Research paradigms in medical education research

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CONTEXT The growing popularity of less familiar methodologies in medical education research, and the use of related data collection methods, has made it timely to revisit some basic assumptions regarding knowledge and evidence.

METHODS This paper outlines four major research paradigms and examines the methodological questions that underpin the development of knowledge through medical education research.

DISCUSSION This paper explores the rationale behind different research designs, and shows how the underlying research philosophy of a study can directly influence what is captured and reported. It also explores the interpretivist perspective in some depth to show how less familiar paradigm perspectives can provide useful insights to the complex questions generated by modern healthcare practice.

CONCLUSIONS This paper concludes that the quality of research is defined by the integrity and transparency of the research philosophy and methods, rather than the superiority of any one paradigm. By demonstrating that different methodological approaches deliberately include and exclude different types of data, this paper highlights how competing knowledge philosophies have practical implications for the findings of a study.

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INTRODUCTION

In recent years, there has been much debate about how to ensure that medical education research is not perceived as the poor relation of medical research.[1–4] Various writers have argued that if medical education is to fulfil its research potential and enjoy academic legitimacy, the discipline must develop a clearer sense of purpose,[5] and stronger theoretical frameworks[6,7] and be able to engage in epistemological discussions about the nature of the knowledge medical education research seeks to create.[4] Similarly to the development of other research disciplines, these hallmarks of academic activity are crucial to the professionalisation process the discipline is currently undergoing.[8]

As part of this debate, an increasing number of editorials, commentaries and letters on the subject have been published within medical education journals.[3,9–11] Some of these have argued that medical education research is (and should be) constructed as a social science[7] and therefore must engage critically with the questions of research philosophy that are central to that tradition.[4] Medical education is a complex, diverse field and effective practice is often defined by contextual factors; similarly, it relies on powerful networks of personal relationships. Unsurprisingly then, a number of writers have expressed an explicit or implicit challenge to the dominant positivist paradigm within medical education research and the prevailing use of experimental methods.[12,13] The work of Albert[8,14,15] problematises this debate as a struggle between competing groups to define legitimacy in the research perspectives and practices in operation in the field of medical education research itself.

As yet, this discussion has not widely influenced the studies published in dedicated medical education journals. Explicit references to theoretical frameworks are becoming more common;[16] however, most peer-reviewed medical education studies (both quantitative and qualitative) still make no mention of the research paradigm or epistemological assumptions underpinning the work. The term 'methodology' is most often used to refer to an applied approach to a particular issue[(e.g. 17,18)] and is rarely used within medical education journals to describe *research* methodology and the related epistemological and ontological perspectives. It is important to note here that this is not necessarily true of the entire field of medical education; educational research published in social science journals and notably in nursing journals is more likely to be underpinned by non-positivist research assumptions and to make those assumptions explicit to the reader. For example, one recent exception is McNamee *et al.*'s[19] inductive phenomenological approach, which describes the research paradigm to contextualise the findings and inform the reader of the underlying assumptions of the work. Most commonly, however, empirical studies in medical education journals continue to focus overwhelmingly on the techniques used for data collection and analysis.[20]

This is problematic for a number of reasons. Lingard[4] argues that: '…while we emphasise the tools when we teach qualitative research, the tools themselves are not the essence of the qualitative paradigm.' Instead, she outlines the importance of the research 'orientation':

'What kind of knowledge are the researchers setting out to make? What are their views on knowledge, their epistemology? Are they conducting the study from an ethnographic, a critical theory, or a case study approach? These dimensions matter much more than the methodological tools, because they shape the way the research question is asked.'[4]

Academic research stems from a philosophical tradition of systematic knowledge development, the underlying premise of which is that any knowledge claim is only defensible within a wider set of assumptions about the nature of reality.[21] Bordage[6] observes that the conceptual framework within a study 'will dictate, whether you are conscious of it or not, what you choose to do and how you interpret your outcomes and results'. This is similarly true for the research paradigm, which is itself a grand theory.[22] As medical education research hopes to extend into wider scope and influence, it will be important to articulate these research assumptions to the wider academic community so that it can critically consider the nature of the knowledge claims within the discipline.

To this end, this paper aims to position itself as a bridge between the meta-commentary in medical education regarding research paradigms and how these issues are present in everyday research studies within the field. The following sections outline four major research paradigms and present an example of how the underlying ontological and epistemological assumptions of a study ultimately influence the nature of the knowledge claims that are constructed. When introducing the 2005 series on qualitative research methods in medical education, Britten[23]

observed: '…there is an overwhelming choice of textbooks on qualitative research, aimed at a wide variety of audiences. What are missing are succinct and accessible explanations of the major methods in qualitative research, and their potential application to the kinds of research questions that practitioners would like to investigate.' We propose that the same is now true of research paradigms and this paper aims to address that need.

The authors' research perspective

Before continuing, it is important to note that the overall position of this paper is a constructionist one, which can be broadly characterised as interpretivism. This perspective has two central elements:

1 it uses a subjective epistemology which anticipates multiple, diverse interpretations of reality rather than seeking to reveal an overarching 'truth',[24–26] and
2 it is associated with an interpretive effort to gather a range of in-depth accounts with the aim of building a detailed picture of how a particular phenomenon is understood by those who have personal experience of it.

We assert that there is no one superior research approach within the research paradigms outlined here; all are valid and informative when used sensitively in context to answer an appropriate research question. However, this paper describes the underlying research philosophy of interpretivism in particular depth because this approach is often the least familiar to those who have trained as educators and researchers in the positivist medical tradition. As a result, we observe that interpretivist research approaches can be a genuine source of conflict in research discussions because the underlying philosophy of interpretivism is less widely understood and accepted. The data gathering example presented later in this paper is drawn from a study underpinned by interpretivism and again describes this perspective as a useful research position. In these ways, the paper promotes interpretivism (a constructionist position) and discusses the strengths of this perspective as a way to increase understanding between researchers who hold and use different beliefs in their research thinking. This paper is directed at medics, medical educators and medical education researchers whose research perspectives and experiences have been predominantly shaped by the philosophy of research knowledge associated with medical science in the positivist tradition. We aim to clarify some areas of debate and misunderstanding that often occur when researchers from this realist tradition meet colleagues with a constructivist perspective.

RESEARCH PARADIGMS IN MEDICAL EDUCATION

'Paradigms are sets of beliefs and practices, shared by communities of researchers, which regulate inquiry within disciplines. The various paradigms are characterised by ontological, epistemological and methodological differences in their approaches to conceptualising and conducting research, and in their contribution towards disciplinary knowledge construction.'[27]

Table 1 outlines four major paradigms currently in use within medical education research and describes the assumptions about ontology (the nature of reality), epistemology (the nature of knowledge), methodology (the nature of research) and the related research methods for each of these perspectives.[21,25–30] The term 'paradigm' is used within this paper to refer to what Morgan describes as an *epistemological stance*.[31] (See Morgan[31] for a full critique of this position.)

The existing literature demonstrates that each of research paradigms generates valuable informing information.[32,33] However, medical education research, and indeed medical research, has historically been dominated by positivistic philosophies of knowledge, whereas interpretive and critical methodologies have enjoyed less popularity. Now, more than ever, there is an increasing diversity in research approaches; yet, from the literature published within medical education journals, discussion with colleagues and international conferences, we observe that positivism is still the dominant framework for many medical educators, researchers and practitioners. It is important to note here that this is not necessarily true of the entire field of medical education; educational research published in social science journals and notably in nursing journals is more likely to be underpinned by non-positivist research assumptions and to make those assumptions explicit to the reader.

Although positivist paradigms are invaluable frameworks within which to answer certain questions, the literature increasingly recognises that the related experimental design research methods (e.g. randomised controlled trials) 'are inadequate tools for studying complex, unstable, non-linear social change'.[34] By contrast, research underpinned by other paradigms, such as interpretivism or critical

Table 1 Research paradigms[21,25,27,29,43]

	Positivism	Post-positivism	Interpretivism	Critical theory
Ontology: What is the nature of reality?	Reality is static and fixed The world is ordered according to an overarching objective truth		Reality is subjective and changing There is no one ultimate truth	Reality may be objective but truth is continually contested by competing groups
Epistemology: What is the nature of knowledge?	Objective, generalisable theory can be developed to accurately describe the world Knowledge can be neutral or value-free	Objective knowledge of the world is not necessarily fully accessible Seeks to establish 'probable' truth	Knowledge is subjective There are multiple, diverse interpretations of reality There is no one ultimate or 'correct' way of knowing	Knowledge is co-constructed between individuals and groups Knowledge is mediated by power relations and therefore continuously under revision
Methodology: What is the nature of the approach to research?	The aim is to discover what exists through prediction and control Theory is established deductively Uses scientific method to develop abstract laws to describe and predict patterns Looks for causality and fundamental laws	Seeks to develop knowledge through the falsification of hypotheses Emphasis on well-defined concepts and variables, controlled conditions, precise instrumentation and empirical testing	Focus on understanding Uses inductive reasoning Meaning is constructed in the researcher–participant interaction in the natural environment Gathers diverse interpretations (e.g. grounded theory, ethnography)	Focus on emancipation Research is used to envision how things could change for the better Seeks representation of diverse and under-represented views Characterised by continual redefinition of problems and cooperative interaction (e.g. action research)
Methods: What techniques can be used to gather this information?	Tends to use quantitative methods, often including statistical testing of hypotheses (e.g. randomised controlled trials, questionnaires)	Quantitative and qualitative methods: systematically gathered and analysed data from representative samples (e.g. surveys, interviews, focus groups)	Tends to use qualitative methods to capture various interpretations of a phenomenon (e.g. naturalistic observation, interviews, use of narrative)	May use both quantitative and qualitative methods, usually in a participatory way Often uses iterative research design (e.g. case studies, focus groups, participant observation)

research, provides very good ways to study complex, unstable, non-linear change. For medical education research, which explores diverse, contextually dependent issues, these alternative paradigm perspectives are useful because they reflect the ambiguous quality of the research questions themselves and allow for a degree of uncertainty within the study design. Therefore, research approaches with epistemological and ontological assumptions that reflect change and complexity are well suited to inform medical education research.

AN OBSERVATIONAL EXAMPLE: METHODOLOGICAL ASSUMPTIONS AT WORK

To demonstrate what these ideas mean in practice, it is useful to explore an example. Figure 1 provides a written account of a conversation with a practice administrator that took place during an observational visit to a research site. This visit was part of a qualitative study into collective learning in primary care teams[35] and the account was written up by the

I spoke with the manager first. He was apologetic that 'there's not much to see' but told me the staff knew I was coming. He checked I was happy for him to 'leave me to it' in the reception area, which I was. I asked the staff if they would keep me right and tell me if I was in the way of their activities. They said they would, and we settled down.

For an hour or so I observed the reception area. I took notes about everything: the activities the staff were doing, the way they interacted, the practice layout, the Eagles song on the radio, as well as how it felt to observe in this context. When someone looked less busy, I would ask if I could sit with them. We talked about how the practice had changed in the time they had been there and how they had learned to do the things they do.

One of the people I sat with was F. She was friendly and unassuming with a gentle manner about her. She let me sit with her at the front desk while she dealt with reception and phone calls. I asked F about how she learned to do the different aspects of her job and if she thought practice teams can learn together. She said she felt they could because they get to know each other well, so they know what each person is good at and who to ask for help. F told me about another receptionist M. She said she can always tell when M is talking to a pregnant woman or a young mum on the phone because her voice changes; it gets softer. M really knows how to handle them; young mums are M's speciality.

I asked F what her speciality was and she said 'grumpy old men' and laughed. I asked her how she had discovered this and she told me a story about an older patient they had had for years who was always aggressive on the phone. The reception staff 'dreaded' talking to him when he called.

The patient phoned one day in the midst of some very stressful practice changes and was very rude to F. He was adamant that he wanted an appointment with a particular doctor, who was on holiday at the time. F told him he couldn't see this doctor until next week but she could give him an appointment with another doctor in the meantime. He insisted it had to be the doctor he wanted and told F *'I could be dead by next week'*. Worn out with the stress of a difficult day and the patient's consistently aggressive behaviour, F had replied *'If you're dead, get your wife to phone and cancel'*.

After a moment, the patient laughed for the first time ever. Now he only likes to deal with her when he phones and F 'gets all the grumpy old men' because the other reception staff refer them on to her.

I asked F what made her say this on that day when he'd been phoning for years. She said it was a difficult day and that it was very out of character because she's normally so timid. In hindsight, if it had caused trouble, F felt the team knew her. They knew she would never be deliberately offhand with a patient and that this man was always difficult. They knew this was out of character for her and she felt they would support her if she needed it. As it was, it worked out well and now grumpy old men are one of her 'specialities'.

Figure 1 Researcher's account of an observational visit

researcher based on detailed field notes. This research asked: 'How do collective learning and change happen in primary care teams?' The study adopted observational research methods, used qualitatively, and supporting interviews with key participants. These methods were used ethnographically[36] and extended data gathering visits took place over a 1-year period. (See Bunniss and Kelly[34] for a more detailed description of the stages of data collection and analysis.) In this study, SB was an overt observer and the data gathering methods were 'naturalistic';[27,37,38] that is, data were gathered with participants in their natural working environment as they went about their everyday work. All participants were aware of the purpose of the research and provided prior consent in keeping with normal research ethics procedures.

Research of this nature is often referred to as *generative* (rather than hypotheses testing) because it allows different interpretations of a particular phenomenon to emerge. Figure 2 provides some examples of possible interpretations highlighted by this particular observation extract, a number of which

1. For this participant, learning well together with her colleagues depends on knowing each other well and being aware of each other's strengths.
2. The administrative team within this practice naturally employs 'specialising' strategies when they deal with patients to provide better care.
3. GP administrative staff are sometimes subject to aggressive behaviours from individual patients and they experience anxiety about this.
4. For this participant, having the support of colleagues who know her character well was a source of reassurance in dealing with a challenging patient exchange.
5. Undergoing stressful organisational change within the practice can potentially impact negatively on staff-patient relations.
6. At times, a positive outcome for patients will be achieved in ways that are counter-intuitive to accepted best practice and may involve a degree of risk.
7. In this case, achieving this positive patient outcome relied on an idiosyncratic, interpersonal exchange between the patient and receptionist, which would have been difficult to predict.
8. The receptionist's real-time personal decision of how to handle this situation directly contributed to this outcome.

Figure 2 Examples of possible interpretations generated by the research account

raise issues which have yet to be fully explored through medical education research. From this we can see how the idiosyncratic, interpersonal nature of a particular staff–patient exchange can direct us towards research issues, which in turn may have implications for future research questions in medical education.

Alternative interpretations within research paradigms

'During fieldwork you are surrounded by a multitude of noises and activities. As you choose what to attend to and how to interpret it, mental doors slam shut on the alternatives.' (Agar[39])

The purpose of presenting the research account and its associated interpretations (Figs 1 and 2) is to demonstrate some of the practical ways in which the underlying research paradigm influences the research design and data gathering methods. The data gathering techniques outlined above present a particular contrast to those we would expect to see in a study conducted within the positivist paradigm. This section explores these differences.

Within the interpretivist paradigm, knowledge generation happens when 'relevant insights emerge naturally through researcher–participant discourse'.[40] Therefore, it is a basic assumption that the researcher's perspective is inextricably bound up within the findings of a study because 'meaning is constructed in the researcher–participant interaction in the natural environment'.[27] This is a natural characteristic of knowledge building within this paradigm (the hermeneutic cycle), which is seen as an inherently social act. Interpretivism assumes that a study can never be bias-free; therefore eliminating bias would not be a research intention. Instead, one of the aims of a study conducted from an interpretivist perspective would be to attend to how the researcher's thoughts, feelings, opinions and experiences might influence what he or she observes and records. Within this particular study, the data capture sheet distinguished between what was observed, the inferences drawn from those observations, the reactions and responses of the researcher, and any pre-existing assumptions or expectations the researcher had about the community he or she was preparing to observe. This reflexivity regarding how the researcher jointly *constructs* knowledge with participants is crucial to the critical interpretation of the data. This demonstrates how paradigms that assume a subjective ontology create a different type of knowledge because participant experiences are considered for the new issues and nuances they highlight.[41] Individual accounts of the world are valuable for their idiosyncrasies in much the same way that case studies would be in a clinical setting.

This approach contrasts sharply with that of a positivist perspective, which assumes overarching patterns of human behaviour and would therefore see little value in captured in-depth information about the experiences of individuals or small groups. Research within this different paradigm would avoid data collection in naturalistic settings because this

introduces further 'variables'. Similarly, given that research from a positivist paradigm aims to measure predetermined characteristics of a particular phenomenon, there is no methodological need to be responsive to participants in the same way during data collection. All of these characteristics of data gathering reflect the ontological assumption that reality exists objectively and the epistemological assumption that it can be most accurately described using deductive reasoning. These design characteristics reflect the ontological and epistemological assumptions that are particular hallmarks of the positive paradigm.

These assumptions are further illustrated by the questions researchers ask of a study. Some questions (e.g. What hypothesis is being tested? How do we know the participant is telling the truth? How do we know the researcher hasn't biased the data? How can one person's experience be representative of that of the wider population?) reflect the assumptions that there is an objective account of reality that we can gather information about and that we can judge the truth value of that reported information. However, other questions (e.g. What is the nature of the experience described by the participant and how has he come to understand it in this way? What aspects of the researcher's own experience has she brought to the data gathering and interpretation? To what extent does this description of reality resonate with others? What new hypotheses and concepts are being generated?) reflect the assumption that meaning is mediated through multiple (and often competing) ways to understand lived experience. These two very different sets of questions reflect diverse research paradigms, which are sometimes found in opposition.

These diverse beliefs within the interpretivist and positivist paradigms are just one example of how assumptions regarding ontology and epistemology often provoke much disagreement in research circles and methodological debates are ongoing within medical education research.[42] The extent to which researchers are comfortable with particular research methods and believe they generate valuable evidence tends to be an indication of the paradigm they are working within and the related assumptions they make within their research. Those who hold different research perspectives look for different criteria of quality in research evidence; these may include criteria pertaining to reliability, generalisability, reflexivity or resonance. However, it is common to all paradigms that rigour itself is a product of the soundness of the theory, the transparency of the research assumptions and the integrity of the research processes for data gathering and analysis. Indeed, regardless of the research assumptions, the central issue concerns the trustworthiness of the researchers in identifying the limitations of the work and disclosing information that could influence the interpretation of the findings. As medical education research continues to develop, it will be useful to articulate these research paradigms and understand the embedded assumptions to avoid asking or being asked the 'wrong' questions and reliving well-worn arguments within the discipline.

CONCLUSIONS

This paper argues that if medical education journals are to continue developing academic legitimacy, the discipline must be able to engage in epistemological discussions about the nature of the knowledge medical education research seeks to create. Developing an increased awareness of the paradigms in use within the field is important because we need to demonstrate that significant decisions regarding the provision of medical education and health care are based on a critical understanding of the nature of knowledge itself. The paper argues that research methodology is not simply about data collection strategies, but, more importantly, that it addresses the philosophical beliefs that determine the nature of the research design. Articulating these underlying assumptions is central to the research task if we are to be able to critically engage with the findings.

This paper presents an observational example which allows us to examine the relationship between the underlying research paradigm, its implications for study design, and the question of what constitutes useful data within different paradigms. It discusses what the differences in research paradigms can mean in practice and demonstrates that arguments within medical education journals over what constitutes 'good' evidence and research practice often indicate a conflict of research assumptions.

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