

## TWELVE TIPS

# Twelve tips for getting started using mixed methods in medical education research

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## Abstract

**Background:** Mixed methods research, which is gaining popularity in medical education, provides a new and comprehensive approach for addressing teaching, learning, and evaluation issues in the field.

**Aim:** The aim of this article is to provide medical education researchers with 12 tips, based on consideration of current literature in the health professions and in educational research, for conducting and disseminating mixed methods research.

**Conclusion:** Engaging in mixed methods research requires consideration of several major components: the mixed methods paradigm, types of problems, mixed method designs, collaboration, and developing or extending theory. Mixed methods is an ideal tool for addressing a full range of problems in medical education to include development of theory and improving practice.

## Introduction

The problems that medical education professionals face are complex and often not well addressed using a single research perspective. While knowing what works is important, an appreciation of why it works, when it works, and for whom it works is needed to deepen our understanding of learning and teaching in medicine (Cook, Bordage, & Schmidt 2008). Indeed, learning in medical education is impacted by a full range of factors, including characteristics of the teacher, student and project, dimensions of assessment, and by the social or cultural milieu. Considering learning without attention to the multiple influences that impact it, provides a somewhat bleak picture, based perhaps on only a superficial analysis of instructional outcomes.

In reviewing research in medical education, Cook et al. (2008) examined over 1400 published studies and found numerous descriptive articles, based on observation, as well as an abundance of justification research studies, geared toward testing the efficacy of various interventions such as experimental or quasi-experimental studies. However, clarification studies that extend or develop conceptual frameworks were missing despite the fact that the theory-building phase is key in the scientific process (Cook et al. 2008). Mixed methods, in its comprehensive approach and employment of diverse data sources, is an ideal tool for filling this critical void. Mixed methods is more than an additive process of combining quantitative and qualitative strategies because, as methods interface, they not only offset each other's weaknesses, but also yield a broader picture and more comprehensive support for validity (cf. Creswell & Plano Clark 2011).

Leech & Onwuegbuzie (2009) provide a practical definition of mixed methods research: "collecting, analyzing, and interpreting both qualitative and quantitative data in a single study, or series of studies that investigate the same underlying

paradigm" (p. 267). From a broader perspective, Tashakkori & Teddlie (2003) suggest that mixed methods is a separate methodological orientation with its own world view, vocabulary and techniques. Similarly, Creswell & Plano Clark (2011) support that mixed methods research is rooted in pragmatic philosophy with emphases on the consequences of actions and on "real-world" practice. Regardless of formal definition, mixed methods provides an increasingly popular approach for medical education researchers; one that is well-suited for advancing the field and for improving teaching and learning across the health professions.

## Tip 1

### Consider the pragmatic world view

A paradigm is a world view or philosophy that colors the researcher's theoretical lens and methodological approach. Positivism drives the quantitative approach, common in science and medicine, with focus on determining cause and effect, selecting variables, and generalizing to a population. The assumption is that a "truth" exists and that the goal of science is to discover it. Constructivism, with its emphasis on understanding the meanings articulated by participants who hold various world views, is typically associated with the qualitative perspective, a more interpretative stance. The constructivist assumption is that learners actively build knowledge based on previous learning and on the affordances or hindrances of the learning situation. Pragmatism, a third philosophical paradigm, is associated with mixed methods. The focus is on the consequences or utility of research and on adopting a pluralistic strategy based on what works in practice (Creswell & Plano Clark 2011). For example, in seeking to understand the functions of a palliative care program focused

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on the last six months of life, Dalkin et al. (2012) conducted a “realist” evaluation using both quantitative and qualitative indices. They drew on a complex analytic framework based on the examination of mechanism, configurations, and outcomes of the program with the goal of improving the quality of life experience for those who were served by the program and improving the quality of end-of-life programs more generally.

## Tip 2

### Layered problems

Layered problems are those that include attention to multiple dimensions of learning or teaching. Regehr (2010) suggests that medical education should consider better ways to think about problems, as well as reexamine assumptions such as “simplicity,” “proof,” and “generalizability” (p. 33), principles that gird the research traditions in the physical sciences. In approaching medical education research from a layered perspective, the first question might be “what is important to know?” and, second, “What are the tiers of information (personal, social, situational, historical, and ecological) that might bear on this phenomenon?” Figure 1 shows the categories of variables that might impact medical student or resident learning. The final thought would include focus on the best ways to “operationalize” or reflect the dimensions of learning and their related components, bearing in mind “rigor and feasibility” (cf. Norcini & McKinley 2007).

In investigating the effects of interprofessional resuscitation skills training for nursing and medical students, Bradley, Cooper, and Duncan (2009) mixed a quasi-experimental design with focus group interviews, addressing not only performance variables but also attitudes, leadership, and perspectives on teamwork. Interview analysis provided strong support for students’ perceptions of the experience of interprofessional education with perceived benefits including efficient teamwork, understanding roles, and communication. Given the lack of support for the efficacy of interprofessional

education in the literature (cf. Reeves et al. 2010), this information may be very valuable to that field.

## Tip 3

### Articulate a mixed question set

In mixed methods research, you will have several research questions that flow directly from the review of literature and set the stage for the configuration of your methodology. Thus, it is important to formulate a clear and integrated set of research questions based on complex or information-rich problems. Tashakkori & Teddlie (2003) advocate developing one mixed methods question that serves as an umbrella for several sub-questions, a top down, or big picture first approach. Creswell & Plano Clark (2011) call for separate sets of quantitative and qualitative questions followed by a mixed method question integrating the findings from both strategies in a “bottom up,” or specific to general approach. The authors go on to say that mixed methods research questions may be content-focused: “How do the perspectives of attendings regarding professionalism relate to their ratings on a scale of resident professionalism?” Alternatively, the question may be method-focused, as in the following example: “To what extent do qualitative results (e.g. interviews with residents) confirm quantitative results (e.g. observation or resident professionalism checklist)?”

## Tip 4

### Team up

Especially for those getting started in mixed methods, it is unlikely that one lone researcher is proficient in all areas of either quantitative or qualitative research. It is important to seek out and incorporate expertise. Within both qualitative and quantitative approaches, there exist a multitude of options. For example, case study, phenomenology, grounded

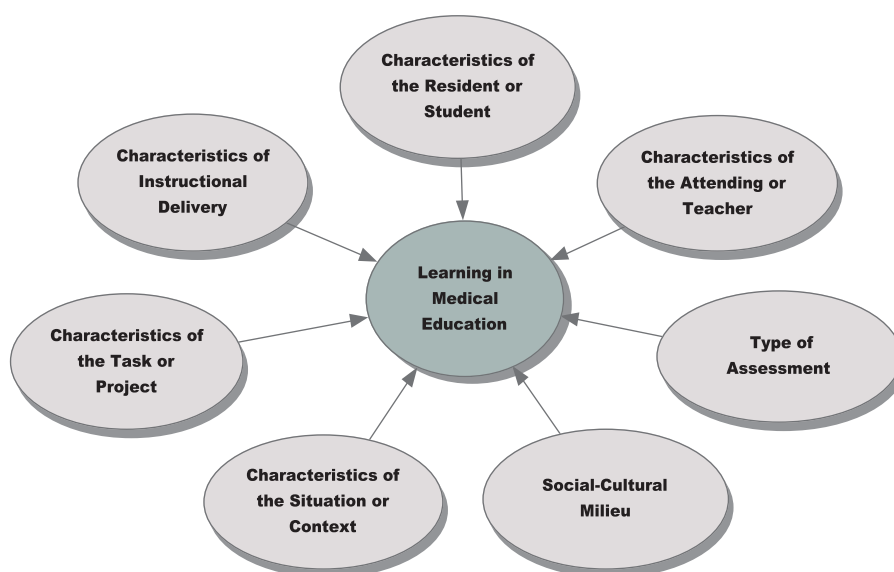


Figure 1. Categories of factors that affect learning in medical education.

theory, ethnography, and historical research are all types of qualitative investigation, each with its own strategy. Similarly, quantitative measures and the associated statistical tests vary. Sheskin (2011) advances 35 different statistical tests, and the emergence of multivariate models or modeling building approaches provides additional and much needed depth to the field (cf. Myers, Gamst, & Guarino 2005). To choose well and to provide strong analysis, it is important to assemble a methodologically diverse and experienced team.

## Tip 5

### Rationale, rationale, rationale

It is imperative to clearly explain your rationale for using mixed methods and to justify that argument based on mixed methods theory. Rationales may include the desire to increase the range and scope of inquiry, to discover new dimensions that may emerge, to triangulate, or corroborated data evidence, or to use methods sequentially in increasing construct validity (Greene et al. as cited in Schifferdecker & Reed 2009). Explain your rationale fully and explain why a single method alone is too limited. Make a water-tight case for your research questions and show direct links from your literature review to your research questions and methods and, finally, from your data analysis back to your questions and rationale.

For example, Moore, McKeithen and Holthusen (2011) in their study regarding educating an interprofessional team to meet the nutritional needs of infants in neonatal intensive care, argue for the importance of mixed methods in providing high-quality needs assessment. “Our overarching goal was to conduct a comprehensive needs assessment to formulate actionable educational strategies that improved the delivery and implementation of nutritional support therapy in NICU’s.” Based on the goal, the authors continue, “. . . no single data collection method alone could achieve the desired result. Hence we developed a methodology that included considering multiple perspectives and used multiple data gathering techniques. . .” (p. 220). This is a clear rationale and one that reflects the pragmatic underpinnings common in mixed methods research.

## Tip 6

### Know your designs

Schifferdecker & Reed (2009) have sorted out the many mixed methods design possibilities and have identified four that have been particularly successful in medical education. The “instrument development model” uses qualitative data for the development of a quantitative instrument. In designing a 360 multi-rater evaluation, Krain & Lavelle (2009) queried residents regarding their interpretations of professionalism and perspectives on how professionalism was acquired and, subsequently, used this information in the design of a 360 multi-rater evaluation with good results (Lavelle, et al. 2009). The “explanatory model” uses qualitative methods to answer questions raised by quantitative data to flesh out findings in a sequential manner regarding a single population at a single

point in time. The “triangulation model” focuses on the simultaneous collection of data and the integration of these, pairing surveys or other quantitative measures with interviews or focus group data. It is the most widely used design in mixed methods research (Creswell & Plano Clark 2011). Murdoch-Eaton et al. (2010) queried medical students regarding the benefits and practical difficulties encountered in developing research skills by combining student focus group data and quantified document analysis to support the need for training. Nofziger et al. (2010) supported peer assessment as a powerful tool to facilitate professionalism for residents using both qualitative and quantitative data derived from a survey. “Longitudinal transformation models” collect data at multiple points over time, often from more than one population. In a mixed methods study of interprofessional learning of resuscitation skills, Bradley, Cooper and Duncan (2009) followed a quantitative assessment of the effects of training with focus groups conducted four months after training to assess subsequent attitudes regarding interprofessional education. Other models such as the “embedded model” or “concurrent transformation model” are used less often in medical education but may hold promise for researchers. See Doyle, Brady and Byrne (2009) for a complete discussion of designs.

## Tip 7

### Check your tool box

The mixed methods researcher has a full and diverse array of tools to address the research questions or to operationalize research constructs. Qualitative tools include interviews, focus groups, observations, critical incident techniques (cf. Gremier 2004), and documents such as logs, emails, or medical records. The data analysis process might involve coding data manually, using coding software such as Nvivo (n.d.), ATLAS ti (n.d.), or MAXQDA (1989); interpreting interrelating themes, and explaining how the data address the research questions. Quantitative tools include surveys, test scores, counting behaviors, checklists, and consideration of data through the assignment of numeric values. The quantitative process would involve generating statistics and conducting tests to make inferences about the population. Tool selection depends on the research question and overall purpose of the study as well as on feasibility, sample type, sample size, and instruments to be used. Including experts in each of these methodologies on your team will facilitate your tool choice and tool management.

## Tip 8

### Use rigorous methods

While using mixed methods tends to extend validity, it does not release the researcher from the expectation that all methods will be rigorous and systematic. Both quantitative and qualitative researches are supported by strict criteria for excellence. For quantitative research, these include dimensions such as adequate sample size, random assignment, statistical control of extraneous variables, and instrument

validity. In qualitative studies, criteria include the selection of key informants, persistent observation, member checks, triangulation, transferability, and confirmability. Interpreting qualitative data may be a time-intensive process as researchers often face stacks of raw or transcribed data and then engage in a process of coding and interpretation. Maintaining rigor across methods is critical yet commonly overlooked by researchers, especially in medical education. See Gruppen (2007) for a review of common pitfalls in quantitative research, and Cote & Turgeon (2005) provide the same for qualitative studies in medical education.

## Tip 9

### Sampling schemes

Teddlie & Yu (2007) advance a typology of mixed methods sampling procedures based on the interface of probability and purposive sampling. Notably, probability sampling is based on the random and representative selection of participants with the goal of generalizing to an entire population, whereas purposive sampling seeks individuals or groups with the specific purpose of answering the study's research question, or gaining in-depth information in a nonclinical or embedded situation. While probability sampling rests on representativeness of the sample and size, purposive sampling rests on saturation, or the point at which the researcher is not getting new information. While generalization is usually a concern for the quantitative researcher, transferability of findings to other settings may or may not be a concern to the purposeful sampler. Teddlie & Yu (2007) advance a theoretical matrix that reflects the type of sampling technique as linked to the type of study – primarily quantitative, primarily qualitative or “proportionately” mixed. What is important in developing the mixed methods sampling is addressing the research questions, considering both generalizability and/or transferability issues, and focusing on both depth and breadth of information across research strands or methods (Teddlie & Yu 2007).

## Tip 10

### Develop theory

Analyze data and draw robust conclusions which extend theory and apply to practice in medical education. As a mixed methods researcher, you have worked with multiple variables in a rigorous and systematic manner. You have made meanings that are supported by diverse methods as you addressed complex problems. It is likely that you have extended or developed theory and it is not beyond the scope of even a single study to make this claim. This is especially important in medical education research where, too often, studies do not include attention to theory. Using multiple and diverse methods strengthens validity, extends theory, and may support or refute hypotheses. For example, in the development of an instrument to evaluate the effectiveness of continuing medical education (CME), Tian, Atkinson, Portnoy and Lowitt (2010) used mixed methods in designing a survey which served to replicate the theory of planned

behavior (Millstein as cited in Tian et al. 2010) by extending that to the design of an evaluation for CME. Here, the focus was on utility in developing a theoretically based, valid and flexible tool for evaluation of CME programming across various topical areas.

## Tip 11

### Contribute to the scholarly community

There are many opportunities for dissemination of your work. If you are seeking publication, your choice of journal depends on the audience that you want to reach, and on that journal's hospitality to mixed methods, although most research-focused journals welcome high-quality mixed methods studies. You might consider a journal in which many of your reference articles were published. Some studies may be ideal for methodological journals such as the *Journal of Mixed Methods Research*. It is important to closely follow the journal's guidelines for submission and to submit a high-quality, well-written article. You may choose to include mixed methods in the title, but this is not necessary although you would want to include mention and support for your choice of methodology in the abstract. Other options for dissemination include presentations and conferences, posters, and of course local discussions with your home community such as grand rounds or journal clubs.

## Tip 12

### Wear your mixed methods hat proudly

Once you have completed your project and are savoring all the benefits of the mixed methods approach, you may feel an allegiance to your new methodology. Working with diverse and excellent team members has hopefully provided you with new ideas and a new skill set. Conducting mixed methods is an ongoing process because as the mixed methods researcher concludes a project, it is often easy to see what needs to be done next; questions emerge and or may be redefined. Mixed methods provides a strategy not only for formal research, but also for informal research as professionals engage in multiple types of information gathering and analysis to ensure effective solutions in everyday situations.

## Conclusion

Mixed methods research is ideal for medical education in terms of developing and extending theory, and in contributing to the improvement of teaching and learning in the profession. The comprehensive and heterogeneous approach supports validity, answers questions in a rich and meaningful fashion, provides new insights and, potentially, raises new questions on the nature of learning and instruction. Mixed methods offers the researcher a chance to go in a new direction, to experiment, and to create meanings that may be beyond those derived from any single method or method set.

**Declaration of interest:** The authors report no conflicts of interest. The authors are responsible for the content and writing of the article.

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