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Constructive alignment of a research-informed teaching activity within an undergraduate diagnostic radiography curriculum: A reflection

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ABSTRACT

Aim: To evaluate the learning experience of a level 5 (year 2) student cohort within a research-informed teaching (RiT) activity and to map findings against learning outcomes and level descriptors using constructive alignment.
Method: An online questionnaire was used to explore the level 5 student experience of a Research-informed Teaching (RiT) activity. Responses were retrospectively mapped against Framework for Higher Education Qualifications (FHEQ) level descriptors for level 5 using constructive alignment.
Results and Discussion: Thirty one out of 46 level 5 students completed the questionnaire (67% response rate). Analysis of the questionnaire supported the integration of this RiT activity within the curriculum in terms of learning and research skill development by students. However, it was identified that this activity could be revised further to better align with level 5 descriptors and incorporate additional higher level cognitive processes.
Conclusion: Learning outcomes for this RiT activity were constructively aligned with FHEQ level 5 descriptors. Recommendations are provided on how these could be further refined to ensure students undertake a more critical approach to the application of theory into practice. Discussion also considers how this process could be used to develop a similar RiT activity at level 6 (year 3).

Introduction and background

Research-informed Teaching (RiT) has been shown to develop student research and communication skills as well as enhancing knowledge and understanding.[1] In 2009, the BSc (Hons) Diagnostic Radiography programme team at the University of Salford, United Kingdom (UK) introduced a level 4 (year 1) Research-informed Teaching (RiT) activity within the undergraduate diagnostic radiography curriculum to engage students with research, as part of their normal teaching and learning experience. The Research-informed Teaching experience I (RiTe I) was designed to facilitate level 4 student understanding of key radiographic concepts using an inquiry-based approach to learning and provided students with the opportunity to be involved with research linked with one of the department's main research foci (image quality and dose optimisation).[2–4] Following the successful integration of RiTe I into the year 1 curriculum, a similar RiT activity was introduced into the level 5 (year 2) curriculum (RiTe II). RiTe II directly builds upon the foundations of the student's knowledge and research skills obtained at level 4, as well as providing students with further learning and skill development opportunities appropriate to their level of study. The following reflective report illustrates the value of using constructive alignment to critically evaluate level descriptors and learning outcomes for a level 5 RiT activity (RiTe II); because this evaluation takes a reflective approach the pronoun 'we' is therefore used where appropriate.

In the UK and Ireland, each stage within any framework of qualifications is commonly referred to as a 'level'. These levels represent bands of qualifications that share similar expectations of attainment. The framework for higher education qualifications (FHEQ) has five levels, three of which are undergraduate (4–6) and

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two are postgraduate (7–8). The learning outcomes for RiTe I were designed to meet the FHEQ level descriptors for level 4 set by the Quality Assurance Agency for Higher Education (QAA).[5] Subsequent evaluations of RiTe I have confirmed the success of this activity.[2–4] However, in designing RiTe II we took a more pragmatic approach. Whilst we compiled a set of learning outcomes based on our own expectations of what we anticipated the students to achieve, we did not undertake a formal mapping process in matching these to level 5 descriptors, as RiTe II was considered to be a curriculum enrichment activity. Whilst it is acknowledged that there should be alignment between learning outcomes, delivery and assessment,[6] we decided that because RiTe II had no summative assessment there was no requirement to provide learning outcomes from an institutional documentation perspective. Furthermore, because there was no summative assessment for RiTe II, we had no method of determining whether the learning outcomes had actually been achieved.

Level descriptors

The QAA in the UK uses qualification level descriptors to provide a point of reference for the setting and assessing of academic standards in higher education. These threshold standards are used to develop programme learning outcomes to appropriate levels and content.[7] Level descriptors can therefore be considered to be generic outcome statements of what a learner is expected to have achieved at the end of a level of learning and were developed as a guide to the writing of learning outcomes for modules to ensure that these subscribe to a particular higher education level, a process that is essential for functioning within a credit framework.[8]

Level descriptors are presented in two parts, with the first part being a statement of outcomes (achievement of which is assessed) which a student should be able to demonstrate for the award of the qualification at that level. The second part of the descriptor is a statement of the wider abilities that a typical student would be expected to have developed. Typically, programmes leading to higher education qualifications (particularly those taken over a number of years such as radiography), include learning that is progressively more challenging. For the award of a higher education qualification at a particular level, the outcomes of this learning must reflect the qualification descriptor for that level.[9] For example level 4 students are expected to demonstrate *'Interpretation and evaluation of knowledge; structured communication and coherent argument'* within their area of study, whilst at level 5 a key characteristic or differentiator is the *'Critical understanding, analysis and evaluation of knowledge; application of outside its original context; communication and argument in a variety of forms'*.[5,7]

Learning outcomes

Learning outcomes are statements that are used to express what is expected that students should be able to do or demonstrate at the end of a learning period. There are various definitions of what is meant by a learning outcome, but it is agreed that learning outcomes focus on what the student has achieved and not just the content of what has been taught.[10,11]

Learning outcomes can be traced back to the *behavioural objectives* movement of the 1960s and 1970s in the United States of America (USA). A key advocate of this movement was Mager[12] who proposed writing specific statements about observable outcomes or *instructional objectives*.[10,12] By using instructional objectives and performance outcomes Mager[12] attempted to define the type of learning that would occur and how that learning would be assessed. Unfortunately, this can lead to outcomes and objectives (usually a specific statement of teaching intention or teacher centred approach) being used interchangeably or worse as a compound phrase (outcomes/objectives). This can cause problems in that objectives can be written in terms of teaching intention or in terms of expected learning which can cause confusion when developing modules or learning activities.[11] Although they both relate to the product of learning and have similar meanings with regard to educational intent, the use of terminology within learning outcomes emphasises student achievement and what should be learnt rather than taught.[11] Learning outcomes are therefore statements of what a learner is expected to know, understand and/or be able to demonstrate after completion of a process of learning.[10] Table 1 provides a comparison of learning outcomes and objectives.

Levels of outcome and taxonomies of learning

As discussed earlier level descriptors provide an indicator of demand, complexity, depth of study and learner autonomy required for the award of a qualification at given level or advancement to the next level. These add to the transparency and clarification of the learning process by providing a structure to guide progression in learning at different levels.[14] However, when writing learning outcomes it is important to consider that these are expressed at the appropriate level of learning and complexity.[7]

Bloom's taxonomy of educational objectives[15] is frequently used for writing learning outcomes. Bloom's taxonomy is considered a major work with regard to concern for levels of achievement as a statement of leaning outcomes and originally focused on the *cognitive* or *knowing domain of learning*. Bloom suggested that in this domain understanding ranged over six levels of learning from the lowest level (factual knowledge) to increasingly more cognitive tasks such as the evaluation of information.[15] At the lower cognitive levels, students have learning which relates to gaining knowledge and understanding. With greater conceptual and intellectual challenge levels, students learn to carry out the higher level activities of synthesis and evaluation. Bloom's taxonomy describes how learners can build upon former learning to develop more complex levels of understanding, by the arrangement of the various thinking processes in a hierarchy. Each level within this hierarchy depends on the student's ability to perform at the level or levels that are below it.[10] Anderson et al.,[16] revised Bloom's taxonomy by changing the names of the 6 domains from noun to verb forms or action words in order to promote a more active form of learning to facilitate students being able to demonstrate a learning outcome at the end of an activity (Table 2). These verbs can be used to help frame learning outcomes for different level descriptors (demonstration of higher order learning or achievement) by their use at the appropriate cognitive level. They also help to ensure that learning outcomes produce the result which is appropriate for the level of achievement intended.[14,15]

However, although Bloom's taxonomy is useful for planning and writing learning outcomes, it was criticised for excluding other domains of learning. Bloom and his co-workers extended the

Table 1
Comparison of learning outcomes and objectives using the research-informed teaching learning activity as an example (Adapted from Ref. 13).

Learning outcome	Equivalent learning objectives
At the end of this activity you will be able to demonstrate the effects of changing kVp and focal spot size with a fixed mAs on dose area product (DAP) and image quality.	At the end of this activity you should be able to: Describe the effects of changing kVp and focal spot size with a fixed mAs. Describe their effects on image quality and dose area product (DAP).

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