

Engaging Undergraduates in Research: Designing and Developing a One-Semester, Course-Based Research Project



Editor's Note: This article is part of a series developed by the Nutrition and Dietetic Educators and Preceptors (NDEP) group on emerging topics of interest in dietetics education.

HOW DO YOU PREPARE STUDENTS in a world of changing information and professional practices? The scientific approach encompasses problem solving, critical thinking, and the ability to interpret and apply scholarly information. Conducting original research at the undergraduate level is a meaningful experience, because the overall process, developing questions and systematically finding the answers, presents a mechanism for students to develop and practice the necessary skills. The Accreditation Council for Education in Nutrition and Dietetics (ACEND) curriculum standards for didactic programs emphasize the importance of these skills, because students must understand research methods, interpret research findings, and translate external findings into evidence-based practice.¹ The value of these skills is also documented across other related disciplines, including biology, psychology, and public health,²⁻⁴ and has been widely endorsed by the Association of American Colleges and Universities as a high-impact learning practice.⁵ Introducing original research activities early also prepares students for the expectations of leading research

at the Master's level.⁶ However, faculty struggle to provide enough individual research opportunities because of increasing workloads. Broader, course-based options are becoming a popular alternative to reach more students. Faculty offer course-based research activities equally across disciplines, ranging from social sciences (49%) to science, technology, engineering, and math (commonly referred to as "STEM" [36%]).⁷ The purpose of this article is to present a semester-long undergraduate research project in a junior-level Lifecycle Nutrition course as a model to highlight the learning opportunities gained by conducting original research at the undergraduate level. Additional evidence from the literature informs implementation considerations and recommendations.

THE VALUE OF UNDERGRADUATE RESEARCH

Undergraduate education began shifting from a model of information consumption toward information creation after the Boyer Commission recommended reforms to better establish research opportunities.⁸ In response, several universities across the United States have added or expanded undergraduate research opportunities to elevate students' educational experiences. Over the last few decades, higher education researchers have documented the high impact of undergraduate research in student learning.⁹ One benefit is greater understanding of academic major and advanced career development.^{7,10,11} Additional outcomes include improvements in domain knowledge, research skills, and higher educational satisfaction.⁷ Enhanced critical thinking skills and student engagement and retention through the application of undergraduate research also supports the novelty of undergraduate research.¹²⁻¹⁵ To balance the student benefits and the

limits on faculty time, course-based research is emerging as a more common option to engage students.¹⁶⁻¹⁸

Given the strong evidence supporting the many benefits of undergraduates conducting original research, the course instructor designed the Spring 2015 Lifecycle Nutrition course to allow junior-level dietetic students to conduct a research project on attitudes and perceptions of college-age students on breastfeeding. In this project, research was built into a multi-component course project in which students used the process of literature review, data collection, and data analysis to better understand the origin of evidence-based practice.

A MODEL OF COURSE-BASED UNDERGRADUATE RESEARCH

Project planning started in November 2014 for implementation in Spring Semester 2015. Students had previously obtained library research instruction in their freshman year and completed the Lifecycle Nutrition course before their senior seminar on research in their senior year. The instructor preselected the topic of breastfeeding, because the topic also coincided with course content taught in Lifecycle Nutrition. The instructor focused the research population to college-aged students to introduce students to perspectives outside of the stereotypical average age of new mothers; this shift in population helped reinforce the need for tailoring interventions to address patient values, preferences, and literacy levels. The larger region of the campus has also historically had a high teen pregnancy rate, making the information applicable to a real-world problem. The instructor also selected the methodological design, qualitative inquiry through focus groups. The course was not designed as a formal research methodology course, but rather as a course that examines the nutritional

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needs of individuals and populations across the life span. Study design and methodology was preselected to streamline the project.

Students formed teams of approximately four students per team. Each team was responsible for completing literature reviews, identifying a line of inquiry, developing focus group questions around the topic of breastfeeding, completing ethics training, recruiting participants, conducting a focus group, analyzing data, and presenting results and findings to the class. Activities were scaffolded across the 16-week semester, and small assignments occurred at each of the major points in the research process. The [Figure](#) describes the educational modules and assignment schedule for the project. In addition, the instructor used regular course materials, such as Academy Position and Practice papers; learning modules, such as Collaborative Institutional Training Initiative (CITI) training;

and hands-on exercises to help students establish a foundation in research methods.

CONSIDERATIONS FOR DESIGNING A COURSE-BASED UNDERGRADUATE RESEARCH PROJECT

Course Design and Logistics

Careful planning of course materials, assessments, and research logistics are essential when designing a course-based research project. To start, the process of research and its many components does not have to be executed in its entirety and to the fullest degree for students to learn its value in their discipline. Selecting and scoping topics and research methods for the students also can be a strategy to balance the course content, research activity, and time.¹⁹ In this case, the instructor used research as a way to help students

understand how the process of research informs the development of evidence-based practice, connecting back to course objectives and accreditation standards. The tenets of the research process came to life through the following course objective: *To apply knowledge about nutritional needs of various phases of the life cycle; specifically to incorporate nutrition education information by planning nutrition education to target a specific audience.*

The components of the research process can be infused also through different courses in the curriculum and can be built on as students progress. Instructors may choose to select certain aspects of the research process and to scaffold skill development. For instance, Florida Atlantic University identified three pedagogical stages for scaffolded undergraduate research skill development: research and inquiry exposure, research and inquiry skill-building, and intensive research and

Assignment	Education Module	Due Date
Research Process Quiz	Quiz determines overall comprehension of a three lecture series on the research process and research methodology, including the conduct of mock focus groups.	Week 3
CITI ^a Research Ethics Training for IRB ^b	Training and certification for human subjects research presents the importance of ethics in research.	Week 3
Literature Review, Research Question Development, & IRB Methods Section	Review tutorial on literature reviews. Apply tutorial information to find, evaluate, and synthesize scholarly literature to guide their line of inquiry.	Week 6
One-on-One Instructor Meeting	Teams distill, analyze, and interpret data to develop emerging topics and themes. Students met with instructor 1 week after completing focus groups to debrief and discuss the direction of their analysis.	Weeks 6-9
Submission of Results Section	Teams submit their results section, including emerging topics and themes supported by the evidence of participant quotes.	Week 10
Submission of Discussion Section	Teams submit their discussion section, comparing existing literature with their findings and interpretation of findings into practice.	Week 12
Group Member Critique	Each team member individually critiqued their other team members and reporting their contribution to the project.	Week 15
Final Paper/Presentation	Teams presented their process, results, and conclusions to their other classmates.	Week 15 (paper) Week 16 (presentations)
^a CITI=Collaborative Institutional Training Initiative.		
^b IRB=Institutional Review Board.		

Figure. Scaffolded assignment schedule for course-based undergraduate research.

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