

## **PERSONAL VIEW**

### **Avoid 'running before we can walk' in medical education research: the importance of design and development research.**

#### **Abstract**

Design and development research has the aim of understanding the feasibility and acceptability of implementing early-stage pilot research before interventions are fully implemented and evaluated for their impact. Increasing the use of design and development research in medical education research requires greater awareness of its importance by all stakeholders, the use of iterative research methodologies, such as educational design research, and the application of modified existing frameworks for healthcare feasibility studies.

The Institute of Education Sciences of the United States (US) Department of Education and the National Science Foundation published their Common Guidelines for Education Research and Development in 2013 (Institute of Education Sciences & National Science Foundation 2013). This publication has been influential in the wider field of education by clarifying the main differences between exploratory research, design and development research, and impact research. These differences have led to changes in education research training, with an increased focus on the alignment of research questions with the most appropriate type of research (Branchaw et al., 2020), and to also inform the evaluation of research funding proposals (Penuel et al. 2020). Our own research endeavours in medical education, with a focus on educational interventions to improve clinical performance, have become increasingly influenced by these

Common Guidelines. In this Personal View we propose that medical education researchers should increase their awareness of the different types of research, especially the use of design and development research before interventions are fully implemented and impact research is conducted.

The Common Guidelines discuss three main types of research that are relevant to research on interventions:

- *Early stage or exploratory research* is conducted at an early stage in the research process and has the aim of studying a new intervention to answer the question ‘Can it work?’ This type of research is the proof of concept or pilot study, in which an idea, based on a clear and justified conceptual model, is put into action as an intervention to see if the idea has the potential to produce the expected changes.
- *Design and development research* seeks to answer the question ‘Will it work in practice?’ This type of research is the feasibility study, which has a focus on understanding the extent to which an intervention after an early stage research study can be implemented within a specific context. These studies have the aim of identifying the various factors in the context that help and hinder the intervention being implemented and achieving its expected changes. These factors include the learners, the educational approach and the wider organisation, such as the curriculum and the available resources. The intervention may require several cycles of iterative development modifications to its design and implementation in response to the findings of the study. The outcome of this research is an intervention that is most likely to work in the specific context.
- *Impact research*, which includes efficacy and effectiveness studies, has the aim to answer the question ‘Does it work?’. These studies seek to answer this question by implementing the intervention into a specific context following the design and development research phase. Efficacy studies measure the impact of the intervention, which is the achievement of expected

change, when there are 'ideal' conditions, such as simulation, and effectiveness studies measure the impact under 'real life' conditions, such as in a clinical setting. Scalability studies consider the impact in several similar or different contexts.

Greater clarity of the research questions and the aims of the different types of research in the Common Guidelines have informed our choice and use of the most appropriate type of research on interventions, with an increasing awareness of the importance of design and development research. This major change in our research practice has avoided the temptation to 'run before we can walk'. This analogy highlights the need for an intermediate phase of research between early stage and impact research to ensure that the intervention is feasible and acceptable to all stakeholders. Our choice of design and development research has implications for the high quality conduct of this type of research and also how it is explicitly presented in any subsequent report or publication, including peer-reviewed journals and conferences.

The Common Guidelines do not have detailed advice on how to conduct design and development research and also we have not identified specific and appropriate guidelines for use in medical education. Despite this limitation, our research practice have been informed by modifying existing frameworks about the quality of conducting feasibility studies of randomised-controlled trials in healthcare. We have found the five objectives for conducting feasibility studies described by Orsmond and Cohn (2015) and the pilot and feasibility extension of the CONSORT guideline for reporting randomised-controlled trials especially useful to guide our research practice (Eldridge et al 2016).

Each research objective for feasibility studies that has been proposed by Orsmond and Cohn (2015) is accompanied by detailed questions to guide the research. We have adapted these objectives for greater applicability to medical education research:

- *Objective 1:* Evaluation of the most appropriate group of learners who might benefit from the intervention
- *Objective 2:* Evaluation and refinement of the methods of data collection, including the choice of outcome measures
- *Objective 3:* Evaluation of the acceptability of the intervention and the methods of data collection, including the choice of outcome measures for all stakeholders
- *Objective 4:* Evaluation of the resources and ability to manage the intervention and the study
- *Objective 5:* Preliminary evaluation of the benefit of the intervention based on the chosen outcome measures

These objectives highlight the need to conduct research in the context in which the intervention is intended to be used. Understanding the various factors that help and hinder how the intervention has been implemented, and also its potential outcomes, usually requires mixed-methods research that combine both quantitative and qualitative approaches. An iterative approach is also required and an appropriate research methodology, such as educational design research, can guide the overall process for conducting the research (Reeves and Chen 2020).

Our personal experience as medical education researchers actively involved in reviewing research proposals and journal submissions, conducting research and supporting early career researchers is that often there appears to be little awareness of design and development research, especially its importance before conducting impact research. We recommend that increasing this awareness of the importance of design and development research in all stakeholders in medical education research, from funders to researchers to journal editors, is the first priority in responding to the challenge of greater use of this type of research. The second priority is an increased awareness and application of iterative research methodologies, such as educational design research, for design and development research. The third priority is the application of existing frameworks for healthcare feasibility studies to medical education, with the

longer-term need to produce 'best practice' frameworks for the conduct of design and development research that are specific to medical education. All of these priorities could be achieved by publications and conference presentations but also through future medical education research training.

Our vision is that design and development research in medical education will avoid the rush to begin 'running before we can walk'. This has the potential to improve the quality and outcomes of impact research by ensuring that interventions are iteratively modified, with implications for how the findings of impact research will influence future medical education policy and practice.

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