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Review

Current thinking in medical education research: an overview

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Abstract

Medical education is fast becoming a separate focus, and together with their clinical commitments, many clinicians now seek higher qualifications and professional accreditation in the field. Research is also developing, and there is a need for evidence-based practice in education, just as in clinical work. This review gives an overview of research into medical education, and explains the fundamentals of educational theory and the specific considerations for the quantitative and qualitative research methods that pertain to it. It also explains the application of these methods to two growing areas of research: technology-enhanced learning (TEL) and normative ethics in training.

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Introduction

There is growing recognition of the importance of formal accreditation and qualification in all aspects of medical and surgical education. Surgical training poses unique challenges because it focuses on the imparting of practical skills together with more generic professional attitudes, often under difficult conditions in operating rooms where circumstances may be critical. Accordingly, it is essential to understand how people learn and to provide training that is well planned and based on pedagogical research. Research into medical education has progressed in recent years from the work of academics from unrelated backgrounds to that of healthcare professionals with additional training in education.¹

The requirements of the General Medical Council (GMC) for trainers² mirror the Academy of Medical Educators' (AoME) domains of competence: the design and planning of learning; the teaching and facilitating of learning; assessment; educational research and scholarship; and educational

management and leadership.³ These are generic competencies and their application to surgery in particular, has been refined by the Faculty of Surgical Trainers (FST).⁴ The Intercollegiate Surgical Curriculum Programme (ISCP) and the FST have since developed a trainer portfolio as a guide.⁵ Members of all surgical subspecialties can now help to shape developments in educational research and change the way in which their juniors learn. Surgeons should also be able to appraise the research effectively and apply evidence-based findings to their teaching, just as they do in their clinical practice.⁶

Theories of adult education

Pedagogy is the theory and practice of teaching and andragogy refers to the method and practice of teaching adults. As adults are often self motivated and curious, they often like to direct their own learning and prefer their teachers to act as facilitators rather than didactic instructors.⁷ Andragogy is learner-centred, and is influenced by developments in educational psychology such as behaviourism (the theory that people learn through conditioning), cognitivism (an attempt

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to understand the “black box” of the mind and the way people learn), constructivism (construction of knowledge from experiential learning), and humanism (learning from a desire to fulfil one’s own potential).⁸

In most cases, traditional methods of evaluation may be used to measure the impact of an educational intervention against a set of standards. However, since the 1990s, design-based research methods have gained favour with some, who view educational research as a “design science” and recognise that successful innovations are a product of a complex system of designed interventions and contexts, as opposed to an analytical science that describes a naturally occurring phenomenon.⁹

Quantitative research in educational research

As scientists and doctors, we are often most comfortable with quantifying and measuring, and we have an innate tendency to use quantitative assessment in medical education research, as in clinical research. The obvious way to quantify the impact of an educational intervention is to assess learners and examine differences in performance.

Assessments can be summative (concerned with passing or failing, or being competent or not at the end of a course), or formative (concerned with continual feedback throughout an educational process).¹⁰ Kirkpatrick identified four levels of learning outcome: reaction (what participants feel about a course); learning (changes in knowledge and attitudes); behaviour (translation of lessons learnt to clinical practice), and results (the organisational impact of an intervention).¹¹ Clearly, a mixed methods approach lends itself to the identification of different facets of the theory to provide the most meaningful assessment of the impact of an educational intervention.

Any assessment must be reliable, suitable, and valid. When considering reliability, assessment techniques should be reproducible (show similar results on different occasions) and internally consistent.¹² Validity includes face validity (the concept that students accept it as being fit for purpose at face value), content validity (appropriate representation of educational content in the assessment), criterion validity (agreement between different tests or the equivalence of assessments) and construct validity (measuring a difference in performance linked to a particular theory or construct).^{10,12}

Different types of assessment show students that an in-depth mastery of the subject is required. Assessments should also reflect the area of healthcare that is being tested, and should examine the application of knowledge rather than simple factual recall. Written tests may take many forms including multiple-choice questions (MCQ), extended matching questions (EMQ), key features items (KFI), and script concordance items (SCI), all of which have their own merits. There has been a general move away from the true/false format of MCQ (the X-format MCQ). Many examining bodies no longer use them, as they test factual recall

rather than in-depth knowledge and the ability to understand and apply it.⁹ Single best answer questions (SBA) may be more reliable in this regard, as the thought processes involved more closely reflect those used to make clinical judgements.¹³

Practical assessments such as objective structured clinical examinations (OSCE) have their merits too. They have good acceptability, sound research backing, and are well recognised by students and trainees, but their staging involves multiple members of staff and a considerable amount of time. They enable an evaluation of “showing how” rather than of “doing” according to Miller’s conceptual pyramid model of clinical competence (Fig. 1), and as such may not be suitable for the assessment of postgraduate trainees whose livelihoods will depend on the acquisition of practical skills.¹⁴

Visual analogue scales (VAS), which were first developed in the 1920s, are good for rating confidence in particular, although self-assessment of confidence has been shown to correlate poorly with actual clinical performance. They consist of a line (commonly of 100 mm) on which the respondent marks a point to indicate a gradation of something continuous.¹⁵ They lend themselves to educational research as their results can be quantified, but there are important caveats to statistical analysis, as this should be done as an ordinal scale rather than a continuum with non-parametric tests such as the Wilcoxon-signed rank test.¹⁵ Generally, in quantitative educational research it is important to consider the kind of marking scales that are used (nominal; ordinal; interval or ratio scales, or both) and to select tests that are appropriate.¹²

Studies may follow typical biomedical designs such as randomised controlled trials, case-control, cohort, or longitudinal studies, and surveys.⁶ Ultimately, research should aim to examine whether improvements in assessment performance translate into competence in practice (translational studies), although this is easier said than done.^{12,16} According to McGaghie, research may transfer across three levels: to improve practice in simulation; have an impact on the performance of the healthcare provider in a clinical setting; or improve outcomes as a result of the educational intervention.¹⁶

Quantitative research, however, has potential pitfalls, in particular the “Halo effect” (higher ratings given to students who are “liked” by raters generally) and the “Hawthorne effect” (students do better because they are aware that they are part of a study).⁶ These, and others, can catch out the unwary and should be borne in mind before embarking upon research in which assessment ratings form the basis for the evaluation of new educational interventions.

Technology-enhanced learning: virtual and “blended” learning

Technology-enhanced learning (TEL) is a growing and evolving sphere of educational research and practice. Whilst it may

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