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Using an implementation science framework to advance the science of nursing education

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ABSTRACT

Background: The process of adopting evidence-based educational practices and teaching methods has not been examined in nursing education.

Purpose: This article provides a framework for adopting educational evidence and designing studies in nursing education using an implementation science (IS) framework.

Method: The three phases for implementing evidence-based practices (development, translation, and sustainment) are used for this framework.

Results: Preparatory activities are needed before implementing a new educational practice or method, followed by identification of implementation strategies (e.g., training and support of faculty, strategies for communication and tips to remove barriers, guides for deciding on timing), assessing process and outcome measures, and plans for sustaining the new practice. A process map, examples of implementation processes, and sample research questions guide nurse educators in planning and conducting studies using an IS framework.

Conclusions: Research has not examined the processes and strategies for applying evidence-based educational practices in nursing. Studies using an IS framework are needed to provide knowledge about how to move evidence into routine educational practices and implement more effective teaching methods. This article provides guidance for nurse educators to begin this research and suggests possible research questions.

Research in nursing education has increased significantly in recent years. Nurse educators recognize the importance of generating evidence to guide their teaching and enable them to make informed decisions about the curriculum, courses, educational practices, teaching methods, and other aspects of nursing education. Studies are lacking, however, on the process of implementing research findings in nursing education and successfully adopting evidence-based educational practices and teaching methods. Concepts from implementation science (IS) may be valuable in guiding nurse educators in how to move evidence into routine educational practices and how to evaluate the adoption of evidence across courses and nursing programs. Most prescient are the opportunities to ask if in fact new approaches affect the outcomes of learners and ultimately the patients for whom nurses care.

Factors that facilitate the uptake of evidence and adoption of an evidence-based educational practice such as a new approach to teaching or assessment, a teaching method, or an educational intervention have not been established through research in nursing. For example, team-

based learning (TBL) has a well-developed evidence base: what factors should be considered when implementing TBL in a beginning nursing course? What factors would facilitate implementing this method and impede it? Research has not determined the process nurse educators use when implementing evidence-based educational practices or new teaching methods in a course or curriculum. As such, this process may be done in a haphazard way, with no outcomes measured to determine the effectiveness of the change. There may be essential components of the new practice or method such as readiness assurance tests with TBL that should be implemented to ensure the effectiveness of the practice or method. Do nurse educators implement those components as intended, or do they adapt and modify approaches they use based on cycles of evaluation and feedback? If so, does that affect the outcomes? Studies using an IS framework would provide knowledge that nurse educators could use when implementing evidence-based teaching practices in their courses and programs (Soicher et al., 2020).

While much research has been done on implementing evidence-

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based practices in health care, research of this type appears to be lacking in nursing education. In the absence of these studies, this article provides a framework for guiding nurse educators in implementing evidence-based educational practices and teaching methods and designing studies in nursing education using an IS framework.

What is implementation science?

Implementation science is the study of processes and approaches to promote the uptake of research findings and evidence into routine practice to improve patient outcomes and the quality and effectiveness of health care (Bazemore et al., 2018; Eccles et al., 2005; Nilsen, 2015; Wensing & Grol, 2019). In education, IS involves exploring the processes and strategies used to translate and apply evidence to guide educational practices with the aim of improving student learning outcomes. Using the example of TBL, these outcomes might include students' academic performance (scores on examinations in the course), problem solving ability, communication skills, engagement in teams and group work, and clinical competence if relevant. Student and faculty satisfaction with and preference for TBL compared to traditional teaching methods might also be examined to determine the effectiveness of TBL in one's own setting (Alberti et al., 2021; Mennenga, 2012, 2015; Ngoc et al., 2020). An understanding of the processes and strategies for successfully integrating research findings into one's own courses; environments in which teaching (classroom, online, simulation, clinical practice); and nursing program is central to engaging in evidence-based teaching in nursing.

In contrast to IS, *improvement science*, more commonly known as quality improvement, focuses on the evaluation of processes to improve care, or in educational settings, to improve student learning outcomes (Granger, 2018). For example, in education, improvement science approaches have already answered a number of questions about how or which teaching strategies work and identified some that are more effective than others (e.g., TBL, problem based learning, deliberate practice). Implementation science aims to answer research questions pertaining to adoption of the existing evidence in practice; that is, is adoption of proven practices such as TBL, problem based learning, and deliberate practice, having the intended effect on learner outcomes? If proven practices such as these are being adopted in nursing education, what are the factors contributing to the culture of successful adoption? Lastly, is effective adoption associated with improved learner outcomes? These IS questions remain unanswered.

Implementation science and education

A search of the literature revealed many studies on IS in health care, but no studies on implementing educational evidence in nursing education and the processes and strategies used by nurse educators for moving evidence into routine teaching practices. In education in general, limited research has been done using an IS framework (Lyon et al., 2018). Soicher et al. (2020), recognizing this need, developed a framework for applying evidence-based educational practices in the classroom. The overarching concept in their framework is scholarly teaching – identifying a problem in the course (classroom, online environment, clinical practice, simulation) or need for a new teaching method, investigating what other educators have done, selecting a different method based on evidence, and comparing results to baseline (Oermann, 2022; Richlin, 2001; Soicher et al., 2020). Soicher et al.'s framework also considers the science of learning and practice-based research—studies done in real world settings to determine the effectiveness of an educational practice or intervention. Studies that produced evidence on the effectiveness of TBL, problem based learning, deliberate practice, simulation, objective structured clinical examination, among many others, are examples of practice-based educational research. As this research accumulates, and there is a sufficient number of quality studies that have been done, findings can be synthesized in systematic reviews

and meta-analyses to provide strong evidence and best practices to guide teaching (Oermann, 2022; Soicher et al., 2020).

Implementation science is the last concept in this framework (Soicher et al., 2020). Educational practices and methods that were effective in a controlled environment (e.g., with a small group of nursing students in one course and one school) may not be effective in other settings because of variations in students, curricula, faculty, and programs and how faculty adapt practices and methods for their courses. Interventions that worked on a small scale often fail when they are scaled up (Ford et al., 2017) or tried out in other settings due to these variations. Studies in education using an IS approach and done across different settings focus on understanding these variables that affect feasibility and sustainability (Soicher et al., 2020).

Core phases and components of implementation science

Many models and frameworks of IS have been developed. In a review of the literature by Huybrechts et al. (2021), the authors found 28 IS models and frameworks. They conducted a narrative review of similarities and differences across them and identified three core phases and three core components needed to implement evidence-based practices. Although Huybrechts et al.'s review focused on health care, these phases and components are useful in guiding nurse educators in implementing evidence-based educational practices or teaching methods in nursing.

Core phases

The three phases for implementing research findings and evidence-based practices are development, translation, and sustainment (Huybrechts et al., 2021). These core phases were identified from process models of IS, which identify the steps, stages, or phases in the process of translating evidence into practice (Nilsen, 2015). Understanding the implementation process in nursing education would provide guidance to educators for translating research evidence into educational practices and facilitate adopting new teaching methods. Table 1 outlines a process for implementing evidence in nursing education.

Development phase

The development phase includes the preparatory activities and review that should be done before implementing educational evidence or a new teaching method. First, an assessment of issues or problems in a course or nursing program that suggests the need for a new approach should be conducted. Generally, there is a “trigger” – a situation that leads to implementation of new practices such as low ratings on student course evaluations, low scores on tests in a course or standardized assessments, feedback from students and faculty that certain teaching approaches or assignments are not effective, or new evidence showing a different teaching method is better. Triggers for implementing TBL in a course might be from course evaluations, a review of tests that indicate students are not able to correctly answer higher level items requiring problem solving and clinical judgment, faculty feedback on the need to engage students more actively in the classroom, or new evidence on the outcomes of more active learning strategies for teaching in nursing.

During this initial assessment, regardless of the trigger, educators should review the research and synthesize the findings, or review summaries of the evidence on which a teaching approach is based (Craig et al., 2008; Oermann, 2020, 2022; Pronovost et al., 2008). For TBL, faculty might begin with systematic reviews done in nursing education to understand the evidence and decide on outcomes to be examined when this new teaching method is implemented in their own course (Alberti et al., 2021; Dearnley et al., 2018; Ngoc et al., 2020; Wosinski et al., 2018). Additionally, faculty should assess the local setting by exploring current teaching methods and extent of active student engagement in courses, interest among the faculty and their readiness for transition to more active learning strategies and to implementation of TBL, preferences of students in the course and nursing program,

Table 1
Process map for implementation phases.

Development phase	
Triggers	Activities
Low ratings on course evaluations Low scores on quizzes/tests in a course or standardized assessments Feedback from students and faculty that teaching approaches or assignments are not effective New research findings/evidence showing a different teaching practice or method is more effective	Review research (syntheses or summaries of the evidence or reviews of individual studies) Conduct survey of current teaching practices, readiness of educators for adopting new approaches, and facilitators and barriers Review characteristics of the course, students, educators, and nursing program that might influence implementation Do fishbone diagrams Conduct focus groups and one-to-one interviews with students and educators Have small group discussions and brainstorming with educators at course and program meetings <i>Identify Evidence-Based Educational Practice(s)</i> Based on the review, identify the evidence-based educational practice(s) that will be implemented (e.g., TBL, problem based learning, deliberate practice)
Translation phase	
Implementation strategies	Outcomes
Removal of barriers or workarounds Training of and support for educators Opportunities to role play and practice implementing new approach Guides and resources for implementation Communication strategies Support from leaders Resources Guides for deciding on timing Peer observations with formative feedback	Improved learning (on quizzes/tests, assignments) Improved scores on standardized assessments Improved clinical competencies Higher scores on course evaluations Higher ratings of student satisfaction Educators express satisfaction Adequate preparation of educators Adoption of new practice or teaching method as designed (fidelity)
Sustainment phase	
Plans for sustaining practice	Outcomes sustained over time
Develop plan to continue with educational practice or teaching method after initial implementation Identify coordinator within course or program to sustain new practice Handoff to new educators in course	Outcomes from translation phase continue Adequate preparation of new educators for using educational practice or method

barriers to implementing these strategies, and other characteristics of the course, students, faculty, and nursing program that might influence implementation. The assessment reveals the feasibility of implementing a new educational practice or teaching method and activities that should be done in preparation for a new approach to teaching.

Translation phase

The second phase, translation, involves the implementation of the evidence-based educational practice or teaching method. This involves implementing the change into the classroom, online environment, simulation, or clinical setting – into the real-world educational setting – and measuring outcomes. In this phase, there are two key actions: (1) introducing the educational practice or teaching method using the information identified earlier in the development phase such as how best to prepare faculty and students, ensure leadership support, and confirm other resources for implementation such as technology support if the method requires a new technology, and (2) monitoring implementation to ensure continuous improvement (Huybrechts et al., 2021).

Understanding the research findings and assessing the setting, explored in the prior phase, are critical to integrating the practice into routine teaching. The translation phase involves applying that information including types of support. For example, in this phase nurse educators would provide the training needed to learn about and use the educational practice or teaching method (as well as the related evidence base); communicate essential information to colleagues, members of the course team, and leaders in the nursing program; confirm that the technology and other resources are set up; identify process and outcome measures to use in evaluating the new practice or method; and monitor the implementation to ensure fidelity and improvement of outcomes.

Sustainment phase

The third or sustainment phase involves the continued use of the

evidence-based practice, for example, active learning strategies become routine practices across all courses in the nursing program. In the sustainment phase, the practice that was introduced earlier is maintained. Huybrechts et al. (2021) indicated that this phase is more than adopting an evidence-based practice, teaching method, or educational intervention but instead is the continued use of it over time.

Core components

Huybrechts et al. (2021) identified three core components that affect the success of the three phases of implementation. These components are the intended change, context, and implementation strategies.

Change

The intended change relates to the type of change or actions needed to implement the evidence-based educational practice or teaching method. This might include gaining new knowledge to understand the practice and related research evidence and to implement the approach in one's own teaching. The change might require a change in behavior of the individual educator, course team, or faculty as a whole or an organizational change.

Context

Implementing evidence-based practices requires an understanding of the context – the setting or environment in which the practice is to be used. In health care, context reflects organizational support and culture, financial resources, interpersonal processes in the setting, leadership, and time, among others (Nilsen & Bernhardsson, 2019). Understanding context is equally important when implementing new educational practices in a course or nursing program: leadership and organizational support for new practices, culture of the school, an understanding of how educators work with one another and with administrators, financial

resources, technological and other resources specific to the evidence-based educational practice or teaching method, and other factors that can influence implementation. In health care, context often explains the variability across studies in success of implementing evidence-based practices and differences in the effectiveness of interventions across settings (Nilsen & Bernhardtsson, 2019; Squires et al., 2015). It is likely this is also true in nursing education.

What works in one setting and course, and with one group of students, may not in another. In nursing education research, typically it is not realistic to randomly assign students to different educational interventions or control the confounding variables through selection of participants and randomization. Implementation studies take place in real-world settings so the task of the researcher is to identify potentially relevant variables that might influence the outcomes and to build these in the study, often as research questions. Examples of these variables are students' prior background and experiences, prerequisite courses, grade point average, and other characteristics of students; placement of the educational practice or teaching method in the curriculum; characteristics of the nursing program and college or university; financial, technology, and other resources; experience and background of faculty and educators in other roles; and culture of the organization and within the course, among others.

Implementation strategies

Implementation strategies are the approaches used to implement the evidence-based educational practice or teaching method. In health care literature, these include strategies such as action plans, audit and feedback, checklists, educational outreach visits, e-learning, educational games, educational meetings, and reports, among others (Chan et al., 2017; Cullen et al., 2022). These strategies used in health care have been shown to be effective in IS studies (Chan et al., 2017; Cullen et al., 2022; Reynolds et al., 2021). For nursing education, implementation strategies may include training and support of educators, techniques to communicate the new approach and help educators in using it in their teaching, strategies to remove barriers or work within them prior to starting the new practice, and guides for deciding on timing of the implementation given the demands on faculty and students. Following the initial training on how to implement an educational practice or teaching method, opportunities for nurse educators to role play and practice implementing the new method, combined with observations by peers with expertise in the practice or method to provide formative feedback, would be valuable in helping educators develop competency and confidence in using the new approach. The strategies used in health care to implement evidence-based practices may be transferable to nursing education; however, research is needed to identify effective strategies for adoption of evidence-based educational practices in nursing education.

Measures for determining effectiveness of implementing evidence-based educational practices

To determine the success or effectiveness of implementing a new evidence-based practice or teaching method, process and outcome measures should be identified early and assessed throughout implementation. Examples of process measures include course and teacher evaluations, mid-semester evaluations, feedback from students and educators, compliance with training, fidelity or adherence to the educational practice or teaching method, and peer evaluation of implementation of the practice or method.

Outcome measures include students' grades on quizzes/tests/course examinations and standardized assessments, scores on course and teacher evaluations, and scores on other measures related to the specific teaching practice or method, such as scores on teamwork or student engagement instruments for implementation of active learning strategies. For both process and outcome measures, nurse educators should identify metrics to use for interpreting the data, for example, students'

grades on quizzes and tests increase and scores on course and teacher evaluations are above the benchmark of the nursing program and are higher than pre-implementation.

Planning for studies in nursing education using implementation science

As a way of integrating the concepts presented in this article, the authors provide examples of implementation processes (through the development, translation, and sustainment phases), beginning with a clinical example that may be familiar to readers (Table 2). Reynolds et al. (2021) found that central line associated bloodstream infections (CLABSIs) were a trigger at two large health care systems. After reviewing the literature and current practices (development phase), they conducted an IS study to evaluate the impact of implementing chlorhexidine gluconate (CHG) bathing in the intensive care unit setting. The evidence-based practice (CHG bathing) was implemented using the effective strategies of audit and feedback and educational outreach visits; metrics included CHG bathing compliance (process measure) and CLABSI rates (outcome measure) (translation phase). Plans were put into place to sustain the improvements over time (sustainment phase).

In nursing education, educators can use a similar approach when triggers are identified. For example, if a course has low ratings on student course evaluations, and feedback from students that some of the lectures and classes did not promote their learning, these may be triggers for the educator to review the literature to identify other educational practices or methods that might be used (development phase). Following the review, the educator may choose to use TBL or problem based learning for the course (development phase). This evidence-based approach then needs to be implemented into the classroom (translation phase). Whereas there are effective implementation strategies identified in the health care literature (e.g., audit and feedback, educational outreach, educational meetings), evidence is not available as to which strategies are effective for implementing educational practices. Health care implementation strategies, however, might be modified and used in nursing education. Once the evidence-based practice is translated into the classroom, process and outcome measures should be evaluated to understand the impact of the change (translation phase). If successful, plans should be put into place to sustain the practice (sustainment phase) (Table 2).

The implementation processes such as those outlined in Table 2 suggest research questions that a nurse educator could use to plan studies for the development, translation, and sustainment phases to build the science in nursing education. Table 3 provides some possible research questions for these studies.

Resources to get started

There are many different implementation models and frameworks that might be used for studies in nursing education and resources to get started. The National Institutes of Health Fogarty International Center includes three toolkits (on IS methodologies and frameworks, participatory research models and building stakeholder relations, and dissemination strategies) and a link to additional resources (<https://www.fic.nih.gov/About/center-global-health-studies/neuroscience-implementation-toolkit/Pages/methodologies-frameworks.aspx>). At the Dissemination and Implementation Models website (<https://dissemination-implementation.org/content/diMain.aspx>), nurse educators can learn about planning a study using an IS model, search for models that would be relevant for their educational practice or teaching approach, learn how to combine multiple models or adapt a model to best meet their needs, and search for measures of variables.

Reporting guidelines for IS research in nursing education

Outcomes of IS studies, similar to other research in nursing

Table 2
Examples of implementation processes.

Example type	Development phase			Translation phase		Sustainment phase	
	Triggers	Activities	Evidence-based practice(s)	Implementation strategies	Outcomes	Plans for sustaining practice	Outcomes sustained over time
Clinical	High CLABSI rate in ICU setting	Review of literature Review of current practices Completion of a Fishbone diagram with staff nurses and providers	CHG bathing for all ICU patients	Audit and feedback Educational outreach visits	CHG bathing documentation compliance (process measure) CLABSI rates (outcome measure)	Integrate CHG bathing into the nurse's handoff Daily review of CHG bathing during unit huddles	Continue to evaluate process and outcome measures over time
Education	Low ratings on student course evaluations Low scores on exams and standardized assessments Tests measure memorization Feedback from students and faculty on lectures, use of PPT, limited discussions in class	Review of literature Review of course evaluations for the prior 3 years Focus groups with students Meetings and interviews with faculty	TBL	Review of evidence with faculty and program leaders Action plan for implementation across courses in junior then senior year Faculty training Educational meetings Guide for implementing readiness tests Feedback	Number of students completing and satisfaction with preclass readings, videos, other learning activities (process measures) Individual and team readiness assurance test scores (process measures) Types and structure of in class group work (process measure) Final exam scores, % correct on higher level items, scores on teamwork, student satisfaction (outcome measures) Student course ratings (outcome measure)	1–2 new courses adopt TBL each year Evidence for TBL and use integrated in new faculty orientation Preparation of students for TBL in 1st nursing course	Higher scores on standardized assessments, NCLEX type items on tests Higher scores on student engagement and program exit surveys Student and faculty preference for TBL over lecture and PPT
Education	Lack of retention of skills In adult health <50% of students can perform essential skills Low preceptor ratings of clinical skills Exit survey score on student assessment of their skill competency is less than 3.0 benchmark	Review of literature on psychomotor learning, skill decay, spaced practice, deliberate practice Theories of motor learning and phases Comparison of skill assessments (checkoffs) in fundamental and adult health courses Interviews with clinical nurse educators and preceptors Review of exit surveys for 3 years (questions related to skills, lab practice, clinical practice) Interviews with residency coordinators	Deliberate practice of skills	Action plan for implementing skill practice Educational meetings (course and lab faculty, simulation director) Meetings with clinical educators and preceptors Observations Timely feedback	Scheduled practice, skills in simulations, skill refreshers (process measures) Observations (faculty, clinical nurse educators, preceptors) with feedback (process measure) Student self-assessment and independent practice (outcome measure) Skill competence (outcome measure)	Skills and practice mapped across courses and simulations Skills refresher integrated in capstone course Annual review of performance evaluations integrated in program evaluation plan with benchmarks	Continue to identify essential skills to practice and gaps in practice Student and graduate skill competence and confidence in performing clinical skills

CLABSI, central line associated bloodstream infection.

CHG, chlorhexidine gluconate.

ICU, intensive care unit.

PPT, PowerPoint.

education, need to be disseminated. Reporting guidelines are tools, often in the form of checklists, that ensure that key information about a study is included in an article. By following these guidelines, authors are prompted to include in their article essential information about the research methodology and to present the findings with sufficient detail for others to accurately interpret them. The aim of reporting guidelines is for articles that report research to be comprehensive, clear, and transparent (Oermann et al., 2018; Stevens et al., 2014).

Pinnock et al. (2017a) indicated that IS studies are often poorly reported, which makes it difficult to find, reproduce, and synthesize the evidence from relevant studies. The Standards for Reporting Implementation Studies (StaRI) are guidelines to ensure comprehensive,

accurate, and transparent reporting of IS studies. These guidelines include a checklist with 27 items and an accompanying explanation of the items (Pinnock et al., 2017a, 2017b). Similar to other reporting guidelines, not every item is needed for every manuscript, but using these guidelines will help ensure that essential information is included to guide readers when considering implementation of educational practices in their own nursing courses and programs.

Summary

Studies using an IS framework are needed in nursing education to guide educators in implementing educational evidence and new

Table 3
Possible research questions for studies on implementation of evidence-based educational practices in nursing.

Core phases	Possible questions
Development	<p>Do educators routinely reflect on current educational practices and their effectiveness, and if so, what data do they use?</p> <p>Is the reflection on current educational practices and effectiveness done typically by an individual faculty member in a course or by the course team or another group of faculty (e.g., curriculum or evaluation committee)?</p> <p>What evidence do nurse educators review as a basis for a new educational practice or teaching method, e.g., systematic reviews of research?</p> <p>Do educators routinely review the literature to gain new ideas for teaching in nursing based on research? If so, are these reviews of nursing education research only, or nursing, health care, and higher education research?</p> <p>What information should be collected about the course, curriculum, students, faculty, leadership in the school, resources, and other areas to successfully implement an evidence-based educational practice?</p> <p>What information about students, educator, resources, and other variables might influence the effectiveness of the practice or teaching method, and thus should be collected in any studies of outcomes?</p> <p>What factors will facilitate implementation? What are barriers in the local setting?</p> <p>What training and support are needed for nurse educators to understand the evidence and educational practice or method and for effective implementation?</p> <p>What are the best approaches to use to prepare educators, students, leaders, and others about a new educational practice or teaching method?</p> <p>How will effectiveness, or success, of the new educational practice or teaching method be measured?</p>
Translation	<p>Do educators use the information collected in the development phase to introduce an educational practice or teaching method, and if so, what is critical information to guide implementation?</p> <p>Are strategies that are most effective for introducing a new educational practice to nurse educators, preparing them to use it, and implementing it into practice being used? At what frequency? At what penetration or in what proportion of the population of nurse educators are the effective strategies being used?</p> <p>Are the most effective methods for communicating with individual faculty members and the course team to facilitate implementation and remove barriers being used?</p> <p>Is there a difference in implementation success based on strength of the evidence for a practice change, characteristics and complexity of the practice to be implemented, extent of change in teaching needed by educators who will implement the new method in their course or nursing program, and commitment of educators to change?</p> <p>Is the new practice or method “better than” the prior one? Is it more effective in terms of student learning or other outcomes?</p> <p>In evaluating an educational practice or teaching method, what variables might influence its effectiveness? Is this information collected as part of the research study?</p>
Sustainment	<p>What plans are in place to monitor implementation to ensure fidelity and continuous improvement?</p> <p>Are the educational practices and teaching methods that were introduced to faculty and students, and implemented in courses or the nursing program, sustained over time? If they are, what factors facilitated this? If the practice was not maintained, why not?</p> <p>What strategies do nurse educators use to evaluate sustainment of an educational practice and continued improvement in learning and other outcomes?</p> <p>Over time, are features of the practice modified? Does this affect outcomes?</p>

teaching approaches. To our knowledge, research has not examined the processes and approaches for applying evidence-based practices in teaching in nursing. Studies of this type would provide knowledge about how to move evidence into routine educational practices and implement more effective teaching methods

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