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Conducting Research in Health Professions Education: From Idea to Publication

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AM Last Page: A Guide to Research Paradigms Relevant to Medical Education

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In order to design or interpret qualitative and quantitative research, one should have some understanding of the assumptions that underpin them. Below, we provide an overview of some of the concepts underlying four philosophical paradigms in medical education research and illustrate the relationships between them.

Paradigm: A philosophical framework that underlies and affects research activities. What are the assumptions underlying one's views on reality and knowledge? (Synonyms: theoretical or epistemological stance, world view)

Positivism	Post-Positivism	Critical Theory	Constructivism
There is one truth, and it can be observed.	There is one truth, but it can never be truly observed.	Multiple truths exist, and they are influenced by power relations among people.	Multiple truths are constructed by and between people.

Ontology: Theory of the view on reality. What is the nature of physical and social reality?

Realism	Critical Realism	Historical Realism	Relativism
Reality is objectively observable and exists independently of the human knower. The world is operated by laws of cause and effect. Variables can be observed, measured, and predicted.	Reality is assumed to exist, but evidence in research is fallible due to the complexity of the enquiry.	Reality is shaped by structures of social, political, cultural, economic, ethnic, and gender factors.	Reality is socially and experientially based; multiple realities exist, change, conflict, and/or become more crystallized.

Epistemology: Theory of knowledge. What are the origin, nature, and limits of knowledge about reality?

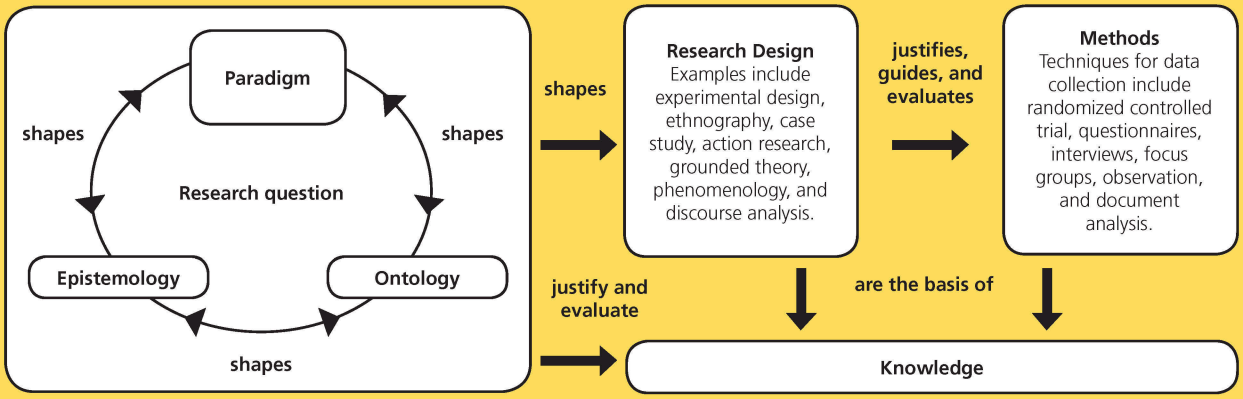
Radical Objectivism	Relative Objectivism	Relative Subjectivism	Radical Subjectivism
Knowledge is independent of the human knower. People can provide an objective, value-free description of reality.	Knowledge is conjectural and based on hypotheses that have not yet been falsified. Objective knowledge about reality is the ideal, which cannot be achieved.	Knowledge is value-dependent, is influenced by power relations, and is the result of interaction between researcher and participants.	Knowledge consists of constructions that arise from interaction between researcher and participants.

Methodology: Strategic approach to answer the research question and to gain knowledge. What is the research design?

Verification	Falsification	Transformation	Interaction
Knowledge is gained through hypothesis generation and testing (deduction). It focuses on prediction and control of phenomena. The aim is to produce generalizable data.	Knowledge is gained by testing if hypotheses can be disproved, using a deductive approach. Outcomes are never totally objective.	Knowledge is gained by raising participants to a different level of consciousness and thereby empowering them.	Knowledge is gained by an inductive approach: recognizing, understanding, developing, and contrasting constructions through dialogue.

Quantitative research **Qualitative research**

As illustrated below, an understanding of research paradigms can guide researchers in designing and performing medical education research. Each step invites the researcher to consider underlying assumptions about knowledge and reality within the field of medical education and related disciplines.



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AM Last Page: Understanding Qualitative and Quantitative Research Paradigms in Academic Medicine

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Qualitative research is becoming more prominent in academic medicine and health care fields, and an increasing number of publications using qualitative methods are featured in prominent journals[1–3]; thus, recognizing the different available approaches can benefit researchers of all types. While a debate may wage between proponents of qualitative versus quantitative research, both sets of methods—and often a blend of the two—offer important insights into the problems the academic medicine community faces.[4–6]

Qualitative paradigm		Quantitative paradigm
How and why events or behaviors occur in complex settings where context is important to understanding: *Examples: How do a diverse student body and faculty affect teaching and learning? How does a resident make the transition to attending physician? What characterizes the phenomenon of a mentor–mentee relationship?*	**Nature of the research question**	How many, how often, what level, and what direction of relationships between defined variables in settings that can be decontextualized: *Examples: What is the relationship between student grades and graduation rates? What type and amount of monetary incentive or financial reward affects a medical student's specialty choice?*
Inductive by researchers (e.g., normative or transcribed text analyzed thematically for patterns)	**Nature of data and analysis**	Deductive by statistics (e.g., data and patterns analyzed through statistical means)
• Case study: An in-depth study of a particular case, which can be descriptive, explanatory, or exploratory • Ethnography: Research intended to provide descriptions of systems, processes, or phenomena within their specific context; stems from anthropology • Grounded theory: A theory developed based on the examination of data (rather than applying a predetermined theory) • Historiography: Research directed at the study of a past event, issue, or problem that uses information from the past • Phenomenology: The study of individuals' perspectives on particular phenomena • Action research: A reflective and team-based approach led by those involved in solving a particular problem • Mixed methods: A combination of quantitative and qualitative approaches including triangulation design, embedded design, explanatory design, and exploratory design	**Types of designs**	• Experimental: The researcher manipulates all variables including the assignment to treatment and control groups in order to discern causality • Quasi-experimental: Research using an experimental variable with groups not formed through random assignment or selection • Surveys: Measurement procedures that involve asking questions of respondents • Mixed methods: A combination of quantitative and qualitative approaches including triangulation design, embedded design, explanatory design, and exploratory design
Normative data from interviews, documents, focus groups, and/or observations	**Data sources**	Ordinal or cardinal data from surveys, financial reporting, census reports, test scores, demographics, and/or observations
• Thematic analysis • Content analysis • Analysis of frequency	**Analytic techniques**	• Descriptive statistics • Regression • Regression discontinuity • Hierarchical linear modeling
• Internal validity (e.g., through triangulation, member checking, coding check) • External validity (e.g., through representativeness check) • Reliability (e.g., through chain of evidence and interrater reliability check)	**Assessment of rigor**	• Internal validity (e.g., through study design and procedures) • External validity (e.g., through criterion measurement) • Reliability (e.g., through test–retest, internal consistency)
• Provides valid and dense information about real situations and contexts, including interactions of variables in context • Allows an in-depth and comprehensive understanding of motives and social or behavioral processes • Provides an understanding and description of people's personal experiences of phenomena	**Strengths**	• Delineates relationships among variables • Provides generalizable research findings when the data are based on sufficiently sized random samples • Provides generalizable results when research has been replicated in different populations/subpopulations • Is useful for large populations
• May produce findings that are not easily generalizable to other settings • May be of limited scope due to the in-depth data-gathering approaches used • May take more time to collect and analyze data • May be more difficult to test theories with large participant pools	**Weaknesses**	• Narrow variables might not be valid • Knowledge produced might be too general for direct application to specific contexts or individuals • Phenomena may be missed if analysis focuses on hypothesis testing rather than hypothesis generation

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Generating Research Questions Appropriate for Qualitative Studies in Health Professions Education

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In qualitative studies, the process of crafting and refining research questions is similar to the process for other types of studies (quantitative, mixed methods, and reviews); the differences are in the nature of the questions, the underlying assumptions, and the treatment of the questions as evolving entities. Qualitative researchers often begin with broad questions, then hone their questions or identify new ones through an iterative process of collecting and analyzing data, reviewing relevant literature, and revising the purpose statement. The components of qualitative research design come together in a reflexive process through which the components occur "more or less simultaneously, each influencing all the others."[1(p2)] As shown below, the research question is the core of the research process.

- The research components that interact with the research question appear in the corners.
- To help readers formulate appropriate questions, we provide examples of initial and revised questions.

The Research Process: Using an Interactive Model to Develop Research Questions[1]

PURPOSE AND GOALS

Identify a problem, dilemma, or phenomenon that…

- sparks your curiosity
- is not well explained in the literature
- is researchable, feasible, significant, and relevant

METHODS

Include key elements such as:

- approaches with epistemological and ontological assumptions
- data collection and analytic techniques
- participants and setting
- presentation of findings
- ethical considerations

Purpose and Goals

Conceptual Framework

Methods

Trustworthiness

My research question is qualitatively oriented if the study…[2]

- aims to explore, understand, describe, discover, or generate
- focuses on process. How and why do things happen?
- uses open-ended or semi-structured approaches and techniques

A "good" qualitative research question…

- **identifies the central phenomenon** to be studied. Usually seeks to understand a process, the meaning of activities and events from the participant's perspective, or the physical or social context of activities and events.
- **explores rather than assumes.** Typically does not impose a conceptual framework upfront; does not assume that participants' experiences and perspectives match those of the researcher.
- **is clear, concise, focused.** Frames the study, clarifies scope and context; strikes a balance between general topic and specific focus.
- **is significant and relevant.** Has implications for fundamental concepts in education or important educational decisions.

CONCEPTUAL FRAMEWORK

Apply theories, beliefs, and prior research findings that…

- are based on the literature, preliminary studies, or personal experiences
- explain your thinking about the problem or phenomenon
- guide study design and analysis

TRUSTWORTHINESS[3]

Demonstrate rigor in approach and methods, such as:

- reflexivity
- credibility

RESEARCH QUESTIONS[1]

- are the core of the research process
- identify what you want to learn about or understand
- start broad, but may change or become more specific
- are often finalized after data collection and preliminary analysis begin
- always remain "sensitive and adaptable" to the other components of the study

Initial Research Questions	Feedback on Research Questions	Refined Research Questions
Do more communication errors occur when sign-out is given by a junior trainee to a senior trainee, or vice versa?	This question may be better suited to a quantitative approach. A qualitative question would focus on process rather than outcomes.	What are the challenges that clinicians face when receiving sign-out from a more experienced versus less experienced clinician?
What are the characteristics of an effective handoff?	This question is too broad. Focus on a particular setting, perspective (giver or receiver), and type of handoff. Make sure the study addresses a gap in the literature.	What makes an end-of-shift inpatient handoff effective from the perspective of the receiving clinician?
How do faculty respond to errors in clinical reasoning?	This question assumes the researcher knows how faculty conceptualize error and that everyone understands error in the same way.	What do clinicians consider to be an error in clinical reasoning? How do they characterize error?

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The Tools of the Qualitative Research Trade

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Choosing the right qualitative research method is like choosing the right tool: When trying to cut a plank, a hammer is mostly useless. A key question to ask when attempting to choose the right qualitative research method is thus, *What are you trying to do?* Identifying your goal should help you choose the right method. Remember, however, that (1) your tools will be more useful if carried in the right toolbox (i.e., methodology or approach),[1] (2) your research will be more impactful if you join a scholarly conversation by using theory and relating your work to that of others, and (3) each method has pros and cons.

METHOD	GOAL	SAMPLE QUESTION	ISSUES TO CONSIDER
INTERVIEWS[2,3] Data: What individuals say in answering an interviewer's questions; notes taken during interviews.	Discover individual perceptions, experiences, or understandings of a specific topic, situation, or phenomenon.	How do residents working in the intensive care unit perceive the role of palliative care services?	Who should you be interviewing (sample)? Does your interviewer have the right training to elicit rich responses? Is his/her role likely to bias interviewees' responses? Is the topic likely to cause reputational or psychological harm to participants?
FOCUS GROUPS[2,4] Data: What homogeneous or heterogeneous groups say during facilitated conversations; shared responses to facilitator's questions and to one another's perspectives.	Explore the range of perspectives on a topic within (and sometimes between) different stakeholder groups.	How do students and faculty members see the undergraduate professionalism curriculum? How is it meeting (or not meeting) their needs?	Is your moderator skilled enough to manage group discussions and different personalities? Is his/her professional role likely to alter participants' responses? Is the topic covered too private for a group discussion? Are hierarchies among group members problematic?
OBSERVATIONS[2,5] Data: What people do in everyday activities or during planned scenarios or simulations, as recorded in field notes and/or via audio or visual recordings.	Develop an understanding of actual rather than narrated behavior. Situate behavior in its broader context. Evaluate the impact of a policy on practice.	How are faculty members modeling the CanMEDS Advocacy Role for students?	What kinds of observational data are you interested in—count data, workflow data, social interaction data? Do you have enough time to observe or to train an observer? Do you have access to sites? Do the ethics of your clinical role conflict with the nature of your role as a researcher?
TEXTUAL ANALYSIS[2,6] Data: What is articulated in key texts identified through purposive sampling. Texts can include anything with text or images.	Make discourse—the main sociohistorical influences on our world—visible. Explore relationships among people, organizations, and institutions, over time and in a specific place.	How has accreditation been used as an argument to implement new educational interventions since the 1960s?	Are there readily available and legitimate documents to answer your research question? Are you able to and interested in paying close attention to subtle changes in language? Do you have time to read hundreds if not thousands of pages, iteratively develop a coding scheme, and read and code again?

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Common Qualitative Methodologies and Research Designs in Health Professions Education

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Qualitative research includes many methodological approaches or research designs; we present the five most commonly used in health professions education. Choice of methodology will depend on the focus of inquiry and the framing of the research question. Each methodology has a specific goal. While data collection strategies (e.g., interview, focus group, observation, document review[1]) often overlap, the approach to data analysis varies for each methodology, resulting in different research outcomes. Understanding the key features of each methodology will help researchers choose the best methodological fit for their research question.

Sample scenario: The pediatrics ward has implemented family-centered ward rounds. Concerns arise regarding didactic teaching in front of patients. Some suggest using role modeling of patient care as a teaching strategy. You wonder how students perceive teaching on family-centered rounds, if role modeling is perceived as teaching, and whether teachers deliberately role model.

	Grounded Theory	Phenomenology	Ethnography	Case Study	Narrative
Goal/purpose	• Develop a theoretical model for how a process or action works	• Understand the nature of a phenomenon, incident, or circumstance through those who experienced it	• Describe and interpret a group's culture/process by examining its behaviors	• Develop an in-depth understanding of one or a small number of cases	• Explore, in depth, one or more individuals' longitudinal experience(s)
Unit of study/analysis	• Process, action, or interaction (e.g., learning on rounds or role modeling as teaching strategy)	• Perception of an event or experience (e.g., teaching or role modeling)	• Group sharing a culture (e.g., senior residents)	• Bounded event, activity, or program (e.g., rounds on specific ward)	• One or more individuals (e.g., senior clinician teacher)
Potential research question	• How do students learn on family-centered rounds? • How does role modeling impact their learning?	• How do team members define teaching on family-centered rounds? • Does it include role modeling?	• Do senior residents incorporate "role model" as one of their roles? • Do they consciously model patient care for junior learners?	• How does teaching occur during family-centered rounds on a ward with high evaluation scores?	• How has one clinical teacher's experience with teaching on rounds evolved with changes in ward structure and over her career?
Approach to data analysis	• Analyze by categorizing and relating data (coding) to generate a model of the process or action	• Analyze for significant statements, units of meaning, and the what and/or how of participant experiences	• Analyze the group's behaviors for themes • Interpret themes to develop cultural portrait of the group	• Analyze for key themes important to understanding the case • Conduct thematic analysis across cases if using multiple cases	• Analyze story for key elements • Develop themes with an emphasis on sequence, turning points, and context
Potential study outcome	• Theoretical model explaining what and who students attend to on rounds and what factors allow an event to become a learning event	• Description of the concept of teaching on rounds, and whether role modeling is experienced as teaching	• Understanding of senior residents' role modeling beliefs/behaviors and whether they see it as a responsibility	• Recommended best practices from exemplar case for teaching on family-centered rounds	• Understanding of how teaching on rounds can evolve as faculty gain experience and/or in response to changes in work environment

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AM Last Page: Quality Criteria in Qualitative and Quantitative Research

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Good research in medical education is characterized by evidence that is trustworthy, applicable to (multiple) practical settings, consistent, and neutral (unbiased)—regardless of whether a qualitative or a quantitative approach is used. However, while qualitative and quantitative research share similar standards for good evidence (quality criteria), the conception and operationalization of these quality criteria differ between the two. Below, we provide an overview of these criteria and a number of techniques that researchers can use to meet them. In addition, we note that the criteria are interlinked, and that some of the techniques contribute to multiple criteria at the same time.

Techniques to enhance quality in **quantitative** research	Quality criteria in **quantitative** research	Quality principles	Quality criteria in **qualitative** research	Techniques to enhance quality in **qualitative** research
– Calculate the sample size that is needed for sufficient statistical power *(power calculation)* – Describe details of the educational context and intervention – Avoid loss of participants or provide information on non-responses – Standardize treatment conditions – Use control groups *(controlled design)*	**Internal validity** The extent to which observed effects can be attributed to the independent variable	**Truth value of evidence**	**Credibility** The extent to which the study's findings are trustworthy and believable to others	– Use multiple data sources *(data triangulation)*, methods *(methodological triangulation)*, researchers *(investigator triangulation)* and theories *(theory triangulation)* – Collect data for an extended period of time *(prolonged engagement)* – Ask feedback from participants on the data or interpretation of the data *(member checking)*
– Use random or stratified sampling *(population generalizability)* – Replicate the study in other contexts *(ecological generalizability)* – Verify predicted relationships between dependent and independent variables *(construct validation)*	**External validity** The extent to which the results can be generalized from the research sample to the population	**Applicability of evidence**	**Transferability** The extent to which the findings can be transferred or applied in different settings	– Make the findings meaningful to others by describing them and their context in detail *(thick description)* – Explain the sampling strategy *(e.g. typical case sampling or maximum-variation sampling)* – Discuss the findings' resonance with existing literature from different settings
– Estimate the internal consistency across repeated measures *(classical test theory)* – Estimate sources of variance affecting the measurement *(generalizability theory)* – Estimate item, test, and person parameters *(item response theory)*	**Reliability** The extent to which the results are consistent if the study would be replicated	**Consistency of evidence**	**Dependability** The extent to which the findings are consistent in relation to the contexts in which they were generated	– Collect data until no new themes emerge *(saturation)* – Continuously analyze the data to inform further data collection *(iterative data collection)* – Continuously re-examine the data using insights that emerge during analysis *(iterative data analysis)* – Be flexible and open towards the process and topic *(flexible/ emergent research design)*
– Use blinded assessors or coders during data-gathering – Anonymize respondent identities – Let the facts speak for themselves – Maintain and safeguard the original data for accountability to journals and the public	**Objectivity** The extent to which personal biases are removed and value free information is gathered	**Neutrality of evidence**	**Confirmability** The extent to which the findings are based on the study's participants and settings instead of researchers' biases	– Search the data and/or literature for evidence that disconfirms the findings – Discuss the research process and/or findings with peers/ experts *(peer debriefing)* – Keep a diary to reflect on the process and the researcher's role and influence *(reflexivity)* – Document the steps and decisions taken in the research, and their motives *(audit trail)*

Suggestions for further reading:
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It's a *Story*, Not a Study: Writing an Effective Research Paper

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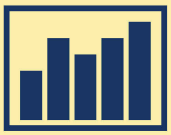
Advice abounds for education researchers hoping to publish their work.[1–3] Authors are commonly told to include a clear question and purpose statement, at least one theoretical frame for the work, sufficiently detailed methods, balanced reporting of results, thoughtful limitations, and conclusions appropriate to the research design.

Helpful though such advice is, we think it misses the fundamental point. Because what separates a mediocre research paper from a great research paper is not such bits and pieces. It is something much more essential.

A decent research paper reports a study.



But a great research paper tells a story.

What's the difference between study and story?

First, the difference is structural:

- A study lives in the methods and results of a report.
- A story unfolds in the introduction and discussion/conclusion.

Second, the difference is rhetorical:

- The study must be reported accurately.
- The story must be told persuasively.

A good story is understandable, compelling, and memorable. It needs a good study at its core, but it uses that study as a launching point to contribute to a conversation in the world about a shared problem.

Below, we illustrate the standard manuscript format according to this story/study concept, detailing for each section the key questions writers should ask themselves in order to achieve a good story. While we distinguish between study and story for the sake of clarity, study and story likely interweave throughout a report's sections.

Introduction

What problem did you explore?[4]

What's the hook—why does the problem matter?

Literature review

What conversation are you joining?

What's the gap in knowledge?

Methods

What did you do?

What was the rationale for the research design?

Is the explanation accessible?

Weave together with style and clarity. Wield the tools of grammar, sentence structure, and paragraph organization wisely to engage and hold readers' attention.[5]

Results

Who are the main characters in your results?

Have you illustrated them convincingly?

Discussion

How does your story add to the conversation?

How have you filled the gap?

How does the design limit your contribution?

Conclusions

What's the key lesson from your story?

What is the inevitable story-in-waiting?

We do not intend for researchers to see their reports as creative nonfiction. Published condemnations of selective and biased reporting in the clinical trials setting[6] could equally apply to medical education research. Authors must root their stories in science. They should narrate honestly and thoroughly, and they must grapple with results that surprise, deviate, or even disappoint. This scientific storytelling approach will elevate published research, expanding its audience and raising its potential to influence.

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