An Independent Study Option – Developing Autonomous Practitioners in an Undergraduate Diagnostic Radiography Programme

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1. Background

The regulatory Health and Care Professions Council (HCPC) validate educational courses, to encourage integration of theory into practice and development of autonomous and reflective thinking practitioners.[1] Diagnostic Radiography is considered one of the most innovative aspects of healthcare utilising a variety of advanced imaging technologies, to produce anatomical images aiding diagnosis and treatment decisions.[2]

The Diagnostic Radiography programme at the University of Liverpool underwent revalidation in 2019, presenting the opportunity to develop innovative teaching methods; this in line both with HCPC Standards, and the University strategy [3,4] to embrace a transformative teaching approach, enhance graduate employability and meet 21st century needs.

Rapid technological advances such as those related to Computed Tomography (CT) and Magnetic Resonance Imaging (MRI), directly impact radiographic practice. Such progression highlights the significance of the theory-practice elements of undergraduate training and the importance of developing independent lifelong learners, the value of which has been emphasised in other healthcare programmes internationally. [8,9,10,11,12,13,14]

With rapidly increasing clinical demand in these areas in the years prior to the COVID-19 pandemic *(Fig. 1),* [5,6,7] training within specialist imaging modalities has received greater emphasis,[6] but since the onset of COVID, this need is ever more critical.[7]

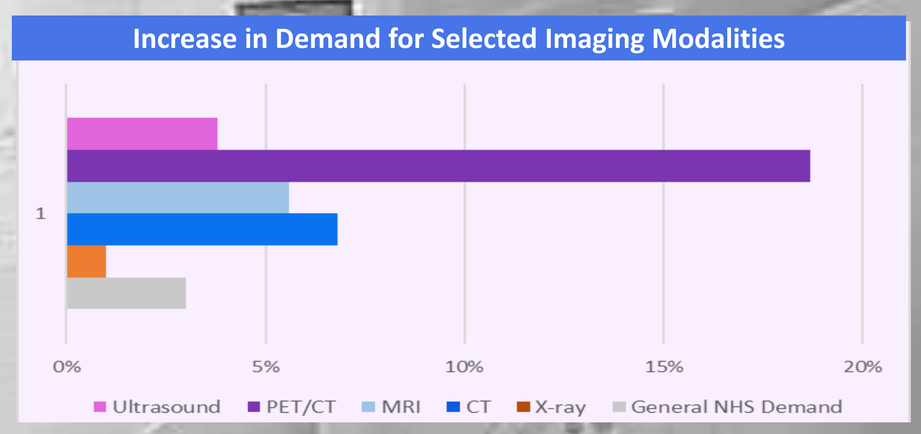

Figure 1: *Graph depicting rise in imaging demand in 5 years prior to COVID-19* [7]

2. 'The Innovation'

The 'Independent Study Option' module was created to help develop independent, life-long learners, who can clearly link theory and practice, using excellent communication skills to meet the criteria required to deliver 21st century healthcare.

Students select an imaging modality of personal interest, then further focus their study through identifying a specific medical condition for which their modality assists diagnosis. The independent choice of topic is designed to enhance motivation, an established concept in andragogy, [15] while additional clinical practice days enable direct links with practice experience to be made, and provide opportunity for students to perceive the integral role their chosen modality plays, in the wider patient pathway.

Seminar groups incorporating peer discussion are a module feature, with peer learning considered a valuable support mechanism during independent study, providing an element of social constructivism.[16] Facilitation of the seminars by members of the academic team enables guided discussion, and provides formative feedback to assist progression.

Assessment comprises a 2000 word assignment to critically evaluate use of the modality within the chosen patient pathway. Students then defend their work via verbal presentation. This supports development of the communication and presentation skills required of a graduate entrant to the profession, adding further authenticity to the assessment.

The use of….	…in Diagnosis and Management of…
Ultrasound	Gallstones
Computed Tomography (CT)	Pulmonary Emboli
Magnetic Resonance Imaging (MRI)	Endometriosis
Fluoroscopy	Mid-gut Volvulus
Radionuclide Imaging (RNI)	Renal Calculi
Positron Emission Tomography CT (PET-CT)	Prostate Cancer
Mammography	Invasive Ductal Carcinoma
Dental Radiography	Dental Caries

Figure 3: *Selected examples of student topics*

3. Module Delivery

The module completed its first iteration in May 2021 and despite the challenges of the COVID-19 pandemic, it was still possible to arrange the required number of clinical days for each student.

Small group seminar teaching was conducted via Zoom, with students allocated to specific modality groups to enable peer support (proportions of selected modalities demonstrated in *Fig.2, right*)

Supportive elements of the module included a presentation skills lecture, a formative presentation assessment and online 'drop-in' sessions with the module lead.

Additionally, clear guidance was given for both elements of assessment via an online module handbook, and weekly feedback from supervisors.

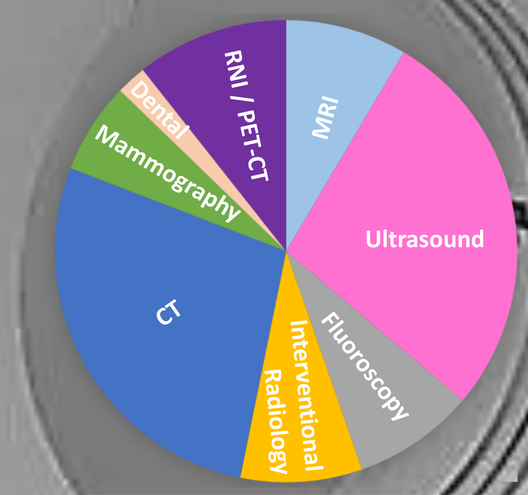

Figure 2: *Proportion of cohort selecting each modality*

4. Student Engagement

Students engaged well at seminar groups, with a wide variety of topics noted (examples in *Fig.3).* A broad range of academic marks resulted from assessment, with more highly achieving students incorporating the more holistic approach to patient management throughout the clinical pathway. The presentation element enabled students to demonstrate depth of knowledge through verbal delivery, and responses to questions, maximising opportunity to showcase knowledge.

Scheduling of the clinical dates presented further challenge, due to timetabling constraints. Students require access to applicable imaging procedures, to provide insight to protocols relating to their chosen clinical condition. Inflexibility in rearranging dates may have impacted this exposure, which needs consideration. Some students expressed the opinion that fewer clinical days could still yield sufficient information.

5. Module Evaluation

Initial evaluation was undertaken via the standard University module feedback tool. This utilises a standard Likert scale with space for free text comments.

Cohort response was small (34%; n=16), but the overall responses were consistently positive (*figures 4a & 4b). Free text comment examples are included in Fig. 5 (below).*

Evaluation Statements	Strongly Agree /Agree *	Neither Agree / Disagree	Disagree (0 strongly disagreed)
I actively participated in learning	93.8%	6.3%	0%
I have contributed well	93.8%	6.3%	0%
Module gave good understanding of subject	100%	0%	0%
Module content related well to learning outcomes	100%	0%	0%
Teaching methods helped me learn	93.7%	6.3%	0%
Content was interesting	93.3%	6.7%	0%

Figure 4a: *Standard Questions and % of students in response categories (* Categories combined for display purpose)*

Evaluation Statements	Strongly Agree /Agree *	Neither Agree / Disagree	Disagree (0 strongly disagreed)
Assessments a fair test of knowledge / ability	92.9%	7.1%	0%
Assessment criteria were clear	92.3%	7.7%	0%
Feedback received was useful	100%	0%	0%
Received the academic support needed	100%	0%	0%
Module was well organised	87.5%	6.3%	6.3%
Order of material facilitated learning	87.5%	6.3%	6.3%
Had access to essential resources	93.8%	6.3%	0%

Figure 4b: *Standard Questions and % of students in response categories (cont) (* Categories combined for display purpose)*

…seminars were very helpful …gave good feedback from facilitator and peers, as-well as giving well-structured timeline …to stay on track

Clinical days difficult to get with amount of students on placement to try and see your chosen pathology

Really enjoyed independent study as something I was interested in

Clinical time seemed too much for my topic in my placement site

…assignment guidelines very clear …helped to know exactly what to include

Figure 5: *Examples of student feedback comments*

6. Summary and Next Steps

So far, findings have emphasised the benefits of independent learning in healthcare education, and the value of applying theory directly to specific patient pathways. Peer learning, formative feedback, and the secondary element of assessment were supportive in enabling students to work independently, demonstrate depth of knowledge and enhance their final mark.

Clinical attendance is integral to the module, to highlight both the variety of modalities the student can choose from, and how effectively they interact in negotiating their attendance. Student perceptions of the access to and value of clinical days warrants further investigation, as it is vitally important that organisation of these days is effective, to give the students a positive experience.

Student modality choice may be based on career aspirations; the value of the module in confirming or amending these aspirations, is another area requiring further exploration.

University ethics approval was recently gained to carry out a series of focus groups to explore these aspects. The results of this forthcoming research will further influence future iterations of this module.

References

[1] Health and Care Professions Council (HCPC) (2017) *Standards of education and training* [2] NHS Health Careers (2020) *Diagnostic Radiographer* [3] University of Liverpool (2021) *Curriculum 2021 – A Curriculum Framework and Design Model for Programme Teams at the University of Liverpool* [4] University of Liverpool (2021) *Our Strategy 2026* [5] National Health Service (NHS) (2019) *Rapid Diagnostic Centres Vision and 2019/20 Implementation Specification* [6] Sloane, C; Hyde, E. (2019) 'Diagnostic Radiography Education: Time for Radical Change?' *Imaging & Therapy Practice,* (Aug 2019), pp.5-10. [7] Richards, M (2020) *Diagnostics: Recovery and Renewal – Report of the Independent Review of Diagnostic Services for NHS England* [8] Moghadari-Koosha, M; Moghadasi-Amiri, M; Cheraghi, F; Mozafari, H; Imani, B; Zandieh, M (2020) 'Self-Efficacy, Self-Regulated Learning, and Motivation as Factors Influencing Academic Achievement Among Paramedical Students: A Correlation Study' Journal of Allied Health Sept 2020; 49(3): e145-e152. [9] Gqweta, N (2012) 'Poor academic performance: A perspective of final year diagnostic radiography students' Radiography 18(3): 212-217. [10] Cadorin, L; Suter, N; Dante, A; Naskar Williamson, S; Devetti, A; Palese, A (2012) 'Self-directed learning competence assessment within different healthcare professionals and amongst students in Italy' *Nurse Education in Practice* 12(3): 153-158. [11] Linaker, KL (2015) 'Pedagogical Approaches to Diagnostic Imaging Education: A Narrative Review of the Literature' *Journal of Chiropractic Humanities* 22(1): 9–16. [12] Naeger, DM; Straus, CM; Phelps, A; Courtier, J; Webb, E (2014) 'Student-created Independent Learning Modules: An Easy High-value Addition to Radiology Clerkships' *Academic Radiology* 21(7): 879-887. [13] Sheakley ML; Bauler TJ; Vandre DD; Woodwyk A; Dickinson BL (2019) 'Effectiveness of instructor-guided independent learning in comparison to traditional didactic lecture in the preclinical medical curriculum: A retrospective cohort study' *Medical Teacher* 41(7):795-801. [14] Spence, B (2019) 'Practical Applications in Radiography Education' *Radiologic Technology* 90(4): 369-386. [15] Knowles, MS (1984) *Andragogy in action* San Francisco: Jossey-Bass, 1984 [16] Elshami, W; Abuzaid, M; Abdalla, M.E. (2020) 'Radiography students' perceptions of Peer assisted learning' *Radiography* (26(2): e109-e113. Background image: wikimedia.org