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Teaching Evidence-Based Synthesis: An examination of the development and delivery of two innovative methodologies used at The University of Portsmouth

Paul Gorczynski, Karen Burnell, Ann Dewey, Joseph T Costello

University of Portsmouth

Abstract

Evidence based practice (EBP) is a process that involves making conscientious decisions that take into account the best available information, clinical expertise, and values and experiences of the patient. EBP helps empower health care professionals to establish service provisions that are clinically excellent, cost-effective, and culturally sensitive to the wishes of their patients. With a need for rapid integration of new evidence into EBP, systematic reviews and meta-analyses have become important tools for health care professionals. Systematic reviews and meta-analyses are conducted in a conscientious manner, following an established set of rules where individuals identify studies that address a particular question based on clearly defined inclusion and exclusion criteria along with a predetermined method of analysis. Conducting systematic reviews and meta-analyses isn't easy nor quick and requires knowledge in a particular subject area, research methods, and statistics. Teaching health care professionals, including undergraduate and graduate students, the processes and skills necessary to carry out systematic reviews and meta-analyses is essential, yet few teaching resources exist for academic staff to facilitate this endeavor. The purpose of this article is to present two strategies taken by academic staff in the Faculty of Science at the University of Portsmouth, UK to teach evidence synthesis and processes to enhance EBP. One case involves a pedagogical approach used with exercise science masters students while the other details the work of an on-line postgraduate certificate program that has been developed in collaboration with Cochrane UK.

Introduction

Evidence based practice (EBP) is a term that many health care professionals have come to know quite well. EBP is a process that involves making conscientious decisions that take into account the best available information, clinical expertise, and values and experiences of the patient (1, 2). EBP helps empower health care professionals to establish service provisions that are clinically excellent, cost-effective, and culturally sensitive to the wishes of their patients (3). In a sense, it is prescribing treatments that have worked best in the past, given the various circumstances clinicians and patients find themselves in at the moment. But coming to establish EBP is difficult and time-consuming work. McKibbon (1) describes a five-step process that helps establish EBP for health care professionals. From question formation (step 1), to information retrieval and evaluation (steps 2 and 3), to prescription and follow-up (steps 4 and 5), health care professionals have come to regard EBP as a critical and well-established, yet onerous, component of their jobs.

To ensure the prompt and continual integration of evidence into practice, the need to synthesize information has become essential, especially given the vast number of scientific articles published every year. With such a need for rapid integration of new evidence into EBP, systematic reviews and meta-analyses have become important tools for health care professionals. Systematic reviews are conducted in a conscientious manner, following an established set of rules where individuals identify studies that address a particular question based on clearly defined inclusion and exclusion criteria along with a predetermined method of analysis (4). The strict set of methodological rules that underpin a systematic review help ensure research studies

are appropriately identified, not selected arbitrarily, whereby the possibilities of biased findings and conclusions are minimized. This is a distinct difference from narrative reviews, which are often based on expert viewpoints, subjective selections of the literature, and biased given the lack of strict rules used to identify and evaluate available information. Although readers should express caution when reading narrative reviews and be mindful of their inherent limitations, they should still recognize the important role they play in contributing to EBP, especially when little is known or has been written about a particular subject.

Systematic reviews can be conducted qualitatively and quantitatively. Using qualitative methods, the methods, results, and conclusions are discussed, compared, and contrasted, and a conclusion and recommendation is provided on a given topic. Those systematic reviews that statistically aggregate and analyze large sets of research findings are known as meta-analyses (4, 5). Meta-analyses aim to combine single effect sizes and yield an overall treatment effect (6, 7). Readers of systematic reviews must recognize that different types of systematic reviews exist, each conducted to best answer a particular research question by skillfully taking into consideration studies of various methods and methodologies.

As previously described (6, 7), conducting systematic reviews and meta-analyses isn't easy nor quick and requires knowledge in a particular subject area, research methods, and statistics. Teaching health care professionals, including undergraduate and graduate students, the processes and skills necessary to carry out systematic reviews and meta-analyses is essential, yet few teaching resources exist for academic staff to facilitate this endeavor (2). In this article, we

briefly present two strategies taken by academic staff in the Faculty of Science at the University of Portsmouth, UK to teach evidence synthesis and processes to enhance EBP. One case involves a pedagogical approach used with exercise science masters students while the other details the work of an on-line postgraduate certificate program that has been developed in collaboration with Cochrane UK, a non-profit organization of researchers and community members who independently produce reviews of research (see www.uk.cochrane.org). Our aim is to provide teaching academic staff insight into fostering and enhancing learning of knowledge synthesis for the enhancement of EBP, in addition to our experiences of the associated challenges and the benefits of both methodologies.

Approach 1: Pedagogical or face-to-face approach

Background

The pedagogical approach used in Psychology of Exercise and Physical Activity, a British Psychological Society (BPS) accredited postgraduate unit, aimed to engage students in an active and creative manner and present research literature on behavioural theory (e.g., Social Cognitive Theory, Self-Determination Theory, Theories of Reasoned Action And Planned Behaviour) in order to help students structure evidence-based physical activity interventions and carry out valid and reliable evaluations. The unit was particularly focused on mental health outcomes related to physical activity and firmly planted in a biopsychosocial perspective (8). The unit presented students information on an array of topics, including: physical activity definitions, epidemiology, and measurement; personality; self-concept; self-esteem; body image; areas of mental health

(e.g., stress, anxiety, depression, other forms of serious mental illness); emotional wellbeing; quality of life; and various theories, models, and approaches to physical activity behaviour change. The unit was designed to cover criteria established by the BPS. As part of their summative assessment, students were asked to identify an area of mental health and conduct a qualitative systematic review that examined the impact of physical activity on their chosen mental health topic. A qualitative systematic review was chosen because it allowed students to identify, synthesize, and critically compare findings without having to statistically aggregate results, which may have been beyond the abilities of all students.

Methodology

In order to teach students good research practice and enhance their understanding of systematic reviews, each seminar incorporated at least one seminal systematic review in the weekly reading and was constructively aligned with the summative evaluation. Qualitative systematic reviews and meta-analyses were used throughout the unit. Students were asked to come prepared to each seminar having read the review; be able to identify its purpose, search and analytic methods, main results, strengths and limitations, areas of future research, and ways that the information could be implemented into practice. In the seminars, students were also asked to solve weekly case studies that challenged them to incorporate their new knowledge directly. Weekly case studies focused on designing practical interventions to aid individuals in becoming more physically active. Case studies specifically were designed around the weekly study topic. Each week, case studies were introduced by the instructor and then left to the students to address. Students then led discussions on the case studies where they presented their interventions and

supporting rationale. The inclusion of the material in this manner was aimed at increasing self-efficacy in students with regards to understanding the intricacies of systematic reviews, being able to deconstruct them for their various parts, and use them for addressing real life problems. The main aim of increasing confidence in students toward dealing with systematic reviews was to have students become familiar with them and feel comfortable in conducting them.

Lessons learned

This pedagogical approach proved successful and resulted in students writing and submitting rigorous and high-quality reviews. In-class quantitative and qualitative mid-year and year-end evaluations assessed learning outcomes, contributions of the unit to the overall degree experience, and student satisfaction. Overall, evaluations were extremely positive. Students enjoyed their learning experience and provided valuable feedback stating that being able to read, understand, and provide critical feedback about research studies and systematic reviews was extremely helpful. In particular, students repeatedly commented that they enjoyed the direct application of their knowledge and skill to various physical activity related research studies in other courses and their theses. One student commented that the best part of the unit was: *“The applied aspect of the theories and academic knowledge.”* While another student stated: *“Good conversations about topics”* and *“being able to apply knowledge”* were very helpful in promoting overall learning.

Although the overall response from students was of high satisfaction, some students did point out areas for improvement. Some students indicated they wanted to have all reading

material available at the beginning of the year so they could plan and coordinate their studying and reading schedules. Others stated they wanted to have more information presented on developing research questions, hypotheses, and objectives. A number of students also asked for further assistance with setting inclusion and exclusion criteria, methods of conducting searches, and extracting necessary data. Student recommendations helped lead to curriculum changes including a refined reading list accessible to new incoming students at the beginning of term and coordinated assistance available from the university library and in particular the Science Faculty Librarian. Some useful insight for others considering this pedagogical approach to teaching evidence-based synthesis would be to:

- Assume students have no working knowledge of systematic reviews;
- Explain different types of reviews (e.g., narrative, scoping, systematic review);
- Stress the importance of conducting the review by formulating rigorous research questions, hypotheses, and objectives;
- Devote time to setting necessary inclusion and exclusion criteria and methods of literature identification and retrieval as well as data extraction;
- Introduce different reference management software options that are freely available to students (e.g., EndNote, Refworks);
- Ensure students are able to communicate the overall take-home message of their review;
- Be patient and cover systematic reviews in a similar manner each seminar, as the repetition will help students become familiar and eventually more confident in reading and critically reviewing systematic reviews; and

- Make the experience fun and enjoyable by allowing students to lead seminars and bring in their own reviews.

Approach 2: Distance learning approach

Background

The importance of personal and professional development in health care professionals' education is widely recognised (9, 10, 11). Evidence-informed healthcare is broad and encompasses a variety of theories, methodologies, methods and tools, which can be challenging to comprehend. This distance learning Postgraduate Certificate has been developed in collaboration with Cochrane, which is recognised as world-leading in systematic review methodology. With two intakes per year (February and September) students can study full time over one year, or part-time over two years. The materials have been written by the course team, who have all conducted and published systematic reviews and protocols. One of the strengths of the course materials is that they are not time-released, but available throughout the registration period so that students (many of whom are busy health care professionals, such as nurses, doctors, and professionals allied to medicine) can study in a flexible, timely manner to suit personal circumstances. This is pertinent as reducing clinical time for health care professionals' personal or professional development is not desirable and is typically avoided (12)

Methodology

The course takes learners through the process of carrying out a systematic review including identifying suitable topics, formulating appropriate answerable research questions, understanding different types of data, identify relevant primary and secondary outcomes, and learning about addressing risk of bias. Students are introduced to computer software to conduct a meta-analysis, write, and present data including the practical application of the unique DORIS Dichotomous Outcome Re-expression & Interpretation Tool) and COD-FISH (Continuous Outcomes on Different Scales Findings, Interpretation, Support, & Help Tool). Using topic-based workbooks with embedded interactive exercises, videos, and quizzes, students also have access to a personal tutor to support learning and invited to take part in regular web-based forum discussions with experienced course team members and other students. The assessments for each of the two units are an on-line multiple choice and open-ended response examination as well as a critical report. These assessments aim to demonstrate students' achievement of learning outcomes and their development of scholarly skills, including knowledge transfer and evidence based inquiry specific to their individual careers and professional and personal goals.

Lessons Learned

Despite considerable expertise in systematic review methodology and a long history of delivering undergraduate and postgraduate courses, the team struggled with the creation and adaption of materials for this e-learning course. Distance learning should not be considered as an “easy” route. The creation of e-learning material that are not simply “information dumping” but instead, provide students with action orientated materials, was particularly challenging. Specifically, proponents of e-learning strategies advocate for multiple instructional approaches to

help students learn about a particular subject matter (13). For instance, as proposed by Clark and Mayer (13), e-learning platforms should be purpose driven, with clear achievable objectives outlined from the start. Essentially, students should know what they're getting into and what skills they'll be coming away with at the end of the course. With respect to materials, online content should be stored in a manner that makes them accessible across multiple devices, like mobiles, tablets, and computers. This allows students to download and engage with learning material when it is convenient for them to review. Materials should also be visually stimulating, using graphics and other information designs to further support written materials. Additionally, content should be designed to be led by both instructors as well as students. This allows students to feel autonomous with their learning process and receive guidance and support when needed. These suggestions were used in the construction of our e-learning platform.

For our course, we found interactive workbooks helpful in delivering necessary material. Specifically, our interactive workbooks had visibly clear objectives, a style of writing that was concise, almost chatty, to provide a narrative thread that led the students through the materials for each unit offered. Each workbook could be stored to personal devices, but also downloaded and printed, whilst, at the same time, on-line materials were interactive to provide students with immersive activities that tested their knowledge as well as challenged them to apply it to a research area. Online interactive materials were designed to provide users immediate feedback in order to point out errors and help students develop the necessary confidence to re-apply their knowledge to another research question. Online material was designed to be constantly available and present, allowing students to progress at their own pace and retake modules where and when

needed. Throughout this learning process, formative feedback from both instructors and other learners proved successful to enhancing the overall learning process.

With respect to challenges, several should be noted. First, making contact with certain students proved challenging. Despite attempts to set up early personal contact with all students through an on-line induction session and personal tutorials at flexible times to suit global time differences, some students simply were not available. Furthermore, some students did not complete all induction tasks, like completing internally available student biographies, similar to those written by staff, to provide all users with background information on who they are and what experiences they bring with them to the course. The teaching team also found students did not feel confident sharing feedback during on-line community discussions using a camera and a microphone. The majority of the students, thus far, have preferred listening on-line to others, or typing responses. Additionally, given the limited interaction between students, individuals did not establish study or peer-support groups, a pedagogical style that has been shown to be essential to e-learning (14, 15).

Through feedback from students, we have established some useful insight for others considering establishing an e-learning course to teach evidence-based synthesis:

- Meet students (either via email, skype or phone call) for a personal tutorial within the first two weeks of the course to discuss learning goals;
- Do not assume students possess IT skills and ensure all students have access to technical support when needed;

- Maintain regularly scheduled contact with all students to ensure students are actively engaged with the learning material;
- Send weekly email updates and correspondence to summarise tutorials and to remind students of important forthcoming dates; and
- Front load the course with lots of opportunities for interaction where students and instructors can discuss relevant course content, as well as provide students the opportunities to forge study and peer-support groups to further enhance their learning.

Anecdotally, these methods seem to have already made an impact on one student in our course, based in Australia, who provided feedback that he felt the course team was engaged and available to support him as needed. As a result, an online ‘open door’ policy, even from a distance, appears to be effective and will be further expanded.

Conclusion

Teaching evidence-based synthesis gives students the necessary skills to understand and produce rigorous systematic reviews, which will allow them to further enhance EBP. Teaching evidence-based synthesis in a pedagogically sound manner will ensure students will be able to approach different research topics in the future systematically and confidently. Our aim for this article was to provide teaching academic staff insight into fostering and enhancing learning of knowledge synthesis for the enhancement of EBP. We hope that this article will stimulate other educators into thinking about their teaching practice and allow them to further expand on their teaching of evidence-based synthesis.

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