transition from one form of learning to the other, it is recommended that future studies consider which of the existing radiography curriculum model(s) best support effective integration of the two forms of provision in radiography education.

- Although the study placed importance on student-supervisor interactions in clinical practice, the extent to which clinical supervisors should interact (i.e., discuss and share experiences) with students was however not addressed by this study. It is thus recommended that future studies be conducted on types of student-supervisor interactions and operationalize this concept so that it can be measured.
- With the limited use of Bogo & Vayda's (1998) ITP loop model in this study, it is recommended that another study, utilizing this same framework, be conducted to understand the thoughts, beliefs, and perceptions that influence the actions taken by these clinical supervisors in the clinical learning environment.
- Although clinical demonstrations and case studies were identified in this study as the strategies by which some radiography instructors of SBAHS helped their students' transition from classroom to clinical learning, there was, however, no proof that these strategies supported the effective integration of the two forms of provision. Because of this limitation, this study recommends Action research in which the effect of clinical demonstrations and case studies on students' transition from classroom to clinical learning could be determined.
- One of the data sets provided evidence on student radiographers' experience of hostility in the clinical learning environment. Although the other three data sources did not confirm this evidence, it is however recommended that a future study on the hidden curriculum in radiography education be conducted. This recommendation is made given the notion that hostility in the clinical area can lead to clinical stress, discomfort, and reduction in self-confidence amongst students. Also, since the hidden curriculum is characterized by the language and support mechanism for professional socialization skills, it is recommended that a multi-dimensional approach be utilized to investigate the actual existence of this problem and the possible solutions.
- Aside from the findings in this study which suggested that teacher training, to some extent, had an impact on teaching strategies of radiography instructors, there has been inadequate research and evidence to support the argument that teacher training impacts teaching effectiveness. For this reason, there is a need

for further research to evaluate the impact of teacher training on the instructional efficiency of instructors.

## References


Abylkassimova, Z. Gusev, B. Grosche, B. Bauer, S. Kreuzer, M., & Trott, K.R. (2000). Nested case-control study of leukemia among a cohort of persons exposed to ionizing radiation from nuclear weapon tests in Kazakhstan (1949-1963). *Annals of Epidemiology*, 10(7):449-483.

Acharya, S. Sarafoglou, K. LaQuaglia, M. Lindsley, S. Gerald, W. Wollnew, N. Tan, C., & Sklar, C. (2003). Thyroid Neoplasm after Therapeutic Radiation for Malignancies during Childhood or Adolescence. *American Cancer Society*, 97(10):2397-2403.

Agnew, J. A. (2011). Space and place. *In: Agnew JA, Livingstone DN, editors. Handbook of Geographical Knowledge.* London: Sage

Ajzen, I., & Fishbein, M. (2000). *Attitudes and the attitude–behavior relation: Reasoned and automatic processes.* In W. Stroebe & M. Hewstone (Eds.), European review of social psychology (Vol. 11, pp. 1–33). Chichester, UK: Wiley.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood-Cliffs, NJ: Prentice-Hall

Almalki, S. (2016). Integrating quantitative and qualitative data in mixed methods research – challenges and benefits. *Journal of Education and Learning* 5(3): 288-296.

Alter, T. (2001). Know-how, Ability, and the Ability Hypothesis, *Theoria*, 67, 229-239.

Akyeampong, K. Pryor, J. & Ghartey, A.J. (2006). A vision of successful schooling: Ghanaian teachers' understanding of learning, teaching and assessment. *Comparative Education*, 42 (2):155-176.

Alabi, G.B. & Mba, J.C. (2012). The quality assurance situation and capacity building needs of higher education in Africa. *Association of African Universities*, Accra.

Allan, H. Smith, P. & O'Driscoll, M. (2010). Experiences of supernumerary status and the hidden curriculum in nursing: a new twist in the theory–practice gap? *Journal of Clinical nursing*, 20, 847–855.

Allen, J.M. (2009). Valuing practice over theory: How beginning teachers re-orient their practice in the transition from the university to the workplace. *Teaching and Teacher Education*, 25(5):647-654.

American Society of Radiologic Technologists - ASRT (2016). Radiography Curriculum. *ASRT Radiography Curriculum Revision Project Group*, Albuquerque, NM 87123-3909. Retrieved from https://www.asrt.org/

American Society of Radiologic Technologists - ASRT (2012).Radiography Curriculum. *ASRT Radiography Curriculum Revision Project Group*, Albuquerque, NM 87123-3909. Retrieved from https://www.asrt.org/

American Society of Radiologic Technologists - ASRT (2004). *Faculty development needs assessment.* Part 2, Educational Program Details. Albuquerque, NM. Retrieved from https://www.asrt.org/

Amoah, S. A. (2011). *The reflective and collaborative practices of teachers in Ghanaian basic schools: a case study*. University of Nottingham,

Arum, R. & Roksa, J. (2011). *Academically adrift: Limited learning on college campuses.* Chicago, IL: University of Chicago Press.

Archer, V. E. (1989). Risk of Thyroid Cancer after Diagnostic Doses of Radioiodine (letter). *Journal of the National Cancer Institute*, 81(9):713-714.

Artino, A. La Rochelle, J. Dezee, K. & Gehlbach, H. (2014). Developing questionnaires for educational research: Amee Guide No. 87, *Medical Teacher*, 36: 463–474.

Baldry Currens, J. A. (2003). The 2:1 clinical placement model. *Physiotherapy.* 89(9): 540-54.

Baldry Currens, J. A. (2000). *An Evaluation of Three Clinical Placement Models for Undergraduate Physiotherapy Students*. Report on phase 11 of the Clinical Education Project. University of East London. London.

Banning, M. (2005). Approaches to teaching: current opinions and related research. *Nurse Education Today* 25 (7), 502–508.

Barbour, R.S. (1998). Mixing qualitative methods: Quality assurance or qualitative quagmire? *Qualitative Health Research*, 8(3), 352-361.

Baverstock, K. F. & Papworth, D. G. (1985). Risk factors for radiogenic cancer: a comparison of factors derived from the Hanford survey with those recommended by the ICRP. *British Journal of Industrial Medicine*, 42:341-345.

Beck, C., & Kosnik, C. (2006). *Innovations in teacher education: A social constructivist approach*. Albany, NY: State University of New York Press.

BEIR VII - Committee on the Biological Effects of Ionizing Radiation (2005). *Health Effects of Exposure to Low Levels of Ionizing Radiation*. Washington, DC: National Academy Press. Retrieved from https://www.nap.edu/read/11340/chapter/1

BEIR V - Committee on the Biological Effects of Ionizing Radiation (1990). *Health Effects of Exposure to Low Levels of Ionizing Radiation*. Washington, DC: National Academy Press. Retrieved from https://www.nap.edu/read/11340/chapter/1

Bengson, J. & Moffett, M. A. (2012a). Non-propositional Intellectualism, *In Knowing How: Essays on Knowledge, Mind and Action, J. Bengson and M.A. Moffett (eds), Oxford: Oxford University Press* 161-195.

Bengson, J. & Moffett, M.A. (eds) (2012b). "Two conceptions of Mind and Action: Knowing How and the Philosophical Theory of Intelligence" In *Knowing How: Essays on Knowledge, Mind and Action. J. Bengson and M.A. Moffett (eds), Oxford: Oxford University Press* 3-58.

Bengson, J. & Moffett, M. A. (2007). Know-how and concept possession. *Philosophical Studies*, 136, 31-57.

Berk, R. A. (2005). Survey of 12 strategies to measure teaching effectiveness. *International Journal of Teaching and Learning in Higher Education*, *17*(1), 48–62.

Bernstein, B. B. (2000). *Pedagogy, symbolic control, and identity: Theory, research, Critique* (Rev.ed.). London, England: Taylor & Francis.

Bernstein, B. (1975). Class, Codes and Control.Vol.3.*Towards a theory of educational transmissions.* London: Routledge & Kegan Paul.

Bernstein, B. (1971). Class, Codes and Control.Vol.1.*Towards a theory of educational transmissions.* London: Routledge & Kegan Paul.

Birmingham City University (n.d.). *BSc. Diagnostic Radiography*. Retrieved from https://www.bcu.ac.uk/courses/diagnostic-radiography-2016-17

Blaxter, L. Hughes, C. & Tight, M. (2006).*How to research* (3rd ed.). Maidenhead UK: Open University Press.

Bleakley, A. Bligh, J. & Browne, J. (2011). *Medical education for the future: identity,*

*power and location*. New York: Springer.

Bogo, M. & Vayda, E. (1998).*The practice of field instruction in Social Work: Theory and Process,* 2nd ed. Toronto: University of Toronto

Bogo, M. & Vayda, E. (1987).*The practice of field instruction in Social Work: Theory and process,* Toronto: University of Toronto Press.

Bok, D. (2005). *Our underachieving colleges: A candid look at how students learn and why they should be learning more*. Princeton, NJ: Princeton University Press.

Botma, Y. (2014). Nursing student's perceptions on how immersive simulation promotes theory–practice integration. *International Journal of Africa Nursing Sciences* 1:1-5.

Botwe, B. Arthur, L. Tenkorang, M. & Anim-Sampong (2016). Dichotomy between theory and practice in chest radiography and its impact on students. *Journal of Medical Radiation Sciences,* 1-6.

Boud, D. (1987). Problem-based learning in perspective. In D. Boud (Ed.), *Problem-based learning in education for the professions*, 13-18. Sydney: Higher Education Research and Development Society of Australia.

Boud, D. (1987). *A facilitator's view of adult learning*. In D. Boud and V. Griffin (eds), Appreciating Adult Learning: From the Learners' Perspective, London: Kogan Page, 222-237.

Boyd, C.O. (2000). Combining qualitative and quantitative approaches. In P.L. Munhall & C.O. Boyd (Eds.), *Nursing research: A qualitative perspective (2nd ed*., 454-475). Boston: Jones & Bartlett.

Brammer, J. D. (2006). RN as gatekeeper: student understanding of the RN buddy role in clinical practice experience. *Nurse Education Today* 26,697–704.

Britt, R. (2006). Online education: a survey of faculty and students. *Radiol.Technol*.; 77(3):183-190.

Bullock, S. M. & Russell, T. (2010). Does teacher education expect too much from field experience? In T. Falkenberg & H. Smits (Eds.), *Field experiences in the context of reform of Canadian teacher education programs,* 2: 91-100. Winnipeg, MB: Faculty of Education of the University of Manitoba.

Burchell, H. Higgs, & T. Murray, S. (1999). Assessment of Competence in Radiography

Education, *Assessment & Evaluation in Higher Education*, 24:3, 315-326.

Burns, N.& Grove, S.K. (1993).*The practice of nursing research: Conduct, critique and utilization (2nd ed.).* Philadelphia: W.B. Saunders.

Caldwell, L. M. Tenofsky, L. M. & Nugent, E. (2010). Academic and clinical immersion in an accelerated nursing program to foster learning in the adult student, *Nursing Education perspectives,* 31(5): 294-297.

Cameron, A., Millar, J., Szmidt, N., Hanlon, K. & Cleland, J. (2014). 'Can new doctors be prepared for practice?: A review'. *The Clinical Teacher*, 11(3):188-192.

Campbell. T. (2007). Evolution and online instruction: using a grounded metaphor to explore the advantageous and less advantageous characteristics of online instruction. *Bull Sci Technol Soc*. 26(5):378-387.

Cardin, S. & Mcneese-Smith, D. (2005). A model for bridging the gap from theory to practice to reality. *Nursing Administration, Quarterly/April-June*, 29, 2, 154-161.

Carlson, E. Wann-Hansson, C. & Pilhammar, E. (2009). Teaching during clinical practice: Strategies and techniques used by preceptors in nursing education. *Nurse Education Today* 29: 522–526.

Cassell, C. (2009). Interviews in organizational research. In D. A. Buchanan & A. Bryman (Eds.), *The SAGE handbook of organizational research methods*, (pp. 500–515). Thousand Oaks, CA: Sage.

Chartered Society of Physiotherapy (2003).Clinical education placement guidelines. CSP. London.

Choi, I., & Lee, K. (2008). A case-based learning environment design for real-world classroom management problem solving. *Tech Trends*, *52*(3), 26-31.

Clapton, G., & Cree, V. (2004). Integration of learning for practice: Literature review. *In Learning for effective and ethical practice.* Edinburgh: Scottish Institute for Excellence in Social Work Education

Cleland, J. (2017). Simulation-based education: what's it all about? Commentary, *Perspect. Med. Edu*. DOI 10.1007/s40037-017-0354-0

Cobb, A.K. (2000). Acculturation and accommodation in qualitative and quantitative research. *Journal of Professional Nursing*, 16(4), 188.

Coffey, M. & Gibbs, G. (2002). Measuring teachers' repertoire of teaching methods.

*Assessment and Evaluation in Higher Education*, 27, 383–390.

Cohen, L., Garcia, J., Apfel, N. & Master, A. (2006). Reducing the racial achievement gap: A social-psychological intervention. *Science,* 313, 1307–1310.

Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education (7th ed.).* London, UK: Routledge.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education (6th ed.).* London, UK: Routledge.

College of Occupational Therapists - CoT (2003). Standards for Education: Pre Registration education standards. *College of Occupational Therapists.* London. Retrieved from http://337492web3.cot.co.uk/sites/default/files/publications/public/PreReg-Ed-Stnds.pdf

College of Radiographers - CoR (2003). A Curriculum Framework for Radiography. *College of Radiographers*. London. Retrieved from https://www.sor.org/system/files/documentlibrary/public/sor_learning_development_framework_clinical.pdf

College of Radiographers - CoR (2002). A Strategy for the Education and Professional Development of Radiographers. *College of Radiographers*. London. Retrieved from https://books.google.com.gh/books/about/A_Strategy_for_the_Education_and_Profess.html?id=UGUDHAAACAAJ&redir_esc=y

Corlett, J., Palfreyman, J., Staines, H., & Humphreys, A. (2003). Factors influencing theoretical knowledge and practical skill acquisition in student nurses: An Empirical Experiment. *Nurse Education Today*, 23, 3, 183-190.

Costley, C., Elliott, G. C. & Gibbs, P. (2010). *Doing work based research: Approaches to enquiry for insider-researchers*. London: Sage.

Creswell, J. W. (2005). *Educational research*: *Planning*, *conducting*, *and evaluating Quantitative and qualitative research*. Upper Saddle River, NJ: Pearson Education.

Creswell, J. W. (2003). *Research Design: Qualitative and Quantitative and Mixed-Method Approaches*, Thousand Oaks, CA: Sage Publications

Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. London: SAGE Publications.

Cunningham, J. Wright, C. & Baird, M. (2015).Managing clinical education through understanding key principles, *Radiologic Technology,* 86(3): 257-273.

Curtise, K. C. & White, P. (2005). Qualitative research design and approaches in radiography. *Radiography* 11, 217-225.

Dalkir, K. (2005). *Knowledge management in Theory and Practice*. Butterworth Heinemann.

Darling-Hammond, L. (2006). *Powerful teacher education*. San Francisco: Jossey-Bass.

Darling-Hammond, L. & Hammerness, K. (2005). The design of teacher education programs. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 390-441). San Francisco: Jossey-Bass.

Davhana-Maselesele, M. Tjallinks, J. &Norval, M. (2001). Theory-practice integration in Selected clinical situations. *Curationis*, 4 – 9.

Davidson, D. (2001). Knowing one's own mind. In *Subjective, intersubjective, objective* 15–38, Oxford: Oxford University Press.

Denzin, N.K. (1970). *The research act: A theoretical introduction to sociological methods*. Chicago: Aldine.

Department of Health - DoH (2001). Working Together, Learning Together: A framework for Lifelong Learning in the NHS. *Department of Health*. London.

Department of Health - DoH (2000). The NHS Plan: A Plan for Investment, A Plan for Reform. *Department of Health*. London.

De Swardt, C. Du Toit, H. & Botha, A. (2012). Guided reflection as a tool to deal with the theory–practice gap in critical care nursing students, *Health SA Gesondheid* 17(1), 1-9.

Dewey, J. (1974). *The relation of theory to practice in education*. In R. Archambault (Ed.), John Dewey on Education: Selected Writings, 315-338. Chicago, IL: University of Chicago Press.

Dick, W. (1996). The Dick and Carey model: Will it survive the decade? *ETR & D, 44(3),* 55-63.

Dillon, D., Bullock, S.M., O'Connor, K., Martin, A.K., Russell, T., & Thomas, L. (2014). Place-based teacher development: Placing practicum learning at the heart of pre-service teacher education. In L. Thomas (Ed.), *Becoming teacher: Sites for teacher development in Canadian teacher education* (pp. 94-120). Ottawa, ON: Canadian Association for Teacher Education.

Dreyfus, H. & Dreyfus, S. (2005). Expertise in real world contexts. *Organization Studies*, 26(5), 779–792.

Dillman, D. Smyth, J. & Christian, L. (2009).*Internet, mail, and mixed-mode surveys: The tailored design method*. 3rd ed. Hoboken, NJ: Wiley.

Duffy, K. (2004). *Failing Students*. Glasgow Caledonian University. Glasgow

Duffy, K. & Watson, H. (2001). An interpretive study of the nurse teacher's role in practice placement areas. Nurse Education Today 21, 551–558.

Eraut, M. (2004). Editorial: The practice of reflection. *Learning in Health and Social Care*, 3(2): 47-52.

Eraut, M. (2003). Editorial: *Learning in Health and Social Care* 3(2): 117-122.

Ezzy, D. (2002). *Qualitative analysis: Practice and innovation*. Crows Nest, NSW: Allen & Unwin.

Falkenberg, T. Goodnough, K. & MacDonald, R. (2014). Views on the practices of integrating theory and practice in Teacher education programs in Atlantic Canada. Alberta Journal of Educational Research, 60(2): 339-360.

Felder, R., & Brent, R. (2003).Learning by doing. *Chemical Engineering Education*, 37(4), 282-283.

Ferguson, E. & Jinks, M. (1994). Integrating what is taught with what is practiced in the nursing curriculum, a multi-dimensional model. *Journal of Advanced Nursing* 20, 687-695.

Field, D. (2004). Moving from novice to expert– the value of learning in clinical practice: a literature review. *Nurse Education Today* 24, 560–565.

Foddy, W. (1993). Constructing questions for interviews and questionnaires. *Theory and practice in social research*. Cambridge: Cambridge University Press.

Fishbein, M. & Ajzen, I. (2010). *Predicting and changing behaviour: the reasoned action approach*. New York: Psychology Press.

Fuller, R. G. & Kuhne, G. (2008). Fostering meaningful interaction in health education online courses: matching pedagogy to course types. *International Journal of Information and Communication Technology Education*, 4(1):44-55.

Gateway Community College (GWCC, 2014). *Medical radiography handbook*. Retrieved from http://www.gatewayct.edu/Search/?searchtext=medical+radiography+handbook

Gehlbach H. Artino A. R. & Durning, S. (2010). AM last page: Survey development guidance for medical education researchers. *Acad Med* 85:925.

George, A. G. (1982). *A history of Social-work field instruction: Apprenticeship in instruction*, in Shefor, B. W. and Jerkins, L. E. (eds). Quality field instruction in Social work, 37-59. New York: Longman.

Gibbs, G. & Coffey, M. (2001). 'The impact of training on university teachers' approaches to teaching and on the way their students learn'. Paper presented at the annual conference of the European Association for Research in Learning and Instruction, Fribourg, Switzerland.

Gibbs, P. & Costley, C. (2006). An ethics of community and care for practitioner researchers, *International Journal of Research & Method in Education.* Routledge, 239-249.

Gijbels, D. Dochy, F. Van den Bossche, P. & Segers, M. (2005). Effects of problem-based learning: a meta-analysis from the angle of assessment. *Rev Educ Res*. 75(1):27-61.

Goh, P., Wong, K., & Hamzah, M. (2014). The Approaches to Teaching Inventory: A Preliminary Validation of the Malaysian Translation. *Australian Journal of Teacher Education, 39*(1).

Gough, M. (2014).*Pedagogies for practical learning: some paradoxical implications arising out of professional formation for the purpose of the university*. Unpublished paper for presentation at the Philosophy of Education Society of Great Britain Seminar "Cross Disciplinary Perspectives on Expertise, Know-How and Professional Education", 9 May 2014

Greene, J. C. & Caracelli, V. J. (1997). Advances in mixed-method evaluation: The

challenges and benefits of integrating diverse paradigms. San Francisco: Jossey-Bass.

Greenwood, J. (2001). Writing nursing, writing ourselves. In E. Chang, & J. Daly (Eds.), *Transitions in nursing: Preparation for professional practice* (pp. 263—277). Sydney, Australia: MacLennan & Petty.

Hager, P., & Beckett, D. (1995). *Philosophical underpinnings of the integrated conception of competence.* Boston: Houghton-Mifflin.

Hall, A. (2006). Mentorship in the community. *Journal of Community Nursing*20, 2–6.

Hancock, B., (2002). *An Introduction to qualitative research*. Trent Focus Group. SAGE.

Helitzer, D. & Wallerstein, N. (1999). A proposal for graduate curriculum integrating theory and practice in public health. *Heath education research*, 14(5): 697-706.

Holstein, J. A. & Gubrium, J. F. (2004).The active interview. In D. Silverman (Ed.), *Qualitative research: Theory, method, and practice* (2nd ed., pp. 140–161). London, UK: Sage.

Hornyak, M., Green, S. G., &Heppard, K. A. (2007). Implementing experiential learning. In Reynolds, M. & Vince, R. (Eds.).*The handbook of experiential learning and management education*, 137-152. New York, NY: Oxford University Press.

Hargreaves, D. (1980). Power and the para-curriculum. *In Standards, Schooling and Education (Finch, A. & Scrimshaw, P. eds).* Open University, Buckingham, 126–137.

Harper D, Butler C, Hodder R, Allman R, Woods J, & Riordan D. (1984). Computer-assisted instruction and diagnosis of radiographic findings. *J Med Syst*.; 8(1-2):115-20.

Harrell, M. C. & Bradley, M. A. (2009). *Data Collection Methods: Semi-Structured Interviews and Focus Groups.* Santa Monica, CA: RAND Corporation.

Hawick, L. Kitto, S. & Cleland, J. (2016). Curriculum reform: the more things change, the more they stay the same? *Perspect Med Educ.,* 5:5–7.

Hetherington, S. (2006). Knowledge-that is Knowledge-how, *In S, Hetherington (ed) Epistemology Futures.* Oxford: Oxford University Press.

Hora, M. T. & Ferrare, J. J. (2013). Instructional Systems of Practice: A

Multidimensional Analysis of Math and Science Undergraduate Course Planning and Classroom Teaching, *Journal of the Learning Sciences*, 22:2, 212-257.

Hornsby, J. (2012). “Ryle's Knowing-How, and Knowing How to Act,” *in Knowing How: Essays on Knowledge, Mind, and Action, J. Bengson and M. A. Moffett (eds.),* Oxford: Oxford University Press, p. 80–100.

Hsu, J. J. Chapelle, C. A. & Thompson, A. D. (1993). Exploratory learning environments: what are they and do students explore? *J Educ Comput Res.,* 9:1–15.

International Society of Radiographers and Radiological Technologists - ISRRT (2014). *Radiography Education Framework*. Retrieved from https://www.isrrt.org

Jerlock, M., Falk, K., & Severinsson, E. (2003). Academic nursing education guidelines: tool for bridging the gap between theory, research and practice. *Nursing and Health Sciences*, *5*(2), 219-228.

Jha, A. Orav, E.J., Li, Z. & Epstein, A. M. (2007). The inverse relationship between performance in the hospital quality alliance measures and mortality rates. *Health Aff.* 26(4):1104–1110.

Johanson, L. (2013). *How do new BSN nurses perceive their nursing education?* Research Corner, Nursing.

Johnson, B. & Christensen, L. (2000).*Educational research: quantitative and qualitative approaches*. Boston: Allyn and Bacon.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26.

Joint Review Committee on Education in Radiologic Technology – JRCERT (2014). *Standards for an accredited program in Radiography*, Chicago. IL 60606-3182 Retrieved from https://www.jrcert.org/

Kember, D. (2001). ‘Beliefs about knowledge and the process of teaching and learning as a factor in adjusting to study in higher education’, *Studies in Higher Education* 26, 205–221.

Kember, D. & Kwan, K. (2000). ‘Lecturers’ approaches to teaching and their relationship to conceptions of good teaching’, *Instructional Science* 28, 469–490.

Kenyon, L. Dole, R. & Kelly, S. (2013). Perspectives of Academic Faculty and Clinical

Instructors on Entry-Level DPT Preparation for Pediatric Physical Therapist Practice. Physical *Therapy,* 93(12), 1661-1672.

Kiersma, M. E. Plake, K. S. & Darbishire, P. L. (2011). Patient Safety Instruction in US Health Professions Education. *Am J Pharm Educ*, 75(8):162.

Kilminster S M & Jolly B C (2000). Effective supervision in clinical practice settings: A literature review. *Medical Education*. 34: 827-840.

Kimchi, J., Polivka, B., & Stevenson, J.S. (1991). Triangulation: Operational definitions. *Nursing Research*, 40(6), 364-366.

Kohn, L. Corrigan, J. & Donaldson, M. (2000). *To Err Is Human: Building a Safer Health System*. Washington, DC: National Academy Press.

Korthagen, F.A.J. (2001). *Linking practice and theory: The pedagogy of realistic teacher education*. Mahwah, NJ: Lawrence Erlbaum.

Kvale, T. (1996). *An introduction to Qualitative Research Interviewing*, Thousand Oaks, CA: Sage, pp. 30-31.

Landers, M., (2000). The theory-practice gap in nursing: the role of the nurse teacher. *Journal of Advanced Nursing* 32 (6), 1550–1556.

Landmark, B., Hansen, G., Bjones, I., & Bohler, A. (2003). Clinical supervision: factors defined by nurse as influential upon the development of competence and skills in supervision. *Journal of Clinical Nursing,* 12, 6, 834-841.

Lave, J. & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.

Lawrence, N. W. (2006). *Social Research Methods: Qualitative and Quantitative Approaches*, 6th ed., Boston: Pearson Education, Inc.

Leckey, J. & Neill, N. (2001).Quantifying quality: The importance of student feedback. *Quality in Higher Education*, 7, 19-32.

Leinhardt, G., McCarthy Young, K., & Merriman, J. (1995). Integrating professional knowledge: The theory of practice and the practice of theory. *Learning and Instruction, 5*, 401-408.

Leotsakos, A. Ardolino, A. Zheng, H. Barraclough, B & Walton, M. (2014). Educating future leaders in patient safety. *J Multidiscip Healthc*. 7: 381–388.

Lincoln, Y. S. & Guba, E. G. (2000). Paradigmatic controversies, contradictions, and

emerging confluences. In Denzin, N. K. & Lincoln, Y. S. (Eds.), Handbook *of qualitative research (2nd ed., 163-188).* Thousand Oaks, CA: Sage.

Lincoln, Y. S. & Guba, E. G. (1985).*Naturalistic inquiry*. Newbury Park, CA: Sage.

Long, C. S. Ibrahim, Z. & Kowang, T. O. (2014). An analysis on the relationship between lecturers' competencies and students' satisfaction. *International Education Studies*, 7(1): 37-46.

Lonka, K. Olkinuora, K. & Makinen, J. (2004) Aspects and prospects of measuring studying and learning in higher education. *Educational Psychology Review*, 16, 301-323.

Lum, G. (2017). Making sense of knowing how and knowing that. *Journal of Philosophy of Education*, 51(3).

Lum, G. (2009). *Vocational and Professional Capability: An Epistemological and Ontological Study of Occupational Expertise.* London: Continuum.

Lum, G. (2007). `The myth of the golden mean', *In J. Drummond and P. Standish (eds.) The Philosophy of Nurse Education.* London: Palgrave Macmillan.

MacNeil, M. (1997). From nurse to teacher: recognizing a status passage. *Journal of Advanced Nursing* 25, 634-642.

Madigosky, W. S. Headrick, L. A. Nelson, K. *et al.* (2006). Changing and sustaining medical students' knowledge, skills, and attitudes about patient safety and medical fallibility. *Acad Med.* 81(1):94–101

Mahmud, A. (2013). The Integration of Theory and Practice of Paramedic Curriculum. *International Journal of Scientific and Research Publications*, 3(7):1 – 4.

Mallik, M. (1998). The role of nurse educators in the development of reflective practitioners: A selective case study of the Australian and UK experience. *Nurse Education Today*. 18:52-63.

Mallik, M. & Aylott, E. (2003). Facilitating Practice Learning in Pre-registration Nursing Programmes: A comparative review of the Bournemouth collaborative model and Australian models. *Unpublished Report to Royal College of Nursing*. London.

Martin, E. Prosser, M. Trigwell, K. Ramsden, P. & Benjamin, J. (2000). 'What university teachers teach and how they teach it', Instructional Science 28, 387–412.

Martino, S. & Odle, T. (2008). *New models, new tools: the role of instructional technology in Radiologic Sciences Education*. American Society of Radiologic Technologists.

Marton, F. (1994). Phenomenography. In Husen, T. & Postlethwaite, N. (Eds.), *International Encyclopedia of Education*, 4424 - 4429. Oxford: Pergamon.

McCaugherty, D. (1991). The theory—practice gap in nurse education: its causes and Possible solutions. Findings from an action research study, *Journal of Advanced Nursing*, *16,*1055-1061.

McCaugherty, D. (1991). The use of a teaching model to promote reflection and experiential integration of theory and practice in first year student nurses: an action research study. *Journal of Advanced Nursing*, 16, 534-543.

McGaghie, W.C. Issenberg, S. Barsuk, J.H. & Wayne, D.B. (2014). A critical review of simulation-based mastery learning with translational outcomes. *Med Educ.* 48:375–85.

McKeachie, W. J. (1997). 'Good teaching makes a difference – and we know what it is', In Perry, R.P. & Smart, J.C. (eds.), *Effective Teaching in Higher Education: Research and Practice*. New York: Agathon Press, pp. 396–408.

McNiff, J. & Whitehead, J. (2005). *All you need to know about action research*. London, UK: Sage.

Michau, R. Robert, S. William, B. & Boyle, M. (2009). An investigation of theory-practice gap in undergraduate paramedic education. *BMC Medical Education*, 9, 23.

Mitchell, E. S. (1986). Multiple triangulation: A methodology for nursing science. *Advances in Nursing Science*, 8(3), 18-26.

Miller, J. & Glassner, B. (2004).The "inside" and the "outside". Finding realities in interviews. In D. Silverman (Ed), *Qualitative research: Theory, method and practice (2nd ed.),* 125-139. London, UK: Sage.

Ministry of Education (2008). Teachers' code of conduct: Rules of professional conduct for teachers in Ghana. Retrieved from http://teachercodes.iiep.unesco.org/teachercodes/codes/Africa/Ghana.pdf

Modell, S. (2003). Goals versus institutions: The development of performance

measurement in the Swedish university sector. *Management Accounting Research*, 14(4), 333-359.

Moorhouse, C. (1991). *Registered Nurse: The First Year of Professional Practice*.

Morgan, D. L. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research*, *1*(1), 48-76.

Morgan, M. G. (1990). *Accreditation and diversity in engineering education (editorial). Science*, 249:969.

Morse, J., & Niehaus, L. (2009).*Mixed method design: Principles and procedures.* Walnut Creek, CA: Left Coast Press.

Morse, J. M. (2001). Are there risks in qualitative research? *Qual Health Research* 11**,** 3–4

Morse, J. M. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing Research*, 40(2), 120-123.

Mortell, M. (2009). A resuscitation ‘‘dilemma’’ theory–practice–ethics. Is there a theory–practice–ethics gap? *Journal of the Saudi Heart Association,* 21, 149–152.

Mulholland, J. Mallik, M. Moran, P. Scammell, J. & Turnock, C. (2005). An overview of the nature of the preparation of practice educators in five health care disciplines. *Making Practice-Based Learning Work,* Occasional Paper No. 6.

Northwestern Medicine School of Radiography (2013). *Radiography curriculum*. Retrieved from http://www.clinicalschools.nm.org/school-of-radiography.html

Norton, L. Richardson, J. Hartley, J. Newstead, S. Mayes, J. (2005). Teachers’ beliefs and intentions concerning teaching in higher education. Higher education, 50:537-5771.

Nursing and Midwifery Council - NMC (2002). Requirements for pre-registration nursing Programmes. Retrieved from http://www.nmc-uk.org/nmc/main/publications/$education

O'Connor, D. L., & O'Neill, B. J. (2004). Toward social justice: Teaching qualitative research. *Journal of Teaching in Social Work*, 24(3/4), 19-34.

Oduro, G.K.T. (2008). Promoting Learning in Ghanaian Primary Schools: The Context

of Leadership and G ender Role Stereotypes". In J. MacBeath and Y.C.Cheng (Eds.) *Leadership for Learning: International Perspectives*. Rotterdam: Sense Publications.

Oliver, P. (2003). *The student's guide to research ethics*. Maidenhead, UK: Open University Press.

Onwuegbuzie, A. J. & Leech, N. L. (2006). Linking Research Questions to Mixed Methods Data Analysis Procedures. In: *The Qualitative Report*, 11(3): 474–498.

Onwuegbuzie, A. J., & Leech, N. L. (2004a). *On becoming a pragmatic researcher: The importance of combining quantitative and qualitative research methodologies*. Manuscript submitted for publication.

Ornstein, A. C., & Hunkins, F. P. (2009). Curriculum: foundations, principles, and issues. United States. Pearson.

Patton, M. Q. (2002). *Qualitative research and evaluation methods (3rd ed.)*. Thousand Oaks, CA: SAGE Publications.

Phelan, A. M. (2005). On discernment: The wisdom of practice and the practice of wisdom in teacher education. In G. Hoban (Ed.), *The missing links in teacher education design* (pp. 57-73). Dordrecht, The Netherlands: Springer.

Philips, D. (2013). Integrating Academic and Clinical Learning Using a Clinical Swallowing Assessment. *Communication Disorders Quarterly*, 34(4): 256-260.

Ponefract, C. & Hardman, F. (2005). The discourse of classroom interaction in Kenyan primary schools, *Comparative Education*, 41(1): 87–106.

Postareff, L. Lindblom-Yla, S. & Nevgi, A. (2007). The effect of pedagogical training on teaching in higher education). *Teaching and Teacher Education* 23, 557–571.

Price, R., High, J. & Miller, L. (1997).*The Developing Role of the Radiographer: issues affecting the future curriculum* - Hatfield, University of Hertfordshire.

Prosser, M. & Trigwell, K. (1999). *Understanding Learning and Teaching: The Experience in Higher Education*. Buckingham, UK: SRHE and Open University Press.

Quality Assurance Agency for Higher Education - QAA (2001). Benchmark Statements for Health Care Programmes. QAA. Gloucester.

Ramsden, P. (2005). *Learning to Teach in Higher Education (2nd Ed)*. Routledge

Falmer, London and New York.

Redmond, B. (2004). *Reflection in Action – Developing Reflective Practice in Health and Social Services*. Ashgate Publishing. Aldershot.

Reja, U. Manfreda, K. Hlebec, V. & Vehovar, V. (2003). Open-ended versus close-ended questions in web questionnaires. *Developments in Applied Statistics*, 159-177

Richardson, J.T.E. (2004). A British evaluation of the Course Experience Questionnaire. *Studies in Higher Education*, 19, 59-68.

Roger, E. (1993). *Quality assurance for university teaching. Society for Research and Higher education*. Open University Press.

Rowland, S. (2006). The Enquiring University: Compliance and Contestation in Higher Education. London.

Ryle, G. (1971). *"Knowing How and Knowing That," in Collected Papers*, 2: 212-225 New York: Barnes and Nobles.

Samuelowicz, K. & Bain, J.D. (1992). 'Conceptions of teaching held by academic teachers', *Higher Education* 24, 93–111.

Sax, G., (2010). "Having Know-How: Intellect, Action, and Recent Work on Ryle's Distinction Between Knowledge-How and Knowledge-That," *Pacific Philosophical Quarterly*, 91(4): 507–30.

Schon, D.A. (1987). *Educating the Reflective Practitioner: Towards a new design for teaching and learning in the professions*. Josey Bass. San Francisco.

Schuman. H. & Presser, S. (1979). The open and closed question. *American Sociological Review,* 44, 692-712.

Scott, T. Pachana, N. & Sofronoff, K. (2011). Survey of Current Curriculum Practices within Australian Postgraduate Clinical Training Program: Students' and Programme Directors' Perspectives. *Australian Psychologist* 46, 77–89.

Scully, J. (2011). The theory-practice gap and skill acquisition: an issue for nursing education. *Collegian*, 18(2):93-98.

Sheffield Hallam University (SHU, n.d.). *BSc. Diagnostic Radiography*. Retrieved from Snowdon, P. (2004). https://www.shu.ac.uk/courses/diagnostic-radiography/bsc-honours-diagnostic-radiography/full-time/2016

Knowing How and Knowing That: a Distinction Reconsidered, *Proceedings of the Aristotelian Society*, 104. 1, pp. 1-29.

Spouse, J. (2008). *Bridging theory and practice in the supervisory relationship: a sociocultural perspective*. The Open University Walton Hall, Milton Keynes, Buckinghamshire MK7 6AA

Spouse, J. (1998a). Scaffolding student learning in clinical practice. *Nurse Education Today* 18, 259–266.

Spouse, J. (1996). The effective mentor: A model for student centered learning in Clinical practice. Nursing Times Research. 1(2): 120–133.

Spouse, J. & Redfern, L. (2000). *Successful Supervision in Health Care Practice.* Blackwell Sciences, Oxford.

Stanley, J. & Williamson, T. (2001). Knowing How, *Journal of Philosophy*, 98.8, pp. 411- 444.

St. Clair County Community College – SCCC (2016). *Radiologic Technology Programme Handbook.* Retrieved from https://www.sc4.edu/media/2621/2016-2017-final-student-rad-handbook-nc.pdf

Steele, R. L. (1991). Attitudes about faculty practice perception of role and role strain. *Journal of Nursing Education* 30, 15-22.

Sun, R. & Zhang, X. (2004), "Top-down versus bottom-up learning in cognitive skill acquisition" *Cognitive Systems Research*, 5: 63–89.

Taradi, S. K. Taradi, M. Radić, K. & Pokrajac, N. (2005). Blending problem-based learning with Web technology positively impacts student learning outcomes in acid-base physiology. *Adv. Physiol. Educ*., 29:35-39.

Tashakkori, A., & Teddlie, C. (2003). The past and future of mixed methods research: From data triangulation to mixed model designs. In: Tashakkori, A., Teddlie, C. (Eds.). *Handbook of mixed methods in social and behavioral research*, Thousand Oaks: Sage, 671–702.

Tashakkori, A., & Teddlie, C., (1998). *Mixed Methodology*: *Combining qualitative and Quantitative approaches*. Thousand Oaks, CA: Sage.

Thompson, N. & Lodge, T. (2004). Case studies radiography: An overview of the nature

of the preparation of practice educators in five health care disciplines. Making practice-based learning work. Radiography, 1-11.

Thurmond, V. (2001).The point of triangulation. *Journal of nursing scholarship*, 33:3, 253-258.

Tidewater Community College (2014). Radiography programme information packet. Retrieved from https://www.tcc.edu/uploads/pdf/TCC-radiography-program-packet.pdf

Tight, M. (2003).*Researching higher education*. Maidenhead, UK: Open University Press.

Trigwell, K., & Prosser, M. (2004). Development and use of the approaches to teaching inventory. *Educational Psychology Review*, 16, 409–425.

Trigwell, K., & Prosser, M. (1996). Congruence between intention and strategy in University science teachers' approaches to teaching. *Higher Education*, 10, 77-87.

Trigwell, K., Prosser, M. & Taylor, P. (1994). 'Qualitative differences in approaches to teaching first year university science', *Higher Education* 27, 75–84.

Trigwell, K. & Prosser, M. (1993). 'Approaches adopted by teachers of first year university science courses', Research and Development in Higher Education 14, 223–228.

University of Ghana (2012). *Handbook for the Bachelor's degree: course description and regulation for programmes in the health sciences* Vol. 4. Retrieved from https://www.ug.edu.gh/sites/default/files/images/Health_Sciences_handbook_2012_FINAL.pdf

University of Leeds (n.d*.). Portfolio Guidelines for students and lecture/practitioners*. Retrieved from https://medhealth.leeds.ac.uk/info/1136/radiography//

University of Portsmouth (2014). *BSc. Diagnostic Radiography*. Retrieved from http://www.port.ac.uk/courses/health-sciences-and-social-work/bsc-hons-diagnostic-radiography-and-medical-imaging/

Vayda, E. & Bogo, M. (1991). A teaching model to unite classroom and field, *Journal of Social Work Education*, 27(3): 271-278.

Webster, R. (1990). *The role of the nurse teacher*. Senior Nurse 10, 16-18.

Wenger-Trayner, É., & Wenger-Trayner, B. (2015). Learning in a landscape of practice: A framework. In É. Wenger-Trayner, M. Fenton-O'Creevy, S. Hutchinson, C. Kubiak, and B. Wenger-Trayner (Eds.), *Learning in Landscapes of Practice: Boundaries, identity, and knowledgeability in practice-based learning* (pp. 13-29). London: Routledge.

Wenger-Trayner, É., Fenton-O' Creevy, M. Hutchinson, S. Kubiak, C. & Wenger-Trayner, B. (2015). *Learning in Landscapes of Practice: Boundaries, identity, and knowledgeability in practice-based learning.* Oxon, UK: Routledge.

Wenger, E. (2007). Communities of Practice: A new approach to solving complex educational problems. in Cashman, J., Linehan, P., & Rosser, M. *National Association of State Directors of Special Education*, x-xi. Alexandria, VA.

Wenger, É. (1998). *Communities of Practice: Learning, Meaning, and Identity.* New York: Cambridge University Press.

White R. & Ewan C. (1991). *Clinical Teaching in Nursing*. Chapman & Hall, London.

Wideen, M., Mayer-Smith, J., & Moon, B. (1998). A critical analysis of the research on learning to teach: Making the case for an ecological perspective on inquiry. *Review of Educational Research, 68*(2), pp. 130-178.

Wilkerson, L. & Irby, M. (1998). Strategies for improving teaching practices: a comprehensive approach to faculty development. *Acad Med*; 73:387-396.

Williamson, K. Gunderman, R. Cohen, M. & Frank, M. (2004). Learning Theory in Radiology Education. *Radiology*, 233:15-18.

Williamson, K. B. Kang, Y. P. Steele, J. L. Gunderman, R. B. (2002). The art of asking: teaching through questioning. *Acad. Radiol.* , 9:1419–1422.

Winch, C. (2017). Professional Knowledge, Expertise and Perceptual Ability. *Journal of Philosophy of Education*, 51(3): 673-688.

Winch, C. (2015). Professional education, know-how and conceptual ability: The role of education in the attainment of concept mastery in professional work. *Theory and Research in Education*, 14(1): 45-62.

Winch, C. Oancea, A. & Orchard, J. (2014). The Contribution of Educational Research to Teachers' Professional Learning Philosophical Understandings. *Oxford Review of Education*, 41(2): 202-216.

Winston, K. (2015). Core concepts in remediation: Lessons learned from a 6-year case study. *Medical Science Education*, 25: 307-315.

Winston, K. Van Der Vleuten, C. & Scherpbier, A. (2013). Remediation of at-risk medical students: theory-in action. *BMC Medical Education,* 13:132.

Winston, K. Van Der Vleuten, C. & Scherpbier, A. (2012). The role of the teacher in remediating at-risk medical students. *Medical Teacher,* 34: 732-742.

Wrenn, J. & Wrenn, B. (2009). Enhancing learning by integrating theory and practice. *International Journal of Teaching and Learning in Higher Education*, 21(2):258-265.

Yin, R. K. (2008). *Case study research: Design and methods (4th ed.).*Thousand Oaks, CA: Sage.

Zhang, L. & Sternberg, R. (2002). 'Thinking styles and teachers' characteristics', *International Journal of Psychology* 37, 3–12.

# APPENDICES

**APPENDIX I**

**ETHICAL APPROVAL FROM VPREC**

UNIVERSITY OF LIVERPOOL | ONLINE PROGRAMMES

| | |
|---|---|
| Dear Derick Sule | |
| I am pleased to inform you that the EdD. Virtual Programme Research Ethics Committee (VPREC) has approved your application for ethical approval for your study. Details and conditions of the approval can be found below. | |
| Sub-Committee: | EdD. Virtual Programme Research Ethics Committee (VPREC) |
| Review type: | Expedited |
| PI: | |
| School: | Lifelong Learning |
| Title: | Theory-Practice integration in Radiography Education: The role of teaching strategies. |
| First Reviewer: | Dr. Lucilla Crosta |
| Second Reviewer: | Dr. Morag Gray |
| Other members of the Committee | Dr. Martin Gough, Dr. Julie-Anne Regan, Dr. Kalman Winston, Dr. Mariya Yukhymenko, Dr. Dimitrios Vlachopoulos |
| | |
| Date of Approval: | 15/09/2016 |
| The application was APPROVED subject to the following conditions: | |
| Conditions | |

| | | |
|---|---|---|
| 1 | Mandatory | M: All serious adverse events must be reported to the VPREC within 24 hours of their occurrence, via the EdD Thesis Primary Supervisor. |
| | | |

This approval applies for the duration of the research. If it is proposed to extend the duration of the study as specified in the application form, the Sub-Committee should be notified. If it is proposed to make an amendment to the research, you should notify the Sub-Committee by following the Notice of Amendment procedure outlined at http://www.liv.ac.uk/media/livacuk/researchethics/notice%20of%20amendment.doc.

Where your research includes elements that are not conducted in the UK, approval to proceed is further conditional upon a thorough risk assessment of the site and local permission to carry out the research, including, where such a body exists, local research ethics committee approval. No documentation of local permission is required (a) if the researcher will simply be asking organizations to distribute research invitations on the researcher's behalf, or (b) if the researcher is using only public means to identify/contact participants. When medical, educational, or business records are analysed or used to identify potential research participants, the site needs to explicitly approve access to data for research purposes (even if the researcher normally has access to that data to perform his or her job).

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Please note that the approval to proceed depends also on research proposal approval.

Kind regards,

Lucilla Crosta

Chair, EdD. VPREC

## APPENDIX II

UNIVERSITY OF LIVERPOOL

## INTERVIEW PROTOCOL

| | |
|---|---|
| **Introduction: (5 Minutes)** | Thank you for agreeing to come and talk with me today. I am Derick Sule, final year doctoral student at the University of Liverpool. As part of my doctoral studies I am researching on Theory-practice integration in radiography education: the role of teaching strategies.<br><br>Being a teaching faculty member of the Radiography department, SBAHS and with your good working knowledge of the radiography curriculum, I would like to interview you about your teaching strategies and how these support the integration of classroom and clinical learning of student radiographers.<br><br>This interview will last for approximately 30 minutes and I will be grateful if granted your consent to audiotape our interaction alongside my notes.<br><br>The themes emerging from today's discussion will be useful in constructing a rich description of how current instructional strategies support the integration of classroom and clinical learning and this can be useful to policy makers in developing better approaches for delivery of the radiography curriculum. Additionally, gaining such understanding will help improve my supervisory role as clinical tutor. In my attempt to use the themes from this discussion, your confidentiality is guaranteed. I will not include your name or any other information that could identify you in any reports written. I will personally destroy the notes and audiotape of today's discussion after this study is completed and published.<br><br>Would you like any clarifications before we proceed?<br><br>Having introduced myself, I would like you to give me a brief outline of your role as teaching faculty member in the radiography programme.<br>• Prompt: What subject(s) do you teach?<br>• Prompt: How long have you been teaching this/these subject(s)?<br>• Prompt: What pedagogical training in teaching have you had since the time of your engagement? |
| **Questions: (20 minutes)** | **1. To begin with, what view do you hold on teaching?**<br>• Prompt: What is your teaching philosophy or what do you |

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|---|---|
| | believe the role of a teacher should be. |
| | **2. What instructional approaches do you adopt for your subject(s)?**<br>• Prompt: Kindly give me examples illustrating your instructional approach<br>• Prompt: Given the context and subject you are teaching, is this the best approach?<br>• Prompt: Is there a possibility of adopting other approaches in your teaching (e.g. Lectures, group discussions, student presentations, seminars, simulations, workshops, tutorials, debates, problem-based, enquiry based, experiential learning) |
| | **3. How are your instructional approaches structured?**<br>• Prompt: Content sequencing and consistency of concepts<br>• Prompt: In what ways are your teaching strategies complementing other courses and clinical situations?<br>• Prompt: Are learning materials presented to students or students are tasked to find their own learning resources? |
| | **4. Looking at your instructional approach, do you think it support theory-practice integration?**<br>• Prompt: How is your course content linked with clinical practice?<br>• Prompt: What are the things you do during your teaching to ensure students apply theoretical knowledge to clinical practice? |
| | **5. Generally, what view do you hold on the current approaches to the delivery of our radiography curriculum?**<br>• Prompt: Do you think radiography curriculum is effective?<br>• Prompt: Do you think radiography curriculum meets international standards, and if not, why not?<br>• Prompt: What about the curriculum will you change if given the opportunity?<br>• Prompt: What enablers and barriers do you foresee to proposed change(s) to curriculum? |
| **Conclusion: (5 minutes)** | Those were the few questions I intended to ask.<br>What other areas do you think this interview has not covered?<br>Thank you very much for your time. |

**APPENDIX III**

**ONLINE SURVEY QUESTIONNAIRE FOR DATA COLLECTION ON THEORY-PRACTICE INTEGRATION IN RADIOGRAPHY EDUCATION: THE ROLE OF TEACHING STRATEGIES**

- This questionnaire contains questions related to the above research topic.
- "Academic instructors" in the questionnaire refer to classroom teachers or lecturers, whilst "Clinical supervisors" refer to qualified radiographers or in-charges at the clinical areas.
- Statements (1-10) are focused on your academic learning experiences whilst statements (11-23) focus on your clinical learning experiences. For each of these statements, please indicate you level of agreement or disagreement.
- Questions 24-27 contain check-boxes which you are kindly expected to select all that apply.
- Questions 28-29 require that you provide short answers

1. Academic instructors demonstrate deep knowledge of subject being taught
2. Academic instructors demonstrate where, how and when classroom knowledge is applicable to clinical situations, making content of taught courses relevant to clinical practice
3. Content of taught courses are appropriately planned and sequentially delivered by academic instructors
4. Classroom learning is most often interactive
5. Course delivery approaches utilized by academic instructors are aligned with my preferred learning style
6. I feel empowered to be responsible for my own learning
7. Teaching strategies of academic instructors empower me to link and apply classroom knowledge to clinical practice
8. Academic instructors provide learning materials and determine what should be learned

9. Students are tasked to find learning materials and resources
10. Academic instructors at times allow me to assume an instructors' role in the learning
11. I get the involvement of academic instructors during my clinical rotations
12. I get the support of clinical supervisors during my clinical rotations
13. Clinical supervisors often allow me to apply acquired knowledge from the classroom to actual patients in clinical areas
14. Clinical supervisors demonstrate good clinical credibility in playing their roles as mentors, role models and coaches
15. Practices of clinical supervisors as observed in clinical areas are very consistent with classroom descriptions of such procedures
16. Collaboration is observed between academic instructors and my clinical supervisors during learning activities in the classroom and clinical area
17. In the clinical area, my Clinical supervisor(s) remain(s) at the background whilst I work independently
18. Clinical supervisors present me with clinical situations based on my previous experiences
19. Clinical supervisors encourage a face-to-face interaction between myself and patients
20. Clinical supervisors often offer me the opportunity for safe experimentation and discovery of solutions in the clinical area
21. Clinical supervisors expose me to existing relationships between patients' clinical
22. Clinical supervisors are more focused on training me than rendering radiographic services to patients
23. I am legitimately accepted and allowed to actively participate under close supervision through interactive and collaborative activities with my clinical supervisors
24. Which of the following instructional technologies do academic instructors in your department employ when teaching you? (Please select all that apply)
    - Email
    - DVD

- Audio (podcast)
- Search engines and databases
- Ebooks
- Eportfolios
- Online discussions
- Online chats
- Wireless classrooms
- Laptops
- Smartphone or cell phone
- MP3 players cell phones
- WebCT
- Blackboard
- Computer-based models for simulations and virtual imaging

25. Which of the following instructional technologies will you recommend that academic instructors in your department use when teaching students? (Please select all that apply)
    - Email
    - DVD
    - Audio (podcast)
    - Search engines and databases
    - Ebooks
    - Eportfolios
    - Online discussions
    - Online chats
    - Wireless classrooms
    - Laptops
    - Smartphone or cell phone
    - MP3 players cell phones
    - WebCT
    - Blackboard

- Computer-based models for simulations and virtual imaging

26. Which of the following teaching approaches/strategies do academic instructors in your department use when teaching you? (Please select all that apply)
    - Students listening to lectures and making notes
    - Teaching being delivered in the classroom and in the form of power-point presentations
    - Students having to memorize factual knowledge
    - Engaging students in team-based or focused-group discussions
    - Students being asked to do presentations
    - Students being engaged in seminars/workshops
    - Using simulations to teach in the laboratory or classroom
    - Academic instructors taking students to clinical areas and demonstrating procedures to them practically
    - Students being offered classroom tutorials
    - Students being engaged in debates, peer reviews and feedback activities
    - Encouraging student-to-student collaborations in performing work-based assignments
    - Academic instructors seek students' viewpoints during learning processes
    - Confronting students with clinical problems, asking students questions and tasking them to find solutions to such problems
    - Engaging students in research or inquiry during normal classroom learning activities
    - Students being challenged to make use of prior experience or knowledge during learning processes
    - Students being encouraged to make use of “concept maps” during learning processes
    - The use of computer-based models for simulation and virtual imaging
    - The use of phantoms for classroom demonstrations

27. Which of the following teaching approaches will you recommend that academic instructors in your department use in teaching students? (Please select all that apply)
    - Students listening to lectures and making notes
    - Teaching being delivered in the classroom and in the form of power-point presentations
    - Students having to memorize factual knowledge
    - Engaging students in team-based or focused-group discussions
    - Students being asked to do presentations
    - Students being engaged in seminars/workshops
    - Using simulations to teach in the laboratory or classroom
    - Academic instructors taking students to clinical areas and demonstrating procedures to them practically
    - Students being offered classroom tutorials
    - Students being engaged in debates, peer reviews and feedback activities
    - Encouraging student-to-student collaborations in performing work-based assignments
    - Academic instructors seek students' viewpoints during learning processes
    - Confronting students with clinical problems, asking students questions and tasking them to find solutions to such problems
    - Engaging students in research or inquiry during normal classroom learning activities
    - Students being challenged to make use of prior experience or knowledge during learning processes
    - Students being encouraged to make use of “concept maps” during learning processes
    - The use of computer-based models for simulation and virtual imaging
    - The use of phantoms for classroom demonstrations

28. Based on your experience over the 4 years training period, what view do you hold on the teaching approaches employed by academic instructors and clinical instructors?
29. In what ways do you think teaching can be enhanced so as to support theory-practice integration amongst radiography students?