Essential Foundational Education Research Methods Articles for Graduate Medical Educators: A Delphi Study

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ABSTRACT

Background Graduate medical educators interested in designing and conducting education research may seek foundational general overview articles on education research methods.

Objective We aimed to identify the most useful foundational education research methods articles for medical educators.

Methods We identified candidate articles through a 2020 Ovid MEDLINE literature search augmented by the authors' personal files and by cross-checking references of included articles. Articles that were primarily about general education research principles were included; articles were excluded if they were not focused on medical education research methods, were published prior to the year 2000, were written in a non-English language, or had no available abstracts. We conducted a modified Delphi study with 10 participants representing a range of specialties and education research experience to find consensus about the most useful articles. We planned 3 rounds of the Delphi process, the first to eliminate any articles not deemed useful for this audience, and the second and third rounds to include articles that at least 80% of the panel deemed "most useful" to education researchers.

Results Of 25 relevant articles identified in the literature search: one was excluded in round 1, 7 met the a priori threshold of 80% agreement for inclusion in round 2, and an additional 2 met inclusion in round 3. These 9 foundational education research methods articles relevant to graduate medical educators are described, along with a capsule summary and specific use for education researchers.

Conclusions Our modified Delphi study of foundational education research methods articles identified 9 articles deemed useful for graduate medical educators who are seeking methods resources.

Introduction

While most graduate medical educators have some research training, the nuances of education research can differ from research in epidemiology and from clinical research commonly taught in medical school and residency.[1-3] Additionally, as educators transition from consumers of the literature to researchers conducting their own scholarship, questions arise about education research methods. Thus, educators may seek resources to guide them in developing, implementing, and disseminating education research projects.

The literature contains resources on a wide range of research topics, but graduate medical educators may struggle to find foundational methods articles that are practical and applicable to medical education problems. Specifically, there is a need for articles that provide a general overview of education research methods, or "primers," that are useful to researchers with a diverse range of experience. Mentors often have their own files of helpful resources but may be missing articles that could be useful to mentees and collaborators.

This study aimed to comprehensively review the medical education research methods literature and perform a modified Delphi study to identify the most useful foundational articles for both novice and experienced education researchers. The resultant list of articles may help guide graduate medical educators in conducting studies and may also serve as a resource for faculty development and graduate medical education training in education research methodology.

Methods

We applied a conceptual framework based on the theory of spiral curricular learning, which posits that

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trainees should revisit basic concepts repeatedly, building upon existing knowledge with iterative cycles of more detailed learning.[4] This lens influenced: (1) our aim of identifying articles that would both reinforce general concepts and provide more detailed content for deeper learning; and (2) our modified definition of "expertise" for our Delphi panel to include a range of education research experience.[5] We assembled an author team of 10 panelists representing 3 institutions, 4 specialties (surgery, emergency medicine, anesthesiology, and infectious disease), and varied academic ranks (1 education fellow, 3 assistant professors, 5 associate professors, 1 professor) with education research experience ranging from novice to expert to participate in the consensus-building process, as well as one nonvoting medical student who administered the surveys, tracked participation, and prepared anonymous summaries of the results for each round.

An Ovid MEDLINE database search was conducted by 2 authors and a research librarian in October 2020 on foundational medical education research methods articles from 2000 to 2020. Our search strategy included both text and index search concepts related to faculty, medical education, physicians/medical staff, and methods. The search yielded 120 articles, which were independently reviewed by 2 authors for inclusion/exclusion criteria, with discrepancies resolved by discussion. Articles primarily about general education research principles (ie, overviews, or primers) were included; articles were excluded if they were not focused on medical education research methods, were published prior to the year 2000, were written in a non-English language, or had no available abstracts. Additional articles were identified from the authors' files and by manually checking the references of all identified articles, and these also underwent 2 author inclusion/exclusion criteria screening.

Each round of voting for the Delphi process was completed online using Google Surveys (Google). Participants provided their names at the beginning of each round to track participation, but this information was reviewed only by the nonvoting member of the team who prepared the anonymous results for group review and discussion after each round. One panelist was also an author on an included article and did not screen nor vote on that article in any round. The first round prompted participants to read each article and rate it on a Likert-type scale from 1 to 7 (1=unlikely to be useful; 7=illuminating, highly useful). Each article needed to meet an a priori threshold of 3 on the 7-point scale to advance to the next round. The second round asked panelists to review results from round 1 and indicate whether each article belonged on a "must-read" list of foundational education research articles (response options were "no," "maybe," and "yes"). Articles with 80% of panelists selecting no were excluded; those with 80% of panelists selecting "yes" were included on a final list of articles, and the remaining articles were carried through to the third round. The final round presented both the round 2 results and links to the

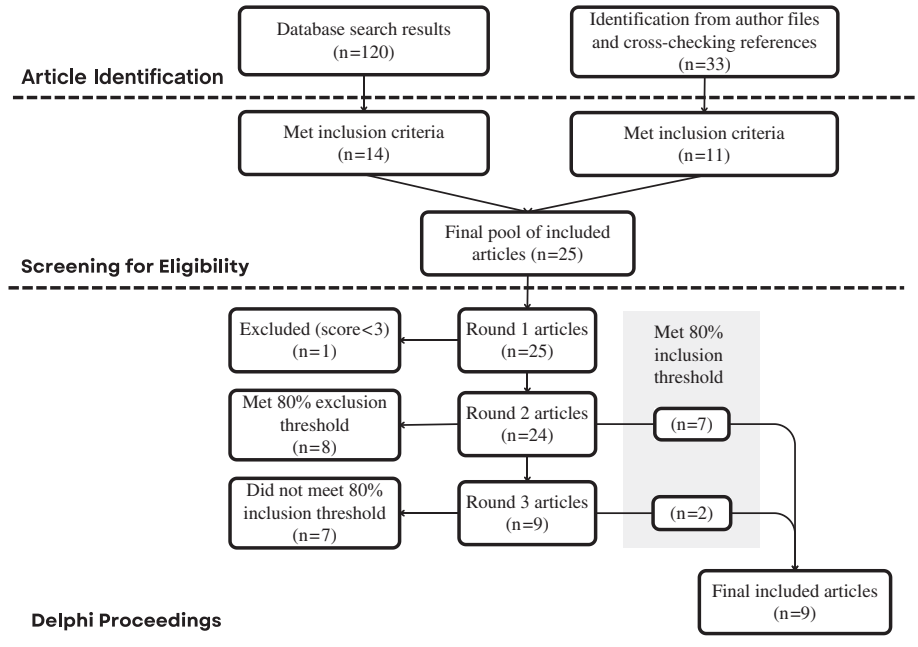

FIGURE
Flowchart of the Literature Research and Modified Delphi Process

TABLE
General Education Research Methods Articles Deemed Most Useful for Early Career Researchers

Article (Author, Year)	Article Summary	Most Useful Elements for Education Researchers
Abramson et al, 2018[5]	General overview to conducting quantitative research that addresses question identification, conceptual framework examples, and attention to Glassick's criteria.	Offers practical insights by illustrating each research step with specific examples, aiding researchers in the development, execution, and presentation of their work.
Beckman et al, 2007[10]	A primer for conducting quantitative and qualitative education research. Explores the frameworks of Glassick, Boyer, and Kirkpatrick, presenting a practical 3-step approach for crafting medical education projects.	Concise overview of study designs, comparison of quantitative and qualitative, examples of experimental methods. Helpful description of validity evidence as well as selecting appropriate outcomes.
Boet et al, 2012[11]	A review discussing conceptual frameworks, question development, and selecting appropriate methods and outcomes, as well as practical education-specific considerations for ethics, error and bias, and rigor.	Tailored for clinician-teachers, this resource provides both foundational knowledge as well as details such as exemplar question refinement, qualitative methodologies, and tips for dissemination. Features instructive definitions, figure, and boxes.
Bordage, 2009[12]	Landmark article on the role of the conceptual framework in framing a study and presenting a scaffolding for readers to build upon in application and future work.	Defines conceptual frameworks and provides examples to illustrate this crucial but complex concept that is essential to rigorous education research.
Bordage et al, 2003[13]	A systematic approach for experimental study design and developing a grant proposal.	Provides clear guidance for education research grant writing, highlighting important considerations for rigorous study design.
Bunniss et al, 2010[28]	Thoughtful discourse of 4 research paradigms in medical education research: positivism, post-positivism, interpretivism, and critical theory. Emphasizes the importance of transparency in research methodology and how philosophical beliefs determine the nature of research design.	This accessible overview of methodologies and their philosophical underpinnings includes a table comparing the 4 paradigms. An observational example is presented to illustrate how applying each paradigm can impact data interpretation.
Cook, 2010[19]	Blend of anecdotal insights and scholarly discourse to provide concrete tips for conducting education research in an approachable and relatable manner.	A user-friendly guide that caters to newcomers, delivering both general advice and detailed instructions. Includes a table of threats to study validity with helpful examples.
Ratelle et al, 2019[26]	Guide to interpreting and conducting quantitative education research, including study framing, methodologic rigor, and evaluating education research quality.	A useful guide for conducting research and for reviewing, which includes important questions to consider when evaluating research, covering concepts such as validity evidence, as well as an overview of rubrics to assess research quality.
Yarris et al, 2011[3]	A primer offering guidance for education research that builds upon an epidemiologic framework for study design, illustrating education-specific approaches to questions, problems, and theories in teaching and learning.	Designed to bridge the gap between clinical and education research, this resource provides insights into study designs, philosophies, and provides examples of avenues for funding and dissemination.

included articles thus far, and asked participants to vote "yes" or "no" to include each remaining article on the must-read list. Articles voted by 80% of the panel as "yes" for inclusion were added to final list (FIGURE). Descriptive statistics were calculated at each stage using Google Sheets. This study did not qualify as human subjects research and therefore did not require institutional review board review at the primary institution.

Results

Fourteen of 120 articles initially identified from the literature search, and 11 of 33 additional articles identified from the authors' files and bibliographic review of included articles met inclusion criteria, yielding a total of 25 articles.[3-28] Nine of 10 panelists participated in the first round proceedings, and all 10 panelists participated in rounds 2 and 3.

In the first round of our modified Delphi proceedings, one article was eliminated. In the second round, 8 articles were eliminated, and 7 were included in the list of essential articles. In the final round, 2 more articles met the threshold for inclusion for a final list of 9 essential articles (FIGURE, TABLE).

Discussion

Our modified Delphi study identified 9 foundational education research methods articles that met consensus as essential resources for education researchers. The selected articles were published between 2003 and 2019 and included topics spanning research question development to study design and analysis to result presentation and dissemination.

Medical education research requires rigorous application of research principles with attention to education-specific considerations. This includes a thoughtful approach toward identifying a research problem and delineating a knowledge gap, appropriate research methods and outcomes, and transparent and rigorous data analysis and presentation of results. The identified articles highlight key concepts and may serve to deepen understanding of methodology as each article is likely to reinforce some key principles of the others as well as provide some new information that can build upon the researcher's evolving foundational knowledge.

Graduate medical educators may find these articles to be a helpful starting point for their own faculty development and may also use this list for teaching and mentoring education research. Because there is no Medical Subject Heading (MeSH) term for "education research," and because excellent foundational articles can be found in a wide variety of health professions and specialty-specific journals, this curated list incorporates a broad literature search which was augmented by hand-checking personal files as well as reference lists of all identified articles. Similar methodology may be applied to future efforts to identify key medical education research articles in specific niches.

This study is limited by omitting articles published since 2020 as well as those without an abstract. Also, while the Delphi panel was intentionally created to include a range in experience levels and specialties, it is unlikely to be representative of all education researchers, and readers may find the articles included to have variable utility. As we used the Delphi method to build consensus among our author team in this study, the panel and author team were identical (except for the one nonvoting author). This method has been used in similar studies but may lead to conflicts of interest between the roles of author and panelist.[29] Additionally, Delphi studies require the team to make decisions about the thresholds for consensus and formats of iterative rounds of voting. Although we relied on both established methods for modified Delphi studies as well as thoughtful consideration of the aim of each round of voting when developing our surveys, the study may have fallen short of our goal of identifying the true consensus regarding the most useful resources. To further foundational learning in medical education research, next steps may include developing an online compendium of annotated resources that could be revised periodically, as well as including additional experts for the rating process.

Conclusions

Our modified Delphi study of foundational education research methods articles identified 9 articles that stood out to our panel as the most useful resources for medical education researchers. This list may be used by graduate medical educators who are seeking methods resources, as well as program directors and mentors seeking to share helpful resources with trainees and colleagues.

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