Design and development of an e-learning programme: An illustrative commentary

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1. Introduction

E-learning is defined as the use of computer or other electronic devices and internet technologies to provide educational interventions aiming at enabling learning and improving performance [7,25]. E-learning is an effective teaching method in health professions: two systematic reviews with meta-analysis demonstrated that e-learning is associated with large positive effects compared with no intervention and e-learning's effectiveness is similar to traditional instructional methods [2]. E-learning is used in a range of learning contexts such as higher education [13,14] and Continuing Professional Development (CPD) [22,25]. Many publications describe how e-learning programmes were developed but few do it thoroughly; studies assessing the effectiveness of e-learning programmes rarely describe how their interventions were developed limiting the extent to which their pedagogical veracity or trustworthiness can be judged [25]. This commentary profiles how an e-learning programme on the biopsychosocial (BPS) model for non-specific low back pain (NSLBP) was developed in response to a need for osteopaths to learn about the current evidence for the management of low back pain [6,12,28]. The programme was designed in the form of CPD for osteopaths with more than 15 years of experience as these osteopaths qualified prior to the introduction of the BPS model in Osteopathic Educational Institution's (OEI) curricula in the UK. The e-learning was intended to be used as CPD independent to any other program of study.

E-learning courses offer access to all practitioners, including those in remote areas and allow access to the course around participants' schedule rather than the other way round [8]. There are two general approaches to e-learning [7]. The first one is *synchronous* where content delivery occurs at the same time as receipt by participants (e.g. webinars) and the second one is *asynchronous* where content delivery occurs at different times than receipt by participants (e.g. a lectured module delivered via e-mail link) [24].

The design and development of the e-learning programme was informed by the ADDIE model [7] and this commentary follows the five stages of the ADDIE model described in sequence below. The ADDIE model is an instructional model that provides guidance on the development and design of e-learning programmes. It is one of the main models used in the development of e-learning programmes in healthcare and has been advocated as a useful tool for developing curricula and improving educational and practice performance [23]. The model has not been formally tested and lacks guidance on which strategies should be implemented to evaluate the e-learning programme and its outcomes. In addition there is little guidance about costing the e-learning development using an ADDIE approach. An alternative model has been developed following a review of postgraduate medical e-learning programmes [4]. However, this newer model also does not appear to have been formally evaluated. The content of the De Leeuw model and ADDIE model have considerable overlap in terms of operational development stages; the De Leeuw model describes the stages in more detail, and the ADDIE is one of the most commonly used frameworks.

2. Analysis

Prior to developing an e-learning programme, analysis of the aims of the e-learning programme is required [21]. This includes identifying the gap in professional knowledge that requires training (needs analysis), who the target audience is, and the content that should be included in the programme [7,17,21].

2.1. Needs analysis

The BPS model has been recommended in a number of clinical guidelines, most recently in the updated guidelines for the management of LBP and sciatica [18]. However, previous research has shown that therapists do not consistently use the model [9,19,20]. Manual therapists commonly assess physical impairment and pain but less frequently factors such as activity limitation and psychosocial function [12]. When measuring manual therapists' attitudes to back pain, they demonstrate more a biomedical approach to back pain than a biopsychosocial one [10,19]. This has been explored qualitatively and similar findings have been found across different manual therapy professions including osteopathy [6,28]. Consequently, a need exists to close the theory-

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practice gap, requiring specific training to change manual therapists' attitudes to back pain, knowledge, skills and confidence to assess and manage patients within a BPS framework.

2.2. Target audience analysis

There is some evidence that osteopaths may be less willing than physiotherapists and chiropractors to engage in psychological issues with their patients with back pain, recommend restricting daily activities, and tend to believe there is an underlying structural cause to back pain [19]. Recent studies demonstrate that collectively, manual therapists report a lack of training on BPS assessment and management and express a need for training in this field [6,26-28].

2.3. Content analysis

Content analysis is arguably the most critical step in the instructional design process [7]. If content is not contemporaneous then there is little value in finding the best instructional methods and media to use in training participants. Prior to developing this e-learning programme, the authors performed a scoping review [5] to identify key elements that should be included in an evidence-based e-learning programme on the assessment of NSLBP in a BPS environment in a manual therapy context. Content analysis can take other forms including use of existing curricular material or recent guidelines.

3. Design

The design stage provides the curriculum structure, it also defines the learning objectives (LO) associated with each unit and lesson and the order in which the LO should be achieved, also known as sequencing. This stage defines the delivery methods and formats for each unit and lesson. It is also recommended that the evaluation strategy for the e-learning programme should be determined at this stage [7,16].

The aim of the set of LO listed (see supplementary material, Table 1 – learning outcomes) was to achieve the overall course objective: To understand how to assess a patient with NSLBP using the BPS model and to understand the management options available.

3.1. Content development

Learning interventions related to clinical practice commonly aim to have an impact on clinical behaviours. Changing behaviour is challenging and several models have been developed to enhance intervention outcomes. A metamodel, the Behaviour Change Wheel, was specifically developed to characterise and design behaviour change interventions [15]. This metamodel was used to enhance the focus and effectiveness of the e-learning programme and informed the content of the programme by highlighting the conditions (both internal to the participants and in their social and physical environment) needed for the adoption of a BPS approach to NSLBP (e.g. willingness to look beyond biomechanical/structural causes to back pain, or interest in updating their knowledge on pain). To enhance the likelihood of behaviour change, these conditions informed the LO of the course. Guidance from the framework was also used to decide how the intervention should approach the different conditions (e.g. with the use of education, persuasion or modelling).

3.2. Sequencing

Three different principles were used to inform the sequencing of the units and learning of the e-learning programme to maximise the learners' experience in terms of the logical flow and the pragmatic access to the learning [7]. One method, known as the prerequisite method, was used to introduce content from the general towards the specific, in this instance, Unit 1 included general information on NSLBP and the BPS

model before more specific content was presented. The content was also organised following a job-context principle where information was organised in the order of a consultation. Unit 2 was designed around the first part of an osteopathic consultation (history-taking); and Unit 3 around the following part of the consultation (examination). Another principle, known as the spiral principle, was to blend different concepts presented earlier in the programme together, for example, Unit 4 integrated the content of the previous units on case history and examination around three different clinical scenarios. Unit 5 then discussed management considerations for patients with NSLBP. The LO and sequencing were entered into a course plan to map the unit/lessons to the LOs (see supplementary material, Table 2– Lesson construct and content for details on the content of each lesson).

3.3. Instructional strategy

A systematic review found that the use of practice exercises, feedback, and repetition of study material in e-learning programmes offer greater learning [3] and a related systematic review and meta-analysis found that including interactive components increases learning time which enhances learning outcomes and satisfaction with e-learning programmes [1]. Drawing on this evidence our e-learning programme used a combination of lectures and quizzes with specific feedback on participants' answers that included information about where in the e-learning programme participants could review content when they had incorrect answers, and exercises centred on clinical scenarios. These were organised using two instructional methods: expositive methods and application methods. Expositive methods were mainly used as they are ideal for teaching new information with the aim of changing participants' attitudes [7]. They were used through the medium of case-studies and presentations. Application methods were used when the LO was to develop job-specific cognitive skills. This was achieved by providing worksheets with information and guidance that could be easily accessed and used by practitioners in the treatment room with patients, and mainly by using scenario-based exercises.

3.4. Delivery strategy

Although many practising osteopaths are likely to be fully computer literate we wanted to ensure all participants could easily access the content. The interface of the e-learning course was designed to be very simple with few options, menus or buttons to minimise the risk of confusing participants when logging onto the website and ensure minimal barriers to take up of the e-learning.

3.5. Evaluation strategy

Evaluation strategies are important to in all educational programmes including in e-learning [16,24]. They can be conducted at different stages of the development of e-learning programmes depending on their aims. Content evaluation is important to assess that the content in the e-learning programme corresponds to the content analysis findings; quality evaluation is a key aspect before implementing an e-learning programme; formative evaluation ensures that participants' learning journeys will not be troublesome; confirmative evaluation measures the effectiveness of the e-learning programme and finally summative evaluation evaluates if an old course is still valid or needs updating [7]. Four evaluation strategies were used (the first three are described in this commentary, the last one will be published separately to this commentary): a content evaluation, a quality evaluation, a formative evaluation, and a confirmative evaluation (with an explanatory mixed methods feasibility study) to assess the feasibility and acceptability of the e-learning programme.