Supporting Undergraduate Students in Conducting Knowledge Synthesis Research: Exploration of Two Approaches

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Context
A recent scoping review (Premji, Hayden & Rutherford, 2021) discovered only a few published articles discussing courses or workshops focused specifically on the teaching knowledge synthesis research process to undergraduates. Other than these handful of publications, there is little known about the support or learning opportunities for undergraduates conducting knowledge synthesis research. As Wissinger (2018) notes, many consider knowledge synthesis research is too complex or time consuming for undergraduates. The benefits of educating undergraduate students on knowledge synthesis methodology go beyond the individual project. Undergraduate students are the graduate students of tomorrow, and the researchers of the future; they may end up supporting and mentoring students throughout their academic and personal lives. Understanding what good quality knowledge synthesis looks like is an essential skill in order to be more critical consumers of information. Furthermore, ensuring students conduct their systematic review using sound methodology taught via educational interventions can result in less research waste and decreases redundancies in the number of systematic reviews being published (Page & Moher, 2016).

Program for Undergraduate Research Experience

- Undergraduate students who received a Program for Undergraduate Research Experience award
- Student-driven funded undergraduate research project for 8, 12, or 16 weeks between the months of May and August
- 3-week series on systematic review methods offered the same day/time for three weeks. Each workshop was 2 hours and taught via zoom
- Divided into morning and afternoon sessions, with each session’s participants from related disciplines
- 2 librarians with expertise in systematic reviews

Workshop Goals
- The 3 workshops provided a solid foundation for students to understand the process and complexity of conducting a systematic review
- All workshop content is based in relevant concepts and principles. Students are able to write a comprehensive protocol understanding seed articles, conducting searches and translating searches
- Students are introduced to reporting guidelines

Content

1. Setting Yourself Up for Success
   - Understand the importance of a protocol for a systematic review Lecture + Activity
   - Describe the various components of a systematic review: subject headings, keywords, field codes, AND/OR operators. Lecture/demonstration
   - Create a researchable question using a question framework Lecture + Activity
   - Develop inclusion/exclusion criteria Lecture + Activity
   - Define subject headings and keywords and understand the differences between them Lecture /demonstration
   - Find and analyze seed/brown papers for keywords and subject headings. Demonstration + Activity

2. Developing Your Data Collection Strategy
   - Determine the searchable concepts in your research question and ranking them according to importance for searching Activity
   - Identify the various components of a systematic review: subject headings, keywords, field codes, AND/OR operators. Lecture/demonstration
   - Build a comprehensive protocol using one concept in a primary database (Web of Science, PsycINFO or EBSCO Academic Search Complete) using correct syntax and the concept block method. Activity
   - Test a comprehensive search against known/seed articles Demonstration
   - Save searches and apply good data management/file management practices (naming, etc.). Lecture/demonstration
   - Evaluate a search and identify errors/missing elements according to a checklist Activity

3. The Next Steps: Translating, Tracking, Reporting and Study Selection
   - Create a translation of a researchable question to another database and AND PsycINFO to EBSCO Academic Search Complete or vice versa. Lecture + Activity
   - Database choices adjusted depending on the disciplines of the students. Lecture/Demonstration + Activity
   - Describe various supplementary search techniques including citation checking Lecture + Activity
   - Understand the reporting expectations of a systematic review, and identify one common reporting guideline Lecture/demonstration
   - Evaluate 2-3 published methods sections against a reporting guideline to determine completeness/reporting expectations Activity
   - Describe the process of study selection, and identify common tools/software used to conduct study selection Lecture/demonstration
   - Evaluate 4-5 article titles/abstracts against stated eligibility criteria to experience the process of title/abstract screening Activity

Nursing Undergraduate Credit Course

- Fourth-year undergraduate nursing students
- Elective course credited towards BScN students interested in research and knowledge translation.
- Course: NURS541 Using Research in Nursing Practice: Missing Evidence to Action
- 13 week credit course
- Once a week, for 3 hours taught via zoom
- 1-1.5 hour lecture followed by group work
- No exams; individual and group assignments; assigned readings
- 1 Nursing instructor and 1 librarian co-instructor; guest speakers

Course Goals
- The key competencies students acquire in this course are the abilities to systematically find, analyze, and synthesize evidence. Students learn that the evidence may lie in low or high on the levels of evidence hierarchy and that they may need to combine research from various levels of evidence. Students also learn to work as a research team to manage a process for determining evidence and engaging in a knowledge translation strategy that will have impact.

Content

1. Lecture
   - Introduction to the course: defining a researchable question using PICO
   - Database search. Activity
   - Search strategy: refining search terms, keywords, truncation, limits, and Boolean (AND/OR) as well as similarity amongst other group members.

2. Assignment
   - PICO question and rationale that is practice-based or issue from their clinical experiences. Group determines the question, and is used throughout the semester. 2 page paper Group Assignment
   - Database search. Activity
   - Although an individual assignment, the group needs to work together to ensure that the systematic searches for each database are similar. It is essential that the students understand the search strategy. Each group develops a search strategy, including keywords, truncation, limits, and Boolean (AND/OR) as well as similarity amongst other group members. Individual Assignment

3. Assignment
   - Detailed inclusion / exclusion criteria, study selection, and completed PRISMA flow diagram. Students use Covidence to screen the results. Selected studies must meet the inclusion / exclusion criteria and students are not to include other systematic review Group Assignment
   - Critical appraisal of 2 studies by each student. Students use the CASP critical appraisal checklist, or a modified “Barber Table” (critical appraisal approach discussed in the course textbook) Individual Assignment

4. Assignment
   - Synthesis of findings. In this assignment, each student group develops a point form comparison of the identified and appraised published studies used in the previous individual assignment. The paper needs to include one or more recommendations for practice. The recommendation must incorporate clinical expertise, context of care, research evidence and/or a patient’s preferences. Limit to 6 double-spaced pages Group Assignment
   - Knowledge translation: Infographic and presentation. Each group develops an infographic that summarizes the findings of their review, including their main message and how change can be implemented Group Assignment
   - Peer review of group Individual Assignment

Lessons Learned

Undergraduate students can be involved in knowledge synthesis research with the right education and continued supports in place. They can be successful in all areas of the review process and are eager to learn and grow their research skills.

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