

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 through similar projects in the future. The skills learned while conducting a systematic review, such as searching the scholarly literature, managing references, appraising studies, and working on a collaborative research project are invaluable. These skills will improve the quality of future academic and research projects. Undergraduate students are already consumers of research, both in 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

Population	❖ Undergraduate students who received a <i>Program for Undergraduate Research Experience</i> award ❖ Student-driven funded undergraduate research project for 8, 12, or 16 weeks between the months of May and August
Format	➢ 3-workshop 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
Instructors	✓ 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 ❑ After completion of the workshops, students are able to write a comprehensive protocol, understand analyzing seed articles, conducting searches and translating searches. ❑ Students are introduced to reporting guidelines
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Content Activities	Workshop #1: Setting Yourself Up for Success 1. Understand the importance of a protocol for a systematic review Lecture 2. Describe the elements of a systematic review protocol Lecture + Activity 3. Create a researchable question using a question framework Lecture + Activity 4. Develop inclusion/exclusion criteria Lecture 5. Define subject headings and keywords and understand the differences between them Lecture /demonstration 6. Find and analyze seed/known papers for keywords and subject headings Demonstration + Activity Workshop #2: Developing Your Data Collection Strategy 1. Determining the searchable concepts in your research question and ranking them according to importance for searching Activity 2. Identify the various components of a systematic search; subject headings, keywords, field codes, AND/OR operators. Lecture/demonstration 3. Build a comprehensive systematic search for one concept in a primary database (Ovid APA PsycInfo or EBSCO Academic Search Complete) using correct syntax and the concept block method. Activity 4. Test a comprehensive search against known/seed articles Demonstration 5. Save searches and apply good data management/file management practices (naming, etc.) Lecture/demonstration 6. Evaluate a search and identify errors/missing elements according to a checklist Activity Workshop #3: The Next Steps: Translating, Tracking, Reporting and Study Selection 1. Create a translation of a search strategy from the primary database to another database (Ovid APA PsycInfo to EBSCO Academic Search Complete or vice versa. Note: Database choices adjusted depending on the disciplines of the students) Lecture/demonstration + Activity 2. Describe various supplementary search techniques including citation checking Lecture 3. Understand the reporting expectations of a systematic review, and identify one common reporting guideline Lecture/demonstration 4. Evaluate 2-3 published methods sections against a reporting guideline to determine completeness/reporting expectations Activity 5. Describe the process of study selection, and identify common tools/software used to conduct study selection Lecture/demonstration 6. Evaluate 4-5 article titles/abstracts against stated eligibility criteria to experience the process of title/abstract screening Activity
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Learn more about the workshop lesson plans:



Support	Personal Librarian Support Student names and project topics were provided to the librarian instructors who recruited subject librarians to participate. Assignments were done based on the topic of the project, not the home discipline of the student. Each student received a welcome message from their librarian (based on a generic template provided by the coordinators). Further contact was student-initiated. Anecdotal evidence showed that some students reached out to their personal librarians and others went to the library for help instead.
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Nursing Undergraduate Credit Course

Population	❖ Fourth year undergraduate nursing students ❖ Elective course chosen by students interested in research and knowledge translation. ❖ Course: NURS541 <i>Using Research in Nursing Practice: Moving Evidence to Action!</i>
Format	➢ 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
Instructors	✓ 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 be 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.
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Content	Course Weekly Overview Week 1: Introduction to the course; designing a researchable question using PICO Instructor + Librarian Week 2: Systematic literature searching Librarian Week 3: Determining inclusion / exclusion criteria, levels of evidence, PRISMA Instructor + Librarian Week 4: Locating the informative elements of a research article: sampling, data collection, reliability and validity Guest Speaker Week 5: Statistics and analysis; understanding qualitative and quantitative data Instructor Week 6: Data extraction: interpreting data results; select themes for synthesis Instructor Week 7: Synthesizing evidence across disciplines and multiple research methods Instructor Week 8: Group presentations on study data extraction Week 9: Group work on synthesizing studies Week 10: <i>Reading Week – no classes</i> Week 11: Knowledge translation and how to implement a practice change; how to create an informative, engaging Infographic Librarian Week 12: Translating research findings Guest Speaker Week 13: Group presentations of Infographic Week 14: Group presentations of infographic
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Assignments	Assignments 1. 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 2. Database search. 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 this. The searches are marked on the use of subject headings, keywords, truncation, limits, and Boolean (AND/OR) as well as similarity amongst other group members. Individual Assignment 3. 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 reviews Group Assignment 4. Critical appraisal of 2 studies by each student. Students use the CASP critical appraisal checklist, or a modified “Barker Table” (critical appraisal approach discussed in the course textbook) Individual Assignment 5. 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 6. 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 7. Peer review of group Individual Assignment
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Support	Librarian Support The Librarian is a co-instructor of record and provides support throughout the course. She meets with each student group outside of class time to review search strategies. The course goal is to provide students with hands-on experience with the main areas of conducting a systematic review. Therefore, the Librarian revises each group’s searches (after they have been marked) so that a manageable number of records (approx. 200) are retrieved in total for each group and uploads the results to Covidence. The students then screen the smaller set of records.
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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

References

Page, M. J., & Moher, D. (2016). Mass Production of Systematic Reviews and Meta-analyses: An Exercise in Mega-silliness?. *The Milbank Quarterly*, 94(3), 515-519.

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