SPECIAL ARTICLE

Tools for Medical Education Scholarship: From Curricular Development to Educational Research

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ABSTRACT

The development of successful educational scholarship, either curricula or medical education research, is vital in ensuring that the field of medical education continues to evolve. Fostering the skills of medical educators in conducting high-quality educational research is essential to this process because publishing such research helps to disseminate best educational practices to the medical community at large. Unfortunately, developing rigorous medical education research can be challenging for pediatric hospitalists within busy clinical settings. In this article, we aim to discuss key principles and frameworks for curricular development as well as offer guidance in transforming a curriculum into a scholarly medical education research product for pediatric hospital medicine providers.

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Medical education remains a cornerstone in our health care system, and pediatric hospitalists are often at the forefront of trainee education given our frequent clinical exposure to residents, fellows, and medical students.[1] Pediatric hospitalists are frequently involved in curricular development for trainees, with curricula encompassing procedural training, handoff implementation, family-centered communication, hospital errors, and a plethora of others.[2–5] An effective curriculum can have a profound impact on future generations of clinicians and the patients they care for, whereas implementing less effective educational curricula can be burdensome for both educators and trainees and potentially distract from the health care system's primary objective of clinical care.

First off, what exactly is a curriculum? A curriculum is a planned educational experience that is an essential component of medical student, resident, and fellowship training, and excellent resources are available for structured approaches to curricular development.[6,7] However, it can often be challenging to transform educational curricula into educational research projects that result in scholarship, with authors asking themselves the question, "How do I get this published?" Although educational curricula can be submitted to online peer-reviewed portals, applying additional rigor at the outset can yield a published article in a broad range of peer-reviewed journals.

Luckily, the medical education literature contains high-quality primers for both quantitative and qualitative studies for medical educators seeking scholarship.[8–13] This article's target audience is pediatric hospitalists interested in developing educational curricula yet lack formal educational training. The purpose of this article is to emphasize guiding principles to focus on during early project development that can enhance educational scholarship quality and offer the best chance of success with publication in a peer-reviewed journal.

KEY CONCEPTS OF EDUCATIONAL RESEARCH

Plan To Publish at the Beginning

In the initial planning stages of either an educational curriculum and/or medical education research project, there are several vital steps that are often overlooked. Authors should start planning for publication at the beginning of the curriculum development process, and this can be accomplished by focusing on several key points: developing a thoughtful medical education research question, using a structured approach to curriculum development, applying a conceptual framework, identifying the scale of educational outcomes by using Kirkpatrick's pyramid, and being aware of the standards of quality scholarship.[8]

Craft Your Question

Generating a specific research question is an integral part of the overall research design because it lays the foundation for the research study and informs each step of the study design.[14] Using the FINER criterion can help ensure a rigorous approach from the start.[15] This includes the following:

- Feasible: Is the question answerable with the resources you have available to you?
- Interesting and important: Is the question interesting to you as the investigator as well as to the medical education community?
- Novel: Does the question add to the current body of knowledge?
- Ethical: Can you answer this question without putting anyone at risk?
- Relevant: Does the answer to the question matter at your institution and others?

Construct Your Curriculum

Introducing an educational curriculum requires advanced planning, preparation, and a structured approach. Educators should strongly consider using Kern's 6-step method (Table 1) because a well-constructed curriculum includes specific and measurable objectives, appropriate methods of instruction to achieve those objectives, and a plan for evaluation of learners and the program.[7] For more extensive training on curricular development, hospitalists may consider attending a workshop at a national meeting or seeking further training at their institution when feasible.

Find Your Framework

Conceptually based educational research helps accumulate a deeper understanding over time, allows others to build on one another's work, and advances the entire field forward. A vital step when developing a curriculum is the identification of a framework when planning for publication. There are 2 main categories of frameworks that educators should familiarize themselves with: theoretical frameworks and conceptual frameworks. Put simply, a theoretical framework articulates the logic of why we are using a particular theory, whereas a conceptual framework justifies why this problem, context, and/or phenomenon is relevant to the field.[16] For the purpose of succinctness, the emphasis of this article is focused on conceptual frameworks.

Conceptual frameworks represent ways of thinking about a problem or a study and can come from theories, models, or evidence-based best practices.[17] Examples include Ericsson's theory of deliberate practice, Bandura's social cognitive theory, Kolb's model of experiential learning, and Schön's theory of reflective practice.[18–21] They provide a solid foundation with standardized vocabulary and well-grounded principles to help clarify the nature of a problem, guide the development of possible solutions or study questions and designs, and help guide the selection of the appropriate methods and the interpretation of outcomes.

Conceptual frameworks help to answer 2 questions: "Why is this research important?" and "What contributions might these findings make to what is already known?"[16] Using the appropriate framework allows the researcher to turn a hunch or observation into a logical, evidence-based, theory-refining, impactful argument that is suitable for peer review and publication.[16]

For example, consider a research question such as determining if intensive practice in performing simulated lumbar punctures improves residents' ability to achieve a successful lumbar puncture on the first

TABLE 1 Kern's 6-Step Method to Curriculum Development

	Description
Problem identification and general needs assessment	Identify a general or specific focus for the curriculum and describe it in a clear manner Analyze the gap between the current approach to the issue and the ideal approach
Targeted needs assessment	Assess the needs of the targeted learners, including previous training and experience, baseline knowledge, skills, and attitudes, and preferred approaches Assess the learning environment, related existing curricula, needs of stakeholders other than the learners, and barriers to implementation
Goals and objectives	Goals: broad, general statements of what you want to accomplish Objectives: more specific and focus on knowledge, attitudes, and skills by using action verbs that target the level of expected competency Should be framed as, "Who will do how much of what by when?"
Educational strategies	Educational methods should be chosen that best fit the type of objective and will most likely achieve the goals and objectives. Examples include lectures, small group evaluations, online modules, hands-on procedural training, etc.
Implementation	Steps include Identify resources Obtain support Develop administrative mechanisms to support the curriculum Anticipate and address barriers Plan to introduce the curriculum
Evaluation and feedback	Assess the learning outcomes and promote continuous improvement Incorporate learner assessment methods that are feasible and measure the desired competency Used to provide formative feedback and outcome measures Establish methods for evaluating the efficacy of the curriculum components in achieving the desired learner outcome

Adapted from Thomas PA, Kern DE, Hughes MT, Chen BY. Curriculum Development for Medical Education: A Six-Step Approach. 3rd ed. Baltimore, MD: Johns Hopkins University Press; 2016:6-9.

attempt. This aligns with Ericsson's[18] theory of deliberate practice, which states that expertise is acquired from intentional practice and feedback as the learner is challenged to work at higher levels.[18] Natural research questions that may be generated include, "What is the appropriate frequency, type, and intensity of feedback to enhance lumbar puncture proficiency?" and "What is the appropriate level of skill required for a resident to be deemed competent to perform a lumbar puncture independently?"

Authors are responsible for explicitly stating the assumptions and principles contained in the conceptual framework that they use in their research projects; unfortunately, this is often overlooked.[22] In fact, the lack of a conceptual framework was noted to have contributed to the rejection of articles submitted to major educational journals 62.2% of the time.[23] Luckily, detailed roadmaps exist that can assist educators in their selection and application of the appropriate conceptual framework.[24]

Aim High on the Pyramid

Even with a strong conceptual model and study design, authors interested in publishing their work will benefit from a healthy consideration of their outcomes. Kirkpatrick's pyramid (Fig 1) offers a tiered system to the scope of potential research outcomes, with 4 defined levels of impact.[25,26]

These 4 levels are as follows:

1. Reaction: How do study participants respond to the training they received? A common way to measure this is with a survey after training. Were the participants satisfied with the training?
2. Learning: What did the participants in the study learn? Examples include objective pre- and posttest measurements to demonstrate that participants learned new knowledge or skills.
3. Behavior: What do participants do differently as a result of the study? This includes documented acquisition of new skills in actual practice.
4. Results: What is the ultimate impact or outcome of the study? What impact did the changed behavior result in? Examples include decreased medical errors or improved patient outcomes.

Level 4 (results) is the most challenging to attain but the most impactful. A prime example of an educational curriculum that yielded significant results is the I-PASS (Illness Severity, Patient Summary, Action List, Situational Awareness and Contingency Planning, Synthesis by Receiver) handoff bundle project. Implementation of the handoff program was associated with reductions

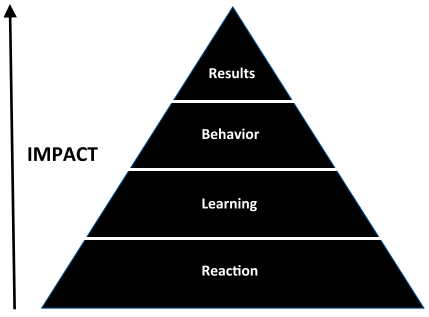

FIGURE 1 Kirkpatrick's pyramid: from learner reaction to impactful outcomes.

in medical errors and preventable adverse events, improvements in communication, and the lack of a negative effect on workflow.[2]

Although each peer-reviewed journal has individual criteria for what it considers publishable medical education research versus a curriculum, the line of differentiation tends to focus on the learning level of the pyramid. A project with objective measures of learning (particularly when compared to a control group) may compel reviewers more than a project with pre- and postsurveys of learners' perceived educational benefits (although retrospective pre- and postsurvey studies can be valuable). Additionally, when aiming high on the pyramid, one should also consider the importance of each level. Educational scholarship that changes behavior but does not have a positive learner reaction may not be sustainable. And sustainability is essential: the holy grail of educational research is that which results in long-standing change.

Certainly, not every curricular intervention needs to reach the peak of the pyramid to be publishable, but authors should be mindful of the "importance" of each level when planning their initiative.

Stepwise to Success

After thoughtful consideration of the conceptual framework and Kirkpatrick's pyramid, authors should apply a structured approach such as Glassick's standards of quality scholarship (Table 2) to ensure that their research is as rigorous as possible.[27] Glassick's criteria should be used as a framework to discuss strategies to ensure that the research question of interest is worthy of further study as well as how to use existing literature and conceptual frameworks to strengthen a research study. As can be seen, there is significant overlap with Kern's 6-step method to curriculum development. For instance, Kern's method includes a needs assessment, which is necessary for a single institution but not as compelling to a national audience. Glassick's criteria focuses on a literature review, which is vital for publication because it ensures that authors understand what is known and unknown about a particular problem and how well their study addresses any gaps. Using Glassick's standards, authors are also engaged in weighing the importance of their outcomes, identifying the appropriate forum for presentation, and critically evaluating their own work.

TABLE 2 Glassick's Standards of Quality Scholarship

	Description
Clear goals	The I-SMART approach to goal setting can help establish clear and realistic goals from the outset.[3,14]
Adequate preparation	This requires a literature review to assess what has already been done and what gaps in knowledge exist and/or are important to fill.
Appropriate methods	Effectively applied research methods must be appropriate to answer the research question and should map back to the goals and/or learning objectives. A thoughtful approach to choosing the appropriate assessment tools and statistical tests is key.[13–15] Methods should also be modified as circumstances change.
Significant results	Authors should weigh the importance of the outcomes to the field of study and consider the likelihood that results open additional areas for further exploration. With an appropriate design, the results can be meaningful whether the intervention "worked." Remember, aim high on the pyramid.
Effective presentation	This is ensuring that appropriate forums are used so that the results are disseminated to the appropriate audiences and that the messages are presented with clarity and integrity.
Reflective critique	This ensures that the author critically evaluates his or her own work, discusses limitations of his or her work and next steps, and values the opinion of others to improve his or her work.

Adapted from Glassick CE. Boyer's expanded definitions of scholarship, the standards for assessing scholarship, and the elusiveness of the scholarship of teaching. Acad Med. 2000;75(9):879. I-SMART, important, specific, measurable, achievable, relevant, and timely.

Plan, Plan, and Plan Some More

Now that we've reviewed multiple structured approaches to curricular development and scholarship, there are several other planning suggestions for authors to consider. Identifying key team members from the project onset is important, and authorship should be discussed early on. Authors must also recognize the importance of submitting their project to the institutional review board (IRB) early on, ideally getting IRB approval before the project starts. Other recommendations include breaking larger projects into smaller steps, crafting contingency plans, and using PDSA (plan-do-study-act) cycles throughout the project's development. Finally, to keep everyone on task and momentum moving forward, authors should use responsibility charts for team members with clear time lines.

Where Should I Submit My Work?

Scholarly projects that are focused on implementing an educational curriculum and assessing its impact on learning, behavior, and outcomes are oftentimes able to reach a broader audience via publication in respected health professions educational journals such as *Academic Medicine*, *Medical Education*, *Academic Pediatrics*, and *Medical Teacher*.[28] Authors may also consider submitting to *Academic Medicine's* Last Page series, and other sites have valuable suggestions for how to get curricular work published.[29,30] Educational curricula that are not

translated into medical education research can be submitted to peer-reviewed portals such as the Association of Pediatric Program Directors Share Warehouse and the Association of American Medical Colleges MedEd Portal; they can also be submitted as abstract presentations or workshops to educational conferences.[29,31,32]

The Finishing Touches

After choosing where to submit your work, it is time to apply one last level of rigor before submission: an author's checklist (Supplemental Table 3).[8] This detailed checklist will ensure that each component of your article is organized, scientific, and thorough. Of note, some of the items in the checklist (eg, validity, type I and type II errors, etc) are beyond the scope of this article and an in-depth discussion can be found in the referenced materials.

CONCLUSIONS

For pediatric hospitalists with a long-term career focus on educational scholarship, the development and progression of projects over time is imperative. Today, you may generate a scholarly project that is focused on an educational curriculum with a positive learner reaction. Tomorrow, with added rigor, this can become a project that tests a curriculum's impact on learning, behavior, and outcomes. Ultimately, quality educational research benefits everyone: faculty, trainees, the institutions, and most importantly, our patients.

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