Symbiosis – Undergraduate Research Mentoring and Faculty Scholarship in Nursing

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Abstract

While teaching is the major focus of academia, research and professional publications frequently determine faculty eligibility for promotion and tenure. In universities where funded research is scarce, faculty need creative means to accomplish research goals. Research is an essential part of baccalaureate nursing education. The goal of research education at the baccalaureate level is to prepare knowledgeable consumers of nursing research. The purpose of this article is to describe an undergraduate nursing research course that provide students with hands on experience in the conduct of nursing research and provide faculty with assistance in moving their research agenda forward. Faculty members were solicited to work with 5-10 students in a research project that was either in the planning stages or actively in progress. After one year of program implementation, faculty and students were involved in presenting poster and oral presentations at state, regional, and international research conferences. Manuscripts as well as proposals for funding are in the process of submission.

Introduction

Many university faculty are asked to be both expert in teaching and scientific discovery as they progress toward promotion and tenure. However, many academic environments provide limited research funding and support, therefore, faculty are encouraged to work efficiently by combining teaching and scholarship activities to maximize outcomes. Research is an essential part of baccalaureate nursing education in many colleges and universities. One goal of nursing research education at the baccalaureate level is to prepare knowledgeable consumers of healthcare research. In order to become discriminating consumers of research, students must understand the major tenets and appreciate the subtleties that are inherent in this process. This article presents an integrated model of teaching undergraduate research, mentoring students in the research process and fostering the completion of pilot studies with faculty and students as team members.

The American Association of Colleges of Nursing [1] emphasize interpersonal collaboration on a research team as an expectation of baccalaureate education. Collaborative research efforts that include both academic faculty and undergraduate students can be mutually beneficial. The model adopted by the School of Nursing faculty at the University of Delaware provides mentored research immersion for each student in an area of focused scientific interest. By

participating in actual research, students learn the research process first hand, and faculty research projects can be expedited.

Literature Review

Faculty scholarship

Several obstacles to faculty scholarship are reported in the literature. Nurses tend to pursue doctorates later in their career, which can limit the number of years of research productivity. The current faculty shortage, in the face of growing student enrollment, creates further challenges for potential nurse scientists [1]. The demands of teaching and service and dwindling collegial support are barriers to conducting research. Heavy teaching workloads may be detrimental to scholarship and grantmanship, as faculty juggle classroom, clinical, and committee responsibilities [2].

Several interventions have been suggested to enhance nursing faculty scholarship [1, 2]. In order to improve academic scholarly output, administrators should foster scholarship. They can do this by offering equal research opportunities to all senior faculty, providing an efficient organizational structure, encouraging faculty development opportunities, and delegating non-faculty activities to support staff [1, 3, 4]. At the individual level, faculty should maintain a balance between work and non-work activities to allow for rest and renewal. Faculty should evaluate how their workload affects research productivity, and consider using teaching assistants and assistive technology, when possible, to free up time for research activities. Creative research ideas may be stimulated through networking with other nurse educators and scholars who have similar interests [4].

Dean's of Nursing have used multiple strategies to support research productivity, addressing the barriers within the nursing education system. Potempa and Tilden note the need to balance the academic mission. Not all faculty may be research intensive, but balancing the teaching, research, service and practice missions should occur across the faculty as a whole and not within each faculty member [5]. Tilden (2006) provides research intensive faculty three years with designated release time from teaching to demonstrate successful scholarship [6]. Mundt provides faculty time and funding for external consultants who serve as mentors and experts in one's area of scientific inquiry [7].

When examining nursing faculty involvement in research, the guiding mission of a university is key to the level of expectation and available resources to support research activity. In their article, Feldman and Acord reported that faculty capacity for research could be strengthened at non-research intensive universities to promote nursing science, by hiring a new dean who would support and assist in research faculty development. They believe that faculty development that included consultations, seminars, and release time was also critical, as was securing funds by the dean. Major outcomes described by these actions included increased involvement in students' participation in faculty research endeavors, increased faculty productivity with presentations and publications, and greater interdisciplinary work. When analyzing research productivity and growth, the major strategy that led to increased faculty success with research productivity was the use of a research retreat in which a program of research and plan for success for each faculty member could be fully developed [8].

Conn, Porter, McDaniel, Rantz and Maas identified the two main ingredients for building research productivity into a school of nursing are infrastructure support and a strong research culture within the nursing program [9]. Infrastructure support at the University of Missouri Sinclair School of Nursing included the development of and participation in research interest groups after faculty decided on key topics, the addition of an associate dean for research, external consultation for developing ideas, planning funding strategies, providing feedback to

junior and senior faculty, and funding research support staff that addressed biostatistics, budget development, and professional editing of proposals. Yet they also reported that this infrastructure alone was insufficient to lead to success [9]. The need for a strong culture of research was essential. The research culture required was emphasized from academic administrators who held faculty accountable for their progress; the dean of nursing provided public support and understands the details of each faculty member's progress program of research. Faculty governance became more decentralized, which further supported faculty autonomy and creativity. The outcomes of this infrastructure and culture change included: a) students at all levels became more involved in faculty research; b) communications about grant activity and research progress occurred regularly; c) programs of research became emphasized more than isolated research projects, and d) the school moved to top-20 ranking for NIH funding [9].

Shrinking financial and collegial resources contribute to the challenges that nursing faculty experience in reaching their research goals [1, 2, 10]. In order to foster a program of individual research, it is helpful for nursing faculty to initiate projects that are within their area of clinical expertise. Consideration should also be given to national research priorities and funding availability, while taking into account the mission of the academic institution. Peirce, et al. suggest that research resources can be allocated based on these priorities [10]. Conn et al caution, however, that the program of research and expertise of the faculty should be the strongest factors in determining which funding calls to pursue [9]. Should a program of research not be adhered to, a faculty member is likely to jump from one isolated research study to another without any long-term, sustainable plan for success.

Nursing faculty have long been involved in the development of strategies to support the ongoing need for knowledge development. Feldman and Acord described how this happened at Pace and Montana State University - Bozeman schools. The faculty envisioned the need for effective and visionary leadership and sought leaders who would promote their research and scholarship efforts. Another strategy for supporting scholarly inquiry was the creation of "The Western Writers Coercion Group." Faculty at the University of Wyoming identified numerous barriers to timely production of publications and proposals [2]. Cumbie et al established a supportive collegial work group that provided mentoring, interdisciplinary connections, and technical advice [2]. The scholarship productivity of the faculty participants has increased; the group expanded its participation from nursing to social work and mathematics. The isolation of writing evolved into a collegial, productive scholarship community [2].

A number of strategies have been effective in minimizing barriers to faculty scholarship. Effective and visionary leadership, adequate resources, professional development, and a culture of research and collegiality support growth of faculty scholarship.

Undergraduate research course

For decades, nursing faculty have faced the challenge of developing innovative strategies for teaching research to undergraduates. Peckover and Winterbun point to a lack of clarity in articulating the purpose of teaching research to undergraduates [11]. The authors note that, while some educators emphasize the trend toward evidence-based practice as the primary rationale for teaching research to undergraduates, others argue that research is included in the undergraduate curriculum to promote the integration of nursing as a discipline of study at the highest academic echelon. Similarly, in their qualitative text analysis of 77 articles published after 1982, Porter and Mansour found that instructors frequently attempt to desensitize students to the negative aspects of research, while emphasizing its value [12]. These authors argued that a collaborative, participatory approach would allow students to recognize the benefits of research through active participation in the research process. Porter and Mansour suggest that the primary aims of research faculty should be to act as mentors for students and to enhance

their analytical skills related to the research process, even when curriculum designs do not support these goals. They add that active student participation in research projects promotes a dynamic educational environment that focuses on *learning* rather than on *teaching*. Collaborative models in which students actively participate in the research process with faculty offer a structure within which these goals can be realized.

Pedagogy for Undergraduate Research—Several strategies have been identified for teaching undergraduate nursing research, including experiential, theoretical, and rhetorical models. Undergraduate collaboration in faculty research projects may be understood as a manifestation of the experiential paradigm. Fazzone described an experiential model for teaching graduate level research that allowed students to experience the research process on a more hypothetical level [13]. Although not actually involved in conducting research, the students vicariously experienced the research process through visualization, scenario interpretation, and discussion during class.

In another model, Kenty proposed formalizing the association between the study of research and student experience in clinical practicum settings [14]. Kenty explicitly describes her model as promoting increased appreciation for evidence-based practice by increasing research literacy. Toward that end, she developed the Collaborative Learning Project, in which students identified a practice problem, and then collaborated with other students in their clinical group to critically review the existing research literature on that problem. Students were required not only to implement a change based on their review of literature, but also to evaluate the efficacy of that change using measurable outcomes. In this way, undergraduates participated fully in the design and implementation of their own projects under the supervision of clinical faculty.

Kenty concluded that this active participation enabled students to more fully synthesize an understanding of the research process. Although a clinical instructor serves as mentor or facilitator through this process, the projects were neither presented externally nor perceived as faculty research projects.

While Kenty proposed linking a research course to an existing clinical practicum, August-Brady suggested developing a research course with its own affiliate clinical component [15]. In this course, students designed and implemented a collaborative clinical project focusing on a patient safety issue, in collaboration with an instructor. The author noted that students expressed ownership and enthusiasm for their projects. Although not specifically designed to meet scholarly expectations, this kind of project could provide opportunities for faculty research publications.

Davidson and Crateau described a rhetorical model that emphasized what they called "the scholarly conversation," that might be applied across academic disciplines [16]. The model guides students through the phases of eavesdropping on, entering into, and ultimately engaging with scholarly conversation about a research project that is already in progress. For nursing research students, the rhetorical approach could be effective for learning both the review of literature and the scholarly writing components of the research process. These are important elements that may not be available when involvement in studies is limited. Using this approach, undergraduates might become familiar with the scholarly language of their discipline, and may come to identify the prominent voices (i.e., experts) in the discussion. Arguably, this model does not offer a thorough or complete strategy for effectively teaching the entire research process to undergraduates. Rather, it may be used as supplementary curriculum material that can facilitate fluency in research and dissemination of findings.

While several strategies have been utilized for teaching the research process to undergraduates, active participation in faculty research projects clearly addresses the needs of both the students

and the faculty. Student participation in faculty research flows naturally from an internal emphasis on research culture [9]. By introducing research to students at all levels, greater connectivity to evidence-based practice and the norm of nursing science will influence the future development of nurse scientists and the everyday practice of evidence based nursing care [5, 6]. The University of Delaware, School of Nursing developed a program to help students integrate their understanding of the research process and to address faculty goals for research and scholarship. The purpose of this paper is to describe an innovative program that provides undergraduate nursing students with hands-on experience in the research process, and at the same time supports the development of faculty research programs.

Program Funding

This undergraduate research experience was developed in collaboration with the University of Delaware's IDeA Network of Biomedical Research Excellence (INBRE) grant from the National Center for Research Resources at the National Institutes of Health. A major goal of the INBRE grant is to develop a state-wide infrastructure to support biomedical research careers. The School of Nursing is recognized as a leader in nursing education in Delaware. However, a survey of recent graduates of the nursing program revealed a decided lack of interest in pursuing research as part of their career. Lack of a doctoral program limited opportunities for undergraduate research involvement. Therefore, the School of Nursing faculty developed a proposal to enhance the experiences of baccalaureate nursing graduates in the research process through a more formal research curriculum. This undergraduate nursing initiative receives funding to accomplish the following goals: 1) develop an undergraduate curriculum in which student nurses participate in research; 2) support the development of student nurse research interns; 3) support student research related travel and presentations and; 4) encourage and support faculty research.

Critical Resources

The success of this program depends on a number of core resources. First, the administration of the School of Nursing provides an environment that encourages (if not demands) growth of faculty scholarship. Second, the school enjoys a core of junior and senior faculty who are willing to trade mentorship for assistance in furthering their programs of research. In addition, the faculty member who coordinates the research course was secure in juggling the roles of facilitator, negotiator, and task master to insure that both the participating students and faculty fulfilled their obligations to each other over the course of the semester.

Funding agencies often require the submission of pilot data to support power analyses, feasibility of recruiting subjects, the researcher's capacities to complete the project, and the identification of potential pitfalls. Many faculty members in the school of nursing do not have access to the funding or manpower to devote to pilot projects. This program provides faculty with highly skilled and motivated personnel (nursing students) to assist in the development, implementation, and evaluation of clinical research.

Program Implementation

The 3-credit undergraduate nursing research course is offered during the junior year of a four-year baccalaureate nursing program. Class size varies from 40 to 70 students each semester. Weekly class requirements include one hour of online lecture content, one hour of in-class discussion, and up to two hours work with faculty mentors on a research project.

Essentials of the mentoring project

During the semester prior to the research course offering, the course coordinator solicits colleagues who might be interested in mentoring a team of students and explains the expectations. It is important for the mentors to understand the course objectives, topical progression of the classes, grading criteria, and the time commitment for the research projects, before they commit themselves to this responsibility. They are also informed that the mentoring process is not counted in the faculty workload. Faculty mentors meet with their student or student team after the first day of class to determine a meeting schedule for the semester and to discuss potential research topics. Every one to two weeks, faculty mentors meet with their assigned students to accomplish the various steps required to complete their study. During team meetings, it is advantageous for mentors to integrate concepts learned in class in order to reinforce important research concepts. Regular meetings with faculty help students understand the research process (see Table 1 for faculty mentoring activities). Mentors may propose an area of study related to their clinical expertise, but students sometimes generate a relevant research question. Selection of the research question is also dependent upon students' ability to complete the project in one semester. It may take several weeks for the students to decide upon an appropriate research question, under the guidance of the faculty mentor.

Discussion of the study design and the goals for the project are important to the success of the research projects. Some faculty mentors have collected information from previous studies that require working directly with the data (e.g., content analysis, data entry). Other faculty mentors focus student team efforts on a stringent review of the literature related to their research project. Secondary data analysis and survey research are also common. In some instances, a larger data set can be generated if a research study is continued over several semesters with different groups of students. However, it is important that each student team choose a project that can be completed over the course of one semester. Faculty may continue their research after the course but students will not be able to benefit from the continuing faculty research.

As part of the in-class sessions, National Institutes of Health- funded researchers from other universities are invited to talk about their program of research. The students and faculty are invited to these lectures series which are scheduled three times each semester. This feature allows both students and faculty to interact directly with expert researchers. Question and answer periods following the presentations can be especially useful in understanding the subtleties inherent in the research process.

Conducting the Study

In any research that involves people, approval by the Human Subjects Review Committee at the university is required. This may be obtained by the faculty mentor prior to the semester, if the focus of the research project is already determined. For new research, faculty and students may use existing templates and guidelines provided by Office of the Vice Provost for Research. However, obtaining human subjects approval must be incorporated into the 14-week semester. Adherence to the formality of human subjects' protection regardless whether subjects are students in the same research course, roommates, or other members of the university community, requires coaching and at least initial observation by research mentors.

Most of the research projects for this course require an extensive literature review. Sometimes, students with a special affinity for writing and library research volunteer for this responsibility. More commonly, the work is divided among members of the team. Once the literature review is completed, the findings are shared with the entire team and several meetings may be devoted to presenting and critiquing the evidence.

Data collection procedures are discussed during team meetings and refined based on available human and financial resources. Participation in data collection provides several challenges for students. Data accrual is not completed during class hours. Therefore, creating the time to complete this activity in their already busy schedules can be stressful. Assuring that students participate fully in course activities (i.e., literature review, data collection, data analysis) is integral to promoting individual and team accountability.

Validation of inter-rater reliability may be needed during some data collection activities. While some students are particularly skilled in interpersonal communications, others lack confidence when approaching potential subjects, particularly if the population is vulnerable and/or diverse (e.g., elderly, homosexual). Despite these challenges, students display increasing enthusiasm as they gradually achieve the projected sample size and begin to see study results emerge. Strengthening of communication and collaborative skills is a positive outcome of this endeavor.

In order to facilitate data analysis, several faculty mentors with statistical expertise collaborate with their colleagues and the student teams to create data coding plans, coordinate data entry and cleaning, and to interpret results. Several meetings may be held to discuss findings, brainstorm implications, and to reach conclusions. Further literature exploration may be necessary. Limitations and potential research biases are identified and discussed during team meetings as the study progresses.

Internal dissemination—The creation of an abstract, poster, and brief oral presentation for an internally-judged event are the culminating requirements of the coursework. All school of nursing faculty and students are invited to a two-hour, end of the semester research "mini-conference" presented by students taking the research course. During team meetings, all students participate in planning the content of the abstract, poster, and oral presentation. However, just a few students, under the guidance of their faculty mentors, are assigned (or volunteer) to create the actual PowerPoint™ poster displays and/or write the final abstract. Constructive criticism and input are provided by the team before the final poster is assembled.

All student team members are required to take part in the 10 minute presentations on their research project, given during the two-hour mini-conference. The audience, composed of fellow students and faculty members, is encouraged to ask questions. The judging panel consists of administrators and/or faculty in the College of Health Sciences who are not involved currently in the course. Using a grading rubric, the judges evaluate each poster based on layout, design, and content, seeking clarification from the student team as necessary. Grading both the individual students and the research team promotes interdependence and individual accountability during the semester. Nurturing a team spirit promotes enthusiasm for the research process. Professionalism in dress and behavior is emphasized. Students are also encouraged to circulate and review their classmates' efforts. The atmosphere of scholarly exchange fostered by the faculty mentors and judges is meant to stimulate and confirm to students that research can be fun and rewarding.

Student evaluation methods—Multiple methods of evaluation are used in the course. In-class quizzes, multiple choice exams, and written reflection on guest speakers account for 70% of the final grade. Research mentors are not involved in these evaluative methods. Mentors do evaluate students based on peer evaluations and their own assessment of students' individual efforts during the research study (15% of the course grade). Attendance, participation at team meetings, data collection activities, and quality of work are reflected in this portion of the grading. The abstract, poster, and oral presentation, together, contribute another 15% to the total research course grade.

Beyond university walls—Throughout the subsequent academic year, faculty mentors seek further dissemination of the students' research findings via abstract submissions for poster and paper presentations at state, regional, national, and international conferences. With the help of university experts in graphics, faculty and students perfect the poster content and layout over the next few months. Abstracts and manuscripts are submitted under the name of faculty mentors and students involved in the research.

The School of Nursing sponsors one or two representatives from each student team to attend the local honor society and nurses association research conference before they graduate the following year. If the study was exceptionally well designed and received, students may be asked to attend a regional or international conference. Each year, several manuscripts are drafted by motivated students and/or the faculty who was the principle investigator of the study. Students are consistently acknowledged as co-investigators and co-authors.

Research Program Evaluation

One aim of the program is the production of reportable research. These products have primarily been poster presentations. To date, the research projects have included both qualitative and quantitative studies. Table 2 shows a summary of completed projects and their dissemination venue.

However, not all of the research that has been planned for this course has been accomplished. Occasionally, faculty mentors are not able to develop a research project that meets student needs, or are constrained by unexpected workload requirements. The course coordinator(s) have several options to meet the implied contract of a research product for all the students in the class. These options include forming larger student teams and recruiting additional faculty as mentors. Additionally, the senior course faculty has provided secondary analytic projects using large national data sets as either primary or backup projects for those students whose faculty mentors' project was delayed.

Functioning as a faculty research mentor is both challenging and rewarding. Conducting a research study with novices in the course of a single semester can be daunting. The time that faculty devote to mentoring research teams is not calculated in faculty teaching workload. Rather, this time is considered a part of the faculty scholarship requirement, because students share responsibility for part of this workload. Participating as a faculty research mentor helps promote confidence in their own research skills. Working with a student team can provide an efficient vehicle for accruing literature relevant to the mentors' areas of scholarly interest. One of the greatest rewards comes from sparking student realization that they are capable of reading, conducting, and disseminating research. As a result, students are more willing to consider nursing and healthcare research as a future career path. Table 3 lists a summary of benefits for faculty and students.

Conclusion

The inclusion of baccalaureate nursing students in the research activities of faculty is an effective method of cultivating future researchers and providing faculty with opportunities to develop their own research expertise and expand their research programs. Collaboratively, faculty and students conduct research that advances nursing practice and impacts healthcare. Identifying sources of funding such as the IDeA Network of Biomedical Research Excellence (INBRE) grant from the National Center for Research Resources at the National Institutes of Health helps to promote the success of such endeavors.

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Table 1
FACULTY MENTORING ACTIVITIES

1	Discuss and explain the research steps.
2	Integrate and reinforce concepts learned in class.
3	Explain research steps as the students perform the activity.
4	Guide and encourage students to develop research questions from the data base or data already gathered.
5	Help develop analytical skills when doing the research.
6	Demonstrate the steps in critiquing research articles in the process of literature review.
7	Coordinate team performance to assure each team member participates equally.
8	Provide guidance and incentives that result in excellent end product (presentations and /or manuscript).
9	Role model an enthusiastic and energetic researcher.

Table 2

Examples of Research Projects and Dissemination Venues

Study Title	Conference Presentations
A survey of job enjoyment in direct-care registered nurses with baccalaureate degrees and non baccalaureate degrees [*]	State
Comparison of upper arm and forearm automatic, noninvasive BP in college students [*]	State
Does the level of pain affect waiting time in the emergency room? [**]	International
Male and female alcohol consumption related to body image [*]	State
Role of sexual orientation in seeking healthcare [*], [**]	State, regional
A literature review of unmet needs of hospitalized older adults [*]	State
Siblings' perceptions of diabetes and its management [*]	State
The effect of average hours worked on nurse job enjoyment [*]	State
The relationship of direct care of nurses' perceptions of nurse/physician relationship and job enjoyment [*]	State
The relationship of direct care of nurses' perceptions of nurse/physician relationship and job enjoyment [*]	State
A pilot study of predictors of intensive exercise among college students [*]	State
A woman's sexual orientation: A determinant of gynecological practices [*]	State, regional
How benefits and barriers, BMI, and gender affect exercise behavior in college students [*]	Accepted, State
The stress of breast cancer for young couples: Responses related to "first year" transitions and strains [*]	Accepted, State
Relationships between sleep, GPA, and working hours in college students [*]	Accepted, State
Comparison of brachial and ankle automatic blood pressure in supine position	Accepted, State

[*]
poster

[**]
oral

Table 3

Benefits to Faculty & Students

Faculty	Students
Spark student enthusiasm for research	Clarify and apply research class concepts to actual study for a better understanding of steps of research process
Spark faculty enthusiasm for research	Achieve undergraduate research course outcomes through active, experiential learning
Forum for sharing enthusiasm for specific area of inquiry	Improve ability to read and critique scientific literature and improve ability to identify gaps in the literature
Expand ability to review the literature in a shorter amount of time	Gain exposure to data analysis tools and software
Gain access to dedicated data collectors and data coders during semester	Develop collaborative/teamwork skills
Decrease need for funded research assistant support during semester	Develop oral and written communication skills
Mentor students in preparation of oral and poster presentation	Learn to evaluate peers
Elicit new ideas from students for future studies/program of research	Gain greater exposure to both quantitative and qualitative research during poster sessions
Groom potential research assistants for future studies	Develop professional behaviors in non-clinical settings
Mentor students during professional conference presentations	Participate in juried research conferences with peers
Accomplish scholarship goals more efficiently; enhance scholarship productivity (presentations and publications)	Present completed project at local, regional, national, and/or international levels, publish noteworthy research projects (Presentations and publications include student's name)
Meld the teaching and scholarship aspects of faculty role	Increase students' interest in and understanding of summer research internship opportunities