Approaches to medical education research

Clinical teachers need to be able to make informed judgements about the quality of published educational research before drawing upon it to enhance their teaching and learning. Those wishing to conduct educational research may have to re-think the nature of 'evidence' to develop and use appropriate research approaches.

This article introduces some of the key debates in medical education research. It provides an overview of some of the key research methods aligned to educational research within a social science (rather than a natural science) paradigm and supports this with some examples from the literature. Common frameworks used to judge the quality and fitness for purpose of educational research are considered. Finally, some key questions to guide educational research design and implementation are suggested.

The nature of 'evidence' in educational research

'My own research in schools and hospitals indicated that both education and medicine are profoundly people-centred professions. Neither believes that helping people is merely a matter of a simple technical application but rather a highly skilled process in which a sophisticated judgement matches a professional decision to the unique needs of each client. Yet the two professions see the role of scientific knowledge in informing professional practice in very different ways. The kind of science, and so the kind of research, involved in each profession is very different.' (Hargreaves, 1996).

Hargreaves' lecture provoked some very public debate about the traditions of research in medicine and education and the different understandings about the nature of 'evidence' in each (Hargreaves, 1996; Hammersley, 1997). Many commentators have noted the ways in which particular types of knowledge are elevated to hold particular status (Boaz and Ashby, 2003; Long et al, 2006) and debates about the relative value of different types of research are widespread. The details of these debates are beyond the scope of this article, but they highlight an important starting point. Our prior histories of research and the views we hold about learning are likely to lead us to value certain types of research above others and lead us to attempt to undertake research in particular ways. There is a risk that we are pulled into binary debates, aligning ourselves to one particular paradigm (natural science *vs* social science), research tradition (quantitative *vs* qualitative) or standpoint on learning (acquisition *vs* participation). This polarization and 'world view' may lead to methods and approaches being taken that are inappropriate for the topic or context being studied.

As Teunissen (2010) recently warned:

'when your grasp of theoretical perspectives is limited, your education and research designs are in danger of lacking profundity.'

Teunissen, like others, is critical of the atheoretical nature of much medical education research, and suggests that once a research topic has been identified, researchers then need to identify the theoretical concepts that can inform the design of the study or guide the analysis of the data (Teunissen, 2010). Others argue that part of this process involves making the conceptions of learning that underpin our approaches to educational research and practice explicit, both to ourselves (as researchers) and to others (Swanwick and Morris, 2010).

To illustrate, let us imagine we have two research teams who have been asked to conduct research into teaching and learning on ward rounds. Team one have developed expertise in research of the positivist traditions of science; they believe in the power of logic and mathematics to demonstrate 'truth' or 'proof'. They value quantitative methodologies that allow them to explore causations, correlations and significance. Their study design looks at the types of interactions between trainers and trainees on the ward round, seeking to quantify the amount of trainer and trainee talk and the number of 'teaching' *vs* 'business' types of exchanges. They decide to investigate how much 'learning' happens and, guided by what Sfard (1998) calls the 'acquisition metaphor', seek to capture the amount of knowledge acquired by doing some before and after measures using a multiple choice questionnaire assessment. They observe and record interactions (number of different type, mean length of utterance) during consultations and seek to find statistical significances between different types of rounds.

Team two, on the other hand, are trained in the social science tradition and value qualitative methodologies that allow them to shed light on behaviours, opinions, experiences and feelings. They decide to explore different stakeholder perspectives on the value of ward rounds for learning purposes, interviewing trainers, trainees and other members of the multidisciplinary team. They too want to look at the ways in which 'learning' is fostered by ward rounds and, guided by what Sfard (1998) calls the 'participation metaphor', they observe ward rounds with a view to revealing the ways in which trainees are 'socialised' into certain ways of thinking about and talking about patients. They also look at the extent to which trainees are provided with the types of learning opportunities that enable them to become full participants in the ward round, eventually leading rounds themselves. They use interview and observational methods, drawing on the traditions of ethnography. Each research team has designed studies that have the potential to inform the ways in which trainee learning can best be supported on ward rounds. The main con-

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trasts between the ways in which they approach their research lie in the ways in which they conceptualize the world, the types of questions they ask and try to answer, and the methods they adopt to try and answer those questions.

Table 1 brings these hypothetical issues to life, by drawing on examples of published research about learning on ward rounds. The last example, Dornan et al (2006), has a broader remit, but is included as an example of systematic reviews in medical education. Column one summarizes the authors' aims and purposes, column two aims to turn these into the types of questions that appear to underpin the studies and column three illustrates the different approaches adopted.

Fitness for purpose in educational research

All clinical teachers are likely to engage with educational research as consumers if not producers. Davies (1999) suggests that in order to make use of existing research evidence and judge fitness for purpose in relation to their own work, all those involved in education should be able to pose answerable questions about education and to retrieve and adopt a critical stance to existing evidence. The 'Best Evidence Medical Education' movement is based on a similar philosophy, with advocates arguing that:

> **'...being a competent education practitioner in both the clinic and the classroom includes being able to understand and integrate evidence of effectiveness, with theory and experience, into teaching practice' (Hammick and Haig, 2007).**

A sensible starting point for all educational research might be to ask 'what do we know works' and, equally importantly, 'what do we know doesn't work?' Judging the quality and fitness for purpose of existing research is an important prerequisite for all medical education researchers, who need to avoid the trap of using frameworks from one tradition to judge the quality of research in another tradition. A number of frameworks exist that seek to counter this risk. One example (*Figure 1*) focuses on quality:

> **'The traditional approach to quality assessment has been to focus on methodological rigour. We have discussed a broader definition of quality that pays closer attention to the ways in which the research will be used and the ways in which it is presented. We have identified a number of dimensions of quality that seem to apply to a variety of types of research. Each of these represents an important dimension of quality assessment' (Boaz and Ashby, 2003).**

A further helpful model is the 'TAPUPAS' model (Pawson et al, 2003), arising from a knowledge review conducted for the Social Care Institute for Excellence which is designed to judge the quality of all types of knowledge, including that generated by research:

- Transparency – are the reasons for it clear?
- Accuracy – is it honestly based on relevant evidence?

Table 1. Studies of learning on ward rounds

Study: stated aims and purposes	Assumed underpinning research question(s)	Methodology and methods
Patterns of interaction among team members, learners' perceptions of the educational utility of rounds (Walton and Steinert, 2010)	What is the nature, frequency and duration of interactions between trainers and trainees on rounds? What are the perceived educational purposes of rounds?	Direct observation of rounds, with simultaneous data-coding (type and duration of interaction) Completion of Likert-scale questionnaire, to signify level of agreement with statements
To explore the teaching and learning processes that occur during rounds and the implications for their role in medical education (Kuper et al, 2010)	What happens during ward rounds and how might we understand this? To what extent do trainers and trainees share similar views on the educational value of rounds?	Ethnography: non-participant observation Semi-structured interviews with trainers and trainees
To explore staff, patient and parent views on paediatric ward rounds and to use outcomes to inform changes to approach (Birtwistle et al, 2000)	What are doctors', nurses', patients' and parents' attitudes towards ward rounds? How might this inform the development of our approach to ward rounds?	Unstructured interviews with each group (doctors and nurses, patients and parents) to determine key themes for a Likert-scale questionnaire administered to a larger population
To identify ways to maximize educational opportunities on ward rounds as part of a wider project to improve on-the-job learning (Stanley, 1998)	To what extent are ward rounds currently structured and conducted in ways that promote junior doctor learning? How might learning opportunities be enhanced?	Observation of ward rounds, with notes taken on structure, routines and trainer-trainee contribution Classification of types of rounds and critique of educational value
To identify final year medical students' deficiencies in conducting rounds in order to develop appropriate teaching and assessment tools for learning (Nikendei et al, 2008)	How prepared are medical students to conduct ward rounds? What are the types of difficulties medical students encounter when conducting a ward round?	Observation and analysis of simulated ward rounds with medical student volunteers
To establish the validity of a task-specific checklist designed to guide and evaluate trainee performance when conducting ward rounds (Norgaard et al, 2004)	How confident can we be in the content and construct validity of the ward round checklist?	Content validity assessed by a Likert-based questionnaire, construct validity assessed by piloting the tool while observing doctors of different levels of seniority conduct a round
To identify the effects of early clinical exposure in medical education (Dornan et al, 2006)	How can experience in clinical and community settings contribute to early medical education?	Systematic review of existing literatures

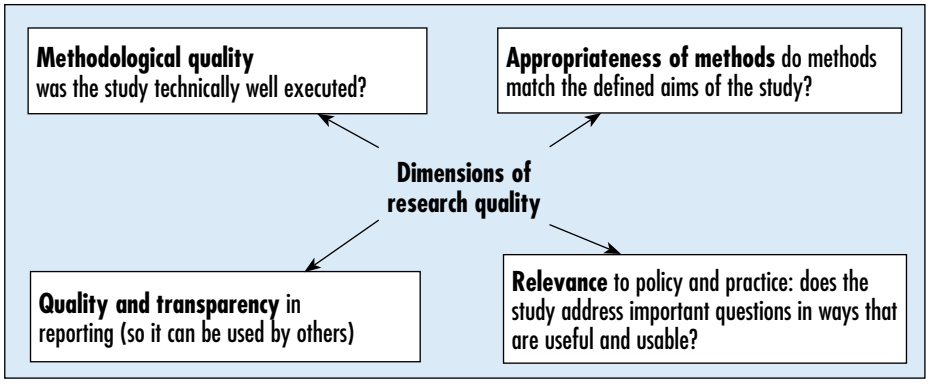

Figure 1. Dimensions of research quality. Adapted from Boaz and Ashby (2003).

- Purposivity – is the method used suitable for the aims of the work?
- Utility – does it provide answers to the questions it sets?
- Propriety – is it legal and ethical?
- Accessibility – can you understand it?
- Specificity – does it meet the quality standards already used for this type of knowledge?

These two models can be used to guide a critique of existing research, or help researchers plan research of high quality.

Designing educational research

So far we have looked at the ways in which different research traditions position researchers to ask particular types of questions and adopt particular types of research approaches. We have also noted the importance of adopting a critical stance to all types of 'evidence', including that in published research. Kuper et al (2008a) suggest that readers of qualitative studies should ask six key questions:

1. Was the sample used in the study appropriate to the research question?
2. Were the data collected appropriately?
3. Were the data analysed appropriately?
4. Can the results of this study be transferred to my own setting?
5. Does the study adequately address potential ethical issues, including reflexivity (position of researcher)?
6. Overall, is what the researchers did clear?

These questions can also be used to guide study design. This section provides a brief overview of key issues in designing educational research in the qualitative tradition. This starts from identifying appropriate research questions and concludes with some key points about data analysis. *Table 2* provides a 'quick guide' to designing and conducting a qualitative study. In reality, the stages are often overlapping with data collection and analysis being iterative and mutually informing.

Research question and design

Steps one to three are all about identifying the ways in which you will approach your research questions and research design. You should also consider how you will analyse your research data: qualitative data analysis can be very resource intensive. Qualitative research is described as:

> **'...any type of research that produces findings not arrived at by statistical procedures or other means of quantification. It can refer to research about persons' lives, lived experiences, behaviours, emotions and feelings as well as about organizational functioning, social movements, cultural phenomena and interactions between nations.' (Strauss and Corbin, 1998)**

Qualitative research often adopts what is described as a 'grounded theory' approach, where the theories emerge from the data (from the ground up) in an iterative fashion. This contrasts with defining a hypothesis and then designing a study to seek data to prove or disprove the thesis which uses identified conceptual or theoretical tools analytically. For those used to working in the natural sciences or experimental research, the former approach and the 'evidence' that emerges from it can appear 'fuzzy' and 'soft'. However, both approaches are equally valid but draw from and seek to explain different phenomena. Kuper et al (2008b) suggest that quantitative research focuses on answering the questions 'what?', 'how much?' and 'why?' whereas qualitative research focuses on answering the questions 'why?' and 'how?'. Increasingly, researchers are using mixed methods drawn from both qualitative and quantitative approaches, but any methods chosen need to be appropriate to the topic and context of the study.

So, a grounded approach might ask a more open question such as 'how do medical students experience learning in the workplace?', whereas a theoretically driven approach might ask 'to what extent can medical students experiences of learning in the workplace be described as time spent in Communities of Practice? (as defined by Lave and Wenger, 1991)'. The research question then leads to the identification of appropriate research methods. The first question might lead us to interview medical students, at different stages in training, individually or in groups. The second question may also lead us to use interview methods, with the questions shaped by core tenets of the theories we are drawing upon (for example, opportunities for legitimate peripheral participation). We may also wish to use some observational methods to triangulate these accounts with what we actually observe in the workplace. *Table 3* describes common educational research methods.

Table 2. Seven steps to designing a qualitative study

Identify starting position, including theoretical position and what previous studies say about the topic
Identify your research questons
Decide upon research methods
Identify an appropriate sampling strategy
Identify ethical issues: gain appropriate permissions
Gain access to the field and gather data
Analyse data and interpret findings (triangulate where possible and refer back to the published literature)

Sampling methods

Steps four and five are also important preparatory stages. Sampling methods used in qualitative studies are described as theoretical or purposeful, with the emphasis being not on gaining a 'representative' sample, as is the tradition in the scientific paradigm, but on gaining a sample that is 'representative of the population being studied', seek-

ing to involve those who are most and least representative as well as the 'typical'. Ethical considerations are particularly important in educational research which is often 'insider' research, where you may already have a pre-existing relationship with those you are studying (as colleague, teacher or manager). Issues of power and authority are explicitly considered in qualitative research, along with reflexivity: the position and impact of the researcher on the research process and those they are researching. The British Educational Research Association (2004) provides comprehensive guidance on these issues. The National Research Ethics Service also provides helpful guidance on the types of study that require ethical approval, distinguishing between research, audit and evaluation studies. Having gained appropriate permissions, the next stage is to gain 'access to the field', where issues of consent are vitally important. It is important to avoid any actions that imply coercion, with participants being able to opt in and opt out of the study at any point.

Table 3. Common educational research methods

Method	Description
Action research	'a method that involves the researcher in working in collaboration with participants through cycles of evaluation and development to produce positive changes to practice or relationships' (Kuper et al, 2008b)
Systematic review	'review of a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research and to collect and analyse data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used to analyse and summarise the results of the included studies' (Clark and Oxman, 2003)
Case study	A case study is an in-depth, detailed, systematic contextual analysis and exploration of a group, organization, event or individual, usually carried out over time. This form of research uses a range of methods, seeks multiple sources of evidence and often generates hypotheses or ideas for further, wider exploration or study
Ethnography	Traditional participant observation is now questioned on ethical grounds (as the researcher status is hidden from the community being observed). Non-participant observation, however, means you seek to gain trust and cooperation, with your observer status agreed by the group. This allows the researcher to observe activities and to engage with group members, to discuss what has been seen and seek further information or explanation
Interview	Interviews are usually carried out on a one-to-one basis, face to face or by telephone or other communication media. They are typically structured (with a list of questions about the topic from which the interviewer does not deviate) or semi structured (with a framework, but allowing for probing into areas or following ideas)
Focus groups	This is a small group meeting or interview, comprising members of a wider community, who are sampled through facilitated open discussion on a specific topic to elicit their opinions or feelings. Like interviews, focus group meetings can be very loosely or tightly structured

KEY POINTS

- Clinical teachers should be mindful of the fact that their prior histories of research and education will influence the value placed on certain types of research and the types of questions they seek to answer.
- The main contrasts between quantitative and qualitative research lie in the ways in which they conceptualize the world, the types of questions they ask and the methods they use to try and answer those questions.
- Clinical teachers should adopt an informed and critical stance to published educational research in order to make judgements about fitness for purpose and the relevance of the study to their own areas of practice.
- A number of helpful frameworks exist to guide the critical appraisal of published research; they may also inform the design of useful and usable research.
- Well-designed educational research poses answerable questions about education, is theoretically informed and seeks alignment between purposes and methods.

Gathering and analysing data

Steps six and seven are separated out in the guide, but in reality are often closely connected. During this stage you may begin to undertake some preliminary analysis, which feeds into subsequent data collection as you seek to gain a 'rich picture' of the issues you are exploring. Qualitative researchers often talk about reaching a point of 'data saturation' where new data collected fails to yield any new or significant insights into the issue being explored. In adopting a grounded approach, it is likely that data analysis will be based upon a first coding of data (into content categories) and thematic analysis, which seeks to make connections between ideas and to shed light on new or emerging phenomenon or understandings. A theoretically-driven approach will typically ask particular questions of the data. A detailed account of data analysis methods is outside the scope of this article, but it is worth noting that qualitative methods have their own rigour and that analysis is enhanced by data 'triangulation'. This may mean using multiple methods of data collection, different study samples, seeking different perspectives on the same research questions, or returning to your respondents with your analysis of data for their viewpoints.

Of course, designing and carrying out your study is only part of the activity – it is also important to think through who the audience will be for your research output and how you can best disseminate the findings. Owing to their often contextually-specific nature, qualitative studies are not 'generalizable' in the ways that quantitative studies claim to be. However, they have high explanatory power, their findings can be transferred to other contexts and they can influence policy and practice as a result. Together, the approaches have the potential to yield powerful insights into medical learning and practice.

Conclusions

High quality educational research in health and medicine provides the information and evidence needed to improve the quality of learning, teaching and assessment

and ultimately to improve patient care. An appreciation that educational research draws on approaches and methods from both scientific and social science disciplines will support clinical teachers in being able to appraise the evidence that results from such studies as well as participate in research activities themselves. **BJHM**

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