

The University of San Francisco

USF Scholarship: a digital repository @ Gleeson Library | Geschke Center

Doctor of Nursing Practice (DNP) Projects

All Theses, Dissertations, Capstones and
Projects

Summer 8-12-2023

Environmental and Occupational Health Risks: Educating Undergraduate (ADN-BSN) Nursing Students for Safer Practice

Dorinda A. Mercado

University of San Francisco, dmercado1107@gmail.com

Follow this and additional works at: <https://repository.usfca.edu/dnp>



Part of the [Nursing Commons](#)

Recommended Citation

Mercado, Dorinda A., "Environmental and Occupational Health Risks: Educating Undergraduate (ADN-BSN) Nursing Students for Safer Practice" (2023). *Doctor of Nursing Practice (DNP) Projects*. 336.
<https://repository.usfca.edu/dnp/336>

This Project is brought to you for free and open access by the All Theses, Dissertations, Capstones and Projects at USF Scholarship: a digital repository @ Gleeson Library | Geschke Center. It has been accepted for inclusion in Doctor of Nursing Practice (DNP) Projects by an authorized administrator of USF Scholarship: a digital repository @ Gleeson Library | Geschke Center. For more information, please contact repository@usfca.edu.

Environmental and Occupational Health Risks: Educating Undergraduate (ADN-BSN)

Nursing Students for Safer Practice

Dorinda A. Mercado

University of San Francisco

Committee Chair: Dr. Francine Serafin-Dickson

Committee Member: Dr. Barbara Sattler

Acknowledgment

I would like to take this opportunity to express my sincere gratitude to my DNP committee for their support, guidance, and insight. To Dr. Francine Serafin-Dickson, my committee chair, in addition to all your work, I am grateful for the friendship we developed during this academic journey together. I will miss our Zoom meetings. To Dr. Barbara Sattler, my second reader, I am honored to have presented the virtual simulation that you developed, as an integral piece of my DNP project. I hope to join forces with you again on other projects. To Ms. Susan Spencer, my editor, I am indebted to your superlative service. I could not have (sanelly) written a scholarly paper that flowed logically, concisely, and explicitly without your skilled direction. My deepest respect for each of you.

I also want to acknowledge the community of educators and nurses I collaborate with at California State University East Bay: My mentor, Dr. Maria Cho; my colleagues, Drs. Sahar Nouredini and Susan McCoy; and our students. I am thankful for your contribution, participation, and dedication to nursing practice.

Last but certainly not least, I am profoundly thankful for the blessings of love, protection, and support from my husband, children, grandchildren, and family. My life achievements are nothing without each of you. My husband–life partner and number one cheerleader–deserves an honorable mention for always encouraging my passion for education. I appreciate it when you often remind me that I “bleed green and gold.” Yes, I am *extremely* proud to be a triple Don!

In gratitude.

Table of Contents

Section I: Title and Abstract

Title	1
Abstract	6

Section II: Introduction

Background	8
Problem Description	10
Setting	11
Specific Aim	12
Available Knowledge.....	12
PICOT Question.....	12
Search Methodology	12
Integrated Review of the Literature	13
Synthesis of Evidence	17
Rationale	18

Section III: Methods

Context	20
Intervention	21
Gap Analysis.....	23
Work Breakdown Structure	24
Gantt Chart.....	25
SWOT Analysis	26
Responsibility/Communication Matrix.....	27
Budget and Cost Avoidance Analysis.....	27

	4
Study of the Interventions	28
Outcome Measures.....	29
Data Collection Tool.....	30
Analysis.....	30
Ethical Considerations	31
Section IV: Results	33
Section V: Discussion	35
Summary	35
Interpretation.....	36
Limitations	40
Conclusion	41
Section VI: Funding.....	43
Section VII: References	44
Section VIII: Appendices	
Appendix A. Evidence Evaluation Table.....	49
Appendix B. Environmental and Occupational Health Risk Module.....	68
Appendix C. Gap Analysis	73
Appendix D. Work Breakdown Structure.....	74
Appendix E. Gantt Chart.....	75
Appendix F. SWOT Analysis	76
Appendix G. Communication Plan/Matrix	78
Appendix H. Proposed Project Budget	79
Appendix H. Return on Investment	79

Appendix H. Cost Avoidance	79
Appendix I. Data Collection Tool: Pre/Post Evaluations	80
Appendix J. Statement of Non-Determination.....	83
Appendix K. Letter of Support	91
Appendix L. Demographic Results.....	92
Appendix M. Quantitative Results.....	96
Appendix N. Qualitative Results	99

Environmental and Occupational Health Risks: Educating Undergraduate (ADN-BSN) Nursing Students for Safer Practice

Abstract

Background: Globally, adverse health effects, including deaths and disabilities, occur from living or working in unhealthy domains where exposure to environmental and occupational hazards exists. A multitude of these hazards are present in clinical settings in the healthcare environment where nurses care for patients and risk ongoing exposures to toxic substances.

Problem: Environmental and occupational health education is rarely included in the standard undergraduate nursing curriculum, contributing to a deficit among nurses in environmental health awareness and knowledge.

Methods: The study design was a pre/post evaluation of a single cohort (n=32) of undergraduate nursing students to assess environmental and occupational health awareness and knowledge after participating in an educational intervention. Knowledge acquisition was the outcome measure used to indicate the effectiveness of the intervention. Data analysis was performed in Qualtrics.

Intervention: The intervention was a self-paced, interactive online educational module on environmental and occupational health risks, with a virtual reality of a simulated patient's room, supplemented with content and resources for extended learning. The virtual reality activity took students into a simulated hospital patient room in two separate visits, where they encountered exposures to occupational hazards.

Results: Correct answers to the nine content questions increased by 156% (mean) and 52% (median) from pre- to post-evaluation. The range of increase in correct answers for seven questions ranged from 32% to 1100%. Correct answers to two questions decreased by 6% and

14%. Qualitative results indicated greater engagement and satisfaction when participants compared their experiences with conventional classroom and textbook learning.

Keywords: *ADN-BSN, education, environmental, hazard, nurse, occupational*

Environmental and Occupational Health Risks: Educating Undergraduate (ADN-BSN) Nursing Students for Safer Practice

Background

An estimated 12.6 million deaths worldwide are attributable to exposure to living or working in unhealthy environments (Office of Disease Prevention and Health Promotion, 2021; World Health Organization, 2016). Recognizing the detrimental health effects of chronic exposure to environmental hazards, the United States Department of Health and Human Services has identified environmental health as one of its Healthy People 2030 data-driven objectives to improve health and well-being (Office of Disease Prevention and Health Promotion, 2021). Potential exposures to hazardous substances are ubiquitous, occurring at home, work, schools, and the community. Occupational hazards are the subset of environmental hazards to which workers are exposed. In hospitals and other clinical settings, chemical hazards can be found in medication areas, supply closets, and patient rooms; physical hazards manifest as back injury, additional musculoskeletal strain, and workplace violence.

Occupational health risks in the health care setting include chemicals that potentially cause harm to nurses, other employees, patients, and their families, such as:

- Pesticides are present in food served to patients and hospital employees. Residues of glyphosate and other widely used herbicides may remain after washing and preparation. Some pesticides are known as “forever chemicals” which persist in the body, with some known to cause autism, Parkinson’s disease, and cancer (Pesticide Action Network, n.d.). Other pesticides have been linked to skin, digestive, neurological, and cardio-respiratory disorders, and implicated in cancer (Rueda-Ruzafa et al., 2023).

- Glutaraldehyde, a potent skin irritant, is found in disinfectant wipes and used to clean and disinfect heat-sensitive medical equipment. A common component of strong disinfectants, glutaraldehyde is associated with chronic obstructive pulmonary disease (COPD) and occupational asthma (Dumas et al., 2019; Healthcare Without Harm, 2002). Glutaraldehyde is not regulated in the United States, and although safer alternatives are available (Healthcare Without Harm, 2002) healthcare workers are routinely exposed to glutaraldehyde vapors.
- Phthalates are used to make pliable plastic, as in IV tubing and bags, and are found in personal care products and cosmetics (Healthcare Without Harm, 2021). Phthalates are associated with lung, liver, and kidney damage and interfere with the development of the male reproductive system (Healthcare Without Harm, 2021). Exposure to phthalates increases the risk of ADHD, interferes with neurodevelopment in children (Pizzorno, 2022). Phthalates are used in the fast food and beverage industries to manufacture packaging and containers, contributing to everyday exposure to disposable plasticware. Gloves intended to provide protection from toxic chemicals, bodily fluids, and other hazards contain phthalates (Pizzorno, 2022).
- Flame retardant chemicals, polybrominated diphenyl ethers (PBDEs), and chlorinated tris (TDCPP), are found in hospital furniture, curtains, mattresses, and linens (Sixclass.org, 2017). These chemicals are linked to adverse brain development, endocrine disruption, fertility issues, and cancer (Laferriere & Crighton, 2017; Sixclass.org, 2017).

Exposure to environmental or occupational hazards, toxic chemicals, biohazard waste, and food additives contribute to poor health and a lower quality of life for those impacted by them (McCullagh et al., 2015; McElroy et al., 2021; Schenk, 2015). Environmental hazards and

their effect on health are a growing concern; results from a Gallup poll indicated that 65% of Americans preferred the safety of environmental protection over wealth (Saad, 2019).

Problem Description

Florence Nightingale posited that the patient's environment, one of the four concepts in the nursing paradigm, must be considered in nursing practice to provide optimal patient care (Polivka & Chaudry, 2018). However, environmental and occupational health has received little attention in contemporary undergraduate nursing curricula, contributing to a deficit among nurses in environmental health awareness and knowledge (McCullagh & Berry, 2015; McElroy et al., 2021). This is a concern because working directly with patients in clinical settings, nurses are among the employees with significant risk of regular exposure to toxic substances. As frontline workers, nurses can advocate for changes in healthcare to mitigate these exposures, thus reducing the health risks to themselves, fellow employees, patients, and their communities (Schenk, 2015). But before they can advocate, they must be well informed. Including environmental and occupational health content in nursing curricula presents an opportunity for nurses to assess and address environmental health impacts.

Nursing is the largest healthcare profession in the United States, with more than four times as many nurses as physicians in the United States (Office of Economic Cooperation and Development, 2019). With a workforce of more than 3.8 million, registered nurses (RNs) deliver a comprehensive array of healthcare services, and have the most direct contact with patients and their families (American Academy of Colleges of Nursing, 2019). Vulnerable populations, including the uninsured, working poor, unhoused, refugees, some immigrant communities, and others who lack access to a primary care physician, may depend solely on nurse-managed care (Morgan, 2021). Notably, nurses receive the highest ratings in honesty and ethics among 22

healthcare professions, with 85% of Americans trusting nurses to ensure good healthcare (Reinhart, 2020).

Nurses' well-being is equally important, as lack of self-care is an issue within the nursing profession. Nurses experience burnout, occupational stress, and compassion fatigue; when they suffer, patient care is compromised (Mills et al., 2015). Environmental and occupational health education for nurses at the undergraduate level is imperative to establish the safety and well-being of the nursing workforce. Nurses who are knowledgeable about hazardous exposures have the potential to assess and address health risks beyond the health care setting and contribute to community-wide disease prevention and population health.

Setting

Evidence from the literature suggests that enhancing awareness and understanding of harmful environmental and occupational exposures facilitates nurse self-care and advocacy for safer practices in healthcare systems and communities. The premise for the project is that foundational education on environmental and occupational hazards is to encourage adoption of safer nursing practices within the patient care setting.

The project was implemented within an existing course, Transition to Professional Nursing, at California State University East Bay, in which approximately four hours were dedicated to occupational and environmental health. Post-licensure nursing students (ADN-BSN) take the Transition to Professional Nursing course during their first semester of their undergraduate program. Approximately 65 nurses are enrolled in the course each semester. The 60-hour course is offered online with one module per week over 15 weeks. The environmental and occupational health module was offered in week 11, with four hours of online and interactive content.

Specific Aim

Increase environmental and occupational health awareness and knowledge by 50% from pre- to post-evaluation for a cohort of ADN-BSN nursing students at California State University East Bay by October 31, 2022, one month from initiation of the intervention.

Available Knowledge

A literature review was performed to determine if the evidence supported the hypothesis that environmental and occupational health education influences student nurses' awareness and knowledge of environmental and occupational risks, thus cultivating safer clinical practices, self-care, and patient advocacy. Evidence was examined for environmental and occupational health practices for nurses that encompassed education, awareness, and knowledge.

PICOT Question

A PICOT (population, intervention, comparison, outcome, time) question guided the search for evidence: In a population of undergraduate student nurses (P), how does environmental and occupational health education, (I) compared to no education (C) increase awareness and knowledge of environmental and occupational hazards in the patient care setting (O) immediately post-intervention (T)?

Search Methodology

The search was performed using the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, and Scopus databases (see Appendix A). The search terms and Boolean phrase combinations were (environmental OR occupational) AND nurs*; occupational environmental health; nurs* AND (education OR intervention) AND knowledge OR skill OR attitude OR awareness; (occupational health nursing) AND (environmental health/education) OR environmental health/trends). The initial return was 185 studies, based on the following inclusion

criteria: studies published in English between 2017 and 2021; full text; peer-reviewed evidence. The review resulted in 51 from CINAHL, 57 from PubMed, and 77 from Scopus. Twenty-nine studies met the inclusion criteria. Titles and abstracts of these 29 studies were reviewed, from which ten studies were selected for evaluation. The strength and quality of evidence in each of the ten studies were appraised using the Johns Hopkins Nursing Evidence-Based Practice tool (Dang & Dearholt, 2018).

Integrated Review of the Literature

Health Promotion and Self-Care

Bak et al. (2020) conducted a qualitative study to examine student nurses' perspectives on health-related behaviors and strategies which potentially would improve their health. Data were collected from focus group activities with student nurses (n=20) in Scotland. Analysis mapped data to sources of behavior, intervention functions, and policy. The authors identified the need for environmental interventions to support the overall health of student nurses: nutritious food; peer support; and health-promoting curricula.

The authors determined that the ideal time to instill awareness of health behaviors is at the onset of undergraduate nursing education. Furthermore, student nurses who participated in the study proposed to endorse health and well-being practices and recommended adding related health advocacy to the curricula to promote self-care.

Malekzadeh et al. (2018) performed a quasi-experimental, non-randomized, two-group study with a post-test. The study's aim was to evaluate how teaching Orem's self-care model affected nursing students' clinical performance and patient satisfaction. The study population consisted of semester six undergraduate students at teaching hospitals in Iran. A convenience sample of nursing students (n = 66) was chosen and divided into intervention (taught Orem's

model) and control (not taught Orem's model) groups. Students who were taught Orem's model improved their clinical performance by 23%; therefore, the authors supported teaching Orem's self-care model to undergraduate nursing students in clinical training.

Nursing Education

Kang and Seomun (2018) completed a systematic review and meta-analysis of studies (n = 11) to explore the effectiveness of web-based nursing education on student nurses' and licensed nurses' knowledge and clinical performance. The results showed a significant difference in participants' knowledge, length of intervention, and program type for web-based education compared to traditional learning. The authors concluded that a combination of traditional and web-based education (i.e., a blended program) is convenient and effective for novice learners.

In a pilot project, McCullagh and Berry (2015) developed occupational health nursing curricular material, which nursing faculty presented to undergraduate nursing students (n = 53). A convenience sample of faculty (n = 14) was recruited to provide feedback on the curriculum. Students offered positive feedback and expressed high interest in occupational health. The authors posited how an association between work and health is critical for nurses to be successful. The authors pointed out that although in line with Healthy People 2020 goals, current nursing programs lack occupational health curricula or provide only minimal content on occupational health.

McElroy et al. (2020) chronicled the experience of nursing faculty at a U.S. university in developing elective courses for nurses on environmental health and climate change and creating a post-baccalaureate certificate program on environmental health. Over ten years, undergraduate (n = 505) and graduate nursing (n = 291) students in this program received formal environmental health education. The emphasis of the study analyzed course enrollment and evaluation data

from five courses. Nearly twice as many RN-BSN/MS students compared to traditional Bachelor of Science in Nursing (BSN) students completed environmental health courses. This is attributed to the greater number of elective credits available to RN-BSN/MS students. The authors acknowledged that the course content was beneficial for practicing nurses who completed the environmental health electives and completed an evaluation form at the end of each semester. Those practicing nurses had the opportunity to apply their gained knowledge to their nursing practice, with immediate impact on patients and communities.

Nursing Awareness

Polivka et al. (2018) performed a scoping review of published environmental health research (n = 548), including at least one nursing author. This peer review focused on environmental health in various nursing journals (n = 118). The authors examined studies published in nursing journals between 1995 and 2015. The majority of the studies were cross-sectional designs published in 118 nursing journals. The review was limited to studies that were published in nursing journals. The results identified three main foci in the nursing research: occupational health, environmental exposures and risks, and environmental health education. Other focus areas included home environment, secondhand smoke, and disaster preparedness. Nurses and nursing students (40%) were among the two main populations studied; [non-nursing] adults (26%) were the other population. The authors noted there has been an increase in environmental health nursing research; however, they recommended including non-nursing journals in future reviews.

Schenk et al. (2015) conducted an online qualitative study on nurses' awareness of environmental impacts from nursing practice to develop the Nurse's Environmental Awareness Tool (NEAT) assessment. Content experts (n = 7) were interviewed over the phone and sent the

160-item draft assessment tool. Based on feedback, the content was reduced to 60 items; a two-part response was constructed for the relationship between environmental impacts and adverse human health risks, and home versus work behaviors were separated. Nurses' application of their gained knowledge [from the survey] of environmental health is affected by favorable patient outcomes. Separating the difference between home and work behaviors would further establish possible barriers specific to the work environment. The literature review in the study confirmed that environmental impacts generated by nursing practices pose great risks to human health. Yet, their literature on nurses' awareness and knowledge of this topic is scarce. The NEAT assessment was developed to support closing this gap in nurse knowledge and practice.

Patient Education

Grindler et al. (2018) performed a quantitative study focused on the assessment of environmental exposure screening frequency of primary caregivers, specifically obstetricians, and gynecologists (n = 312), at a patient's first visit. The participants reported no regular screening (58%), lack of resources to refer patients (73%), discomfort with obtaining specific history (85%), and insufficient knowledge to advise their patients (96%). The authors encouraged healthcare providers to screen for environmental exposures and offered suggestions to improve ecological awareness of women's health.

Laferriere and Crighton (2017) completed a multi-phase, qualitative study that explored the need for environmental health education for pregnant women and new mothers. The authors determined to understand if environmental health education provided from trusted sources and reinforced by prenatal care would benefit expectant and new mothers. The study surveyed new mothers (n = 606); 46% had no information about environmental risks. Only 8% received information from their healthcare providers or public health services. The themes that emerged

from the surveys were concerns for their children, preventative actions and barriers, and preferred routes and sources of information. Although mothers preferred their healthcare provider as their trusted source of information, prenatal care providers lacked sufficient environmental health knowledge. Limitations were participant self-selection bias, language barriers that prevented participation, and lack of a father's perspective. The authors recommended elevating consumer and healthcare provider awareness of environmental health risks and toxin-free products.

The findings of Grindler et al. (2018) and Laferriere and Crighton (2017) directly support the DNP intervention of educating nursing students and suggest how students' increased knowledge impacts not only themselves, but their patients as well.

Synthesis of Evidence

Two studies addressed health promotion and self-care in nursing students. Bak et al. (2020) performed an intervention with focus group activities to instill awareness of healthy behavior, in which students identified strategies to promote health care and advocacy. Malekzadeh et al. (2018) found that teaching self-care with the Orem model improved nursing students' clinical performance.

McCullagh and Berry (2015) presented occupational health nursing curricular material to undergraduate students. Faculty and students expressed high interest in occupational health education and recognized the strong association between work and health. Bak et al., (2020) determined that the optimal time to provide occupational health education to nurses is at the undergraduate level.

Grindler et al. (2018) found that primary caregivers, specifically obstetricians, rarely provided any type of screening during the patient's first visit. Notably, 96% of obstetricians in

the study reported insufficient knowledge to advise their patients. Laferriere and Crighton (2017) wanted to understand if environmental health education from trusted healthcare providers reinforced by prenatal care would benefit new mothers. Only 8% of study participants received any information from their healthcare providers or public health services. Both studies support educating nurses on environmental and occupational health risks, as nurses are trusted, frontline healthcare providers, and can provide health education not provided by the physicians.

These studies support the educational intervention directed to California State University East Bay (CSUEB) ADN-BSN students. Further supporting the educational intervention is the finding of McElroy et al. (2020) that environmental health education at the undergraduate level will benefit the future of nursing practice. Although environmental and occupational health nursing research on education has slowly increased, a scarcity remains (Polivka et al. (2018). Kang and Seomun (2018) explored the effectiveness of web-based versus traditional modes of nursing education. The authors suggested that blended programs with web-based education can effectively teach novice learners.

Rationale

The well-being of nurses and patients is equally important; when nurses suffer, patient care is compromised. Two frameworks that focus on the well-being of nurses and the relation of nurse well-being to patient care guide the intervention: Pender's Health Promotion Model and Orem's Self-Care Deficit Nursing Theory.

Pender's Health Promotion Model is well accepted and widely used in undergraduate studies (Alligood, 2018) and appropriate to inform an online educational intervention with ADN-BSN students. Pender's model asserts that health is a positive state, rather than the absence of disease, and focuses on a plan to change unhealthy behaviors as it promotes health. Health

promotion requires motivation to improve one's well-being and capability (Alligood, 2018). To motivate the participants, the nursing students engaged in a virtual simulation experience immersed in a patient room. Educating nursing students about hazardous exposure has the potential to influence behavioral change and health promotion, as knowledge itself can be a motivating factor in developing self-efficacy for the provision of effective care (Lundberg et al., 2017; McElroy et al., 2021). Self-efficacy, one of the central constructs of Pender's model, is imperative in nursing practice (Alligood, 2018). Pender's model guides students and novice nurses to develop self-efficacy. To enhance self-efficacy, the educational intervention also included curated web-based resources, audio files, and social media.

A second framework, complementing Pender's model, is Orem's Self-Care Deficit Nursing Theory. Orem's theory of self-care can be applied to the prevention of hazard exposure to humans and their well-being (Petiprin, 2020). Lack of self-care is of great concern for nurses, as self-care is vital to overall health and well-being (Mills et al., 2015). This project used Orem's self-care theory to establish the inverse relationship between self-care and exposure to environmental and occupational hazards. Orem's self-care theory necessitates an implicit "professional expectation" of the nursing role as an advocate for health promotion (Mills et al., 2015, p. 792). The content of the educational intervention and the additional resources promoted personal and professional self-care. A nurse who authentically practices self-care potentially influences a patient's self-care for their health-promoting behavior (Mills et al., 2015; Petiprin, 2020).

Methods

Context

Undergraduate nursing curricula are driven by accreditation standards, which historically have not included occupational and environmental health education. Nursing students may not be aware of the health risks of environmental and occupational exposures to hazardous chemicals. Without formal education to raise awareness and impart knowledge, they are ill-prepared to engage in safer clinical practice and better patient care as part of their profession and thus miss opportunities for disease prevention, early detection, and intervention.

Nurse education in environmental and occupational exposures at the undergraduate level has the potential to influence how nursing students integrate their acquired awareness and knowledge into patient care practice. Learning about occupational exposures in the hospital setting may increase the likelihood of nurses assessing their own and their patients' potential exposures in their homes, schools, workplaces, and communities. Nursing students must understand the impacts of environmental and occupational health risks that cause adverse health effects in order to impart this knowledge to others as their trusted caregivers. Increasing awareness and knowledge upstream at the onset of undergraduate education leverages nurses' ability to advocate for themselves, their patients, and the community, and to impact global health through policy changes. Thus, the goal of the educational intervention was to heighten CSUEB undergraduate nursing students' awareness and knowledge of environmental and occupational health hazard exposures that are ubiquitous in the hospital setting. The project scope was to develop, implement, and evaluate an environmental and occupational health risk educational module for a cohort of CSUEB ADN-BSN students participating in the Transition to Professional Nursing online course. The premise for the project is that foundational education on

environmental and occupational hazards is to encourage the adoption of safer nursing practices within the patient care setting.

A DNP project requires a team to achieve favorable outcomes (Moran et al., 2019). Key stakeholders guided the success of the project, supporting the educational intervention to improve nursing practice with respect to environmental and occupational health risks. The DNP project team comprised the University of San Francisco (USF) DNP student, the USF nursing faculty DNP project chair and second reader, the CSUEB nursing faculty consultant, the CSUEB nursing faculty of record for the Transition to Professional Nursing, and the CSUEB nursing students. The USF faculty second reader is an international leader in environmental health and nursing and the developer of the virtual simulation educational module used in this project. Participating CSUEB nursing students are key stakeholders as their engagement with the educational intervention directly affects project outcomes.

Intervention

The study design is a pre/post evaluation of awareness and knowledge acquisition following participation in an online educational module (see Appendix B) with a virtual simulation activity. The virtual simulation activity was developed by Dr. Barbara Sattler, Professor Emerita of the USF School of Nursing and Health Professions and founding member of the Alliance of Nurses for Healthy Environments. Internal validity was established by administering the questionnaire to five faculty experts in instructional design and assessing the consistency of responses.

The virtual activity took students into a simulated hospital patient room on two separate visits where they encountered exposure to occupational hazards. Students used a mouse or trackpad to navigate through the patient room and assessed their self-awareness by identifying

potential occupational or environmental health or safety risks (i.e., write down notes or a list of hazardous risks). To establish a baseline, after the initial simulated visit, students answered a pre-evaluation with nine questions on hazardous risks. During the second simulated visit, they encountered nine “hot spots” representing commonly occurring occupational hazards, for example, disinfectants, sharps, and discarded dressings. Each hot spot contains a link to a short educational video clip and supplementary resources. Students were able to review and repeat the virtual activity at their own pace over one month. For the post-evaluation, students answered the same nine content questions without access to the videos and resources in the virtual simulation activity. Knowledge acquisition was measured by the change in the number of students selecting the correct answer for each of the questions.

Demographic data on their years of experience as an RN, and their patient care setting (if employed) were collected with the pre-evaluation questionnaire. Students were also asked to answer a self-assessment question on their environmental and occupational health awareness and a question on whether they had learned about environmental and occupational health in their ADN program. For the post-evaluation, students were also asked to rate the efficacy of the simulation activity in comparison to reading a textbook. Both evaluations included a comment section for narrative feedback.

Students participated in the intervention as part of a required course in their nursing curriculum, Transition to Professional Nursing, which students took online. The environmental and occupational health module with the virtual simulation activity was integrated into the curriculum and took approximately four hours to complete, including supplemental activities in the module. Students could return to the module repeatedly and access the virtual simulation and all resources over one month. Students completed the module online through the Canvas learning

management system. The pre- and post-evaluation questionnaires were administered to students with a link to Qualtrics to support anonymous responses and protect student confidentiality. All data was collected, analyzed, and formatted for reporting within Qualtrics.

Gap Analysis

Evidence from the literature reveals a lack of environmental and occupational health education in the undergraduate nursing curriculum (McCullagh & Berry, 2015; Polivka & Chaudry, 2018). Moreover, in 1995, the Institute of Medicine (IOM) reported a scarcity of nursing research on environmental health, and, as a result, there is a need to increase research (Polivka & Chaudry, 2018). The absence of environmental health research conducted by nurse educators may compromise the integrity of environmental health nursing responsibility (Carnegie & Kiger 2010). Furthermore, education and research are well needed in developing and sustaining the nurse's role, and supporting environmental health practice (Carnegie & Kiger, 2010; Polivka & Chaudry, 2018). Accordingly, hazardous environmental exposure exists in our day-to-day lives and requires nursing action.

The gap analysis of the nursing program indicated that undergraduate nursing students receive sparse information on environmental and occupational risks. The lack of corresponding awareness and knowledge compared to the subject matter of core courses diminishes the importance of self-care and protection from hazards to which they are exposed as nurses. An educational intervention as an online modality in the form of a virtual simulation is a step toward closing this gap that has been shown to be effective in engaging learners (see Appendix C).

Work Breakdown Structure

The work breakdown structure (WBS) expressed the project's tasks and deliverables in an orderly manner. The WBS is a tool to complete the action items so the project lead and the team members may achieve the project's objectives. For purposes of the project, the WBS was categorized as follows: initiation, planning, execution, control, and closeout (see Appendix D).

The project lead identified that nurses are regularly exposed to potential environmental and occupational hazards during the initiation phase. To illustrate, chemical toxins in medical supplies, such as intravenous bags and tubing, are prevalent within patient care settings. A literature review was conducted, and a gap analysis revealed that environmental health knowledge was lacking in nursing education. Hence, as a solution, the development of an educational module to improve nursing practice based on environmental and occupational health education addressed the gap, as defined in the AIM statement. Pender's Health Promotion Model and Orem's Self-Care Deficit Nursing Theory were identified as the frameworks complementary to safe nursing practice to guide the project. The DNP student, as the project lead, and supported by the project team, concluded that implementing the intervention as an online educational module was an effective modality.

The planning phase required the organization of the project tasks to be completed in a timely manner. In a collaborative effort to support the project lead successfully, key stakeholders who shared the same goal were consulted. The first key stakeholders meeting allowed for discussion of intervention and implementation possibilities. An intervention was narrowed down to an online educational module. Guidance from the CSUEB expert consultant determined implementation within an appropriate ADN-BSN nursing course.

The execution phase commenced with a stakeholder's kick-off meeting to walk through the final steps. The educational module encompassed a virtual simulation presented to a group of faculty experts in instructional design. Based on the feedback, the educational module was adjusted prior to implementation. The official launch of the finalized intervention was in October 2022, for one month.

The tasks, status, updates, and adjustments were communicated through stakeholder meetings and/or emails. Lastly, the project was closed out with a stakeholder/DNP committee debrief to prepare for and finalize the DNP student's presentation. Subsequently, the revisions as recommended by the DNP committee were completed by the DNP student, then submitted to the DNP project repository.

Gantt Chart

The Gantt chart portrays the timeline of the work breakdown structure's phases and corresponding activities over the years 2021 through 2023. The progress of events, tasks, and deliverables completed by the key stakeholders, accordingly, was conceptualized in a monthly manner required to achieve successful outcomes (see Appendix E). The timeline represented the workflow of the following project phases: initiation, planning, execution, control, and closeout. Initiation began with the identification of a problem, gap analysis, and an aim statement development, followed by a theoretical model and intervention consideration. Planning involved stakeholder collaboration in intervention development and approval. Execution included an additional stakeholder meeting, project implementation, and analysis. Control of the project entailed communication with stakeholders on the status, updates, and further adjustments. Closing the project required stakeholder input to prepare the project for presentation. Upon this,

final feedback from the DNP committee was incorporated into the presentation and final paper prior to submission to the USF's DNP Project Repository.

SWOT Analysis

A strengths, weaknesses, opportunities, and threats (SWOT) analysis was performed to evaluate the California State University East Bay (CSUEB) Baccalaureate Nursing of Science (BSN) program concerning the proposed test of change (see Appendix F).

The internal strength of the CSUEB BSN program in the context of the project was a faculty expert who has developed and taught an established environmental health nursing elective course. Another strength is that progressive faculty are open to innovative pedagogy that appeals to and engages the young demographic of the student population: gen z and millennials. These students are technologically savvy and embrace innovative learning methods like virtual reality and gaming.

The internal weakness was that undergraduate student nurses needed standard environmental and occupational risk exposure knowledge. Since this field is not tangible compared to the core areas of nursing, there is no interest in learning and engaging. Also, the need for more seasoned faculty buy-in to teach environmental and occupational health may reflect their absent eagerness.

The external opportunity was the ability to adapt the education module to other nursing programs and healthcare disciplines. Extending the program to other institutions allows the university, the nursing program, and the faculty to be recognized for their contribution to nursing education. Newly graduated student nurses may be inspired to advance their knowledge and awareness and advocate for safer working environments.

The external threat was that other nursing institutions would not embrace the project due to the process and time constraints of changing their nursing curriculum. Institutional hospital procurement may resist change as challenged by their union's standard of practice and policy.

Responsibility/Communication Matrix

The communication plan mapped out the key stakeholders and their corresponding roles and responsibilities (see Appendix G). This chart illustrated how the project lead effectively collaborated, individually and as a team. Primarily, communication among the stakeholders was via email or virtual meetings. The DNP committee, which included the chair and second reader, was the principal support of the project lead. Their availability to maintain communication with the project lead supported its timely success. In collaboration with the DNP committee, the CSUEB faculty consultant holds a central role by offering feasible advice and expertise. In addition, the CSUEB faculty consultant interplayed between the project lead and the CSUEB faculty of record, in which the nursing course implemented the intervention. Lastly, the ADN-BSN student participants' feedback and evaluations were pivotal during and after implementation. The matrix was an efficient means of productive communication among the project lead and key stakeholders.

Budget and Cost Avoidance Analysis

The budget was a proposal of hypothetical rates and approximate hours to develop and implement the intervention as an educational module. The chart included the key roles: Environmental Health (EH) Expert, EH Expert Consultant, Faculty, and the DNP Student/Project Lead. The remaining budget covered the (in-kind) expenses of the partnering EH expert consultant and faculty of record. The total implementation cost was \$42,775 for year one. As

projected, if 12 nurses had a work-related asthma attack from an occupational hazard per year, the cost avoidance would amount to \$72,000.

Regarding a return-on-investment, there is a potential loss to a healthcare organization when an employee has a work-related asthma attack due to a lack of proper education on environmental and occupational health risks and exposure to these risks. The return-on-investment net savings for year one would be to subtract the implementation cost from the cost avoidance, which equals \$29,225 for year one. Subsequent years would have greater net savings as the implementation cost would not be needed. Environmental health education would benefit the hospital and nursing staff as absences would be avoided from potential environmental and occupational health risks. See Appendix H for budget, cost-avoidance analysis, and return-on-investment.

Study of the Interventions

Providing nurses with an online, virtual mode of environmental and occupational health risk education at the undergraduate level can help close the gap between the current and desired states of awareness. The rationale for choosing the intervention is the efficacy of interactive virtual learning in contrast to learning from a textbook, and the logistical practicality of modular, self-paced online learning. Online nursing education with a complementary virtual simulation component has advantages over traditional classroom lectures in learning outcome effectiveness and convenience (Cant et al. 2023; Liu & Butzlaff, 2021; Volejnikova-Wenger et al. 2021). For this project, making the educational intervention accessible for one month on the learning management system enabled the students to proceed at their own pace, and have any questions answered promptly by the DNP student.

The approach was a pre- and post-evaluation of the nursing students' environmental and occupational health awareness and knowledge. Baseline awareness and knowledge were established through the administration of a pre-evaluation questionnaire. The same questionnaire, without demographic content, served as the post-evaluation to assess change from the baseline. The questionnaire consisted of nine items aligned with the content of the virtual simulation. Demographic information (i.e., years of experience as a registered nurse and employment setting), self-assessment of awareness and knowledge, and prior environmental and occupational health education were collected at baseline to provide context for the outcomes. A pre/post-study design to evaluate outcomes provided evidence that the observed outcomes were due to the intervention.

Outcome Measures

Awareness and knowledge of environmental and occupational health risks were selected as the two outcome measures to assess the effectiveness of the intervention. Evidence from the literature and the DNP student's experience has shown environmental and occupational health instruction to be lacking in nursing curriculum, with implications for undergraduate nurses' overall lack of subject awareness and knowledge of hazards in their occupational setting. A questionnaire reflecting the educational content of the intervention was developed de novo by content experts and the DNP student. Internal validity was established by administering the questionnaire to five faculty experts in instructional design and assessing the consistency of responses. The questionnaire was administered prior to intervention to establish a baseline, and immediately after intervention to assess change. Changes from baselines to post-intervention are expressed in the aggregate as the number of students with correct answers and percent change.

Data Collection Tool

The data collection tool was a questionnaire composed of qualitative and quantitative items (see Appendix I). Demographic data were collected in the pre-intervention questionnaire only. Nine multiple-choice items reflecting the virtual simulation content enabled direct pre/post comparison as an indication of the intervention's effectiveness. A comment section was included in both questionnaires for optional, open-ended feedback. Prior to administering the pre-evaluation questionnaire, the data collection tool was shared with five faculty experts in instructional design who provided feedback. Minor adjustments were then made to improve conciseness and flow.

The post-evaluation questionnaire included a prompt to rate the efficacy of the virtual simulation experience in comparison to learning from a textbook. Responses were rated on a Likert scale of 1 (highly effective) to 5 (highly ineffective). In order to solicit responses anonymously and maintain participant confidentiality, the pre-and post-evaluation questionnaires were created in Qualtrics and administered through a link provided via the learning management system. Qualtrics was utilized to collect, evaluate, analyze, and display the results.

Analysis

Quantitative data were collected, analyzed, and formatted for reporting within Qualtrics. Qualitative data were collected in Qualtrics and exported to MS Word for thematic analysis.

Quantitative Analysis

Quantitative analysis was applied to demographic data (years of experience as an RN and occupational setting), self-assessment of environmental and occupational health awareness, learning experience, and the nine questions on the virtual simulation activity content. The pre-evaluation self-assessments of environmental and occupational health awareness and learning

experience were scored on Likert scales of 1 to 5. The nine content questions in the pre- and post-evaluations were multiple choice with four choice options per question. The change in the number of correct answers for each question from pre-evaluation to post-evaluation is expressed numerically (number of students) and as a percent improvement. A post-evaluation question on the efficacy of the virtual simulation activity was scored on a 5-point Likert scale. Graphs and tables were created to display the data.

Qualitative Analysis

The pre- and post-evaluations each had one optional, open-ended comment section for a narrative response. The responses were extracted from Qualtrics, analyzed thematically, and presented as a Word Cloud. The pre-evaluation comments generated a theme pertaining to the clarity of the multiple-choice questions, while the post-evaluation theme referenced the instructional value of the simulation.

Ethical Considerations

The federal Occupational Safety and Health Act (1970) granted workers in the U.S. the right to a healthy and safe workplace. However, the Occupational Safety and Health Administration (OSHA) established by the act, has spent little time focusing on the healthcare sector relative to other industries. Few standards are in place to protect workers from biological and chemical safety hazards present in 21st century clinical settings. Lack of appropriate standards and inadequate resources to inspect facilities and enforce regulations prevent OSHA from ensuring a safe healthcare workplace (Patel & Davis, 2023).

Provision Five of the American Nurses Association (ANA) Code of Ethics (2015) states that the expectation of self-care and such action demands safeguarding the nurse's overall well-being, personally and professionally. Provision Six of the ANA Code of Ethics advocates for the

provisions align with the overarching goal of the DNP project to advocate for self-care by mitigating commonly hazardous exposure in the patient care setting.

A Jesuit value that relates with the DNP project at the university level is *cura personalis*, care for the person. *Cura personalis* is of particular interest in addressing the self-care of the nursing profession. Self-care is foundational and vital as it impacts the nurse's overall health and well-being (Mills et al., 2015). Based on Orem's self-care model, the nursing act of self-care behavior impacts both nursing practice and patient care. Practicing self-care is simply imperative for both nurse and patient.

Confidentiality of the participant data was maintained through careful control of digital files. No identifying data was collected other than the participants' employment setting and years of experience as an RN. Data was kept exclusively on secured, password-protected computers. Anonymity was ensured through administering the pre-and post-evaluations through Qualtrics. Findings are reported in the aggregate without any identifying information.

The University of San Francisco School of Nursing and Health Professions Doctor of Nursing Practice Department determined that this project met the guidelines for an evidence-based quality improvement change in practice and was deemed non-research (see Appendix J). Nonetheless, the practicum site, California State University East Bay (CSUEB), required an Internal Review Board (IRB) approval as the intervention involved students as the project participants, which was submitted and approved as exempt. The University of San Francisco's IRB approved the project as exempt, as well. The project also received support from the practicum site, California State University East Bay (see Appendix K). There were no identifiable issues or conflicts of interest for this project.

Results

Demographics

Thirty-one of the 32 participants responded to the demographic prompts in the pre-evaluation questionnaire (see Appendix L). The work experience as a registered nurse (RN) ranged from none (0) to five or more years, with a mean of 1.4 years. Twenty-six participants (84%) had RN work experience of 0-1 year. Three participants (9%) had 5+ years of RN work experience. One participant each (3%) had RN work experience of 1-3 or 3-5 years. Employed participants (66%) worked in either inpatient (53%) or outpatient (13%) settings. Unemployed participants made up 34% of the cohort.

Thirty-one participants responded to the awareness self-assessment question. However, only 30 responded to the occupational health component of the prompt, while 31 responded to the environmental health component. Pre-evaluation: 68% of participants (n=21) rated themselves “aware” of environmental health, and 57% (n=17) rated themselves “aware” of occupational health. However, only 6.5% (n=2) of participants rated themselves “highly aware” of environmental health, while 13.3% (n=4) rated themselves “highly aware” of occupational health.

More than half of the participants “agreed” or “strongly agreed” that their Associate Degree of Nursing (ADN) program provided education in environmental health (55% of 31 respondents; n=17) and occupational health (57% of 30 respondents; n=17%).

Quantitative Results

Compared to participants’ (n=32) correct answers to the virtual simulation questions on the pre-evaluation questionnaire, the number of post-evaluation correct answers showed overall improvement (see Appendix M). Improvement for each question is expressed as a percent

change in correct answer choice from pre- to post-evaluation. Correct responses to two questions improved by 100% and 1100%, from pre- to post-evaluation, respectively: (Q5) Properly discarding a dressing change with minimal blood (100%); and (Q11) antimicrobial scrubs (1100%). Questions with greater than 50% improvement were (Q6) exposure to used sharps (52%); (Q8) disinfectants used in hand sanitizers (54%); and (Q10) potential health risks associated with personal products (52%). The questions with less than 50% improvement were (Q9) the classification of phthalates used in IV tubings (32%) and (Q12) hospital food and drinks that may contain pesticide residue (40%). Two questions had fewer correct answers post-evaluation: (Q7) chemicals in bleach (-14%) and (Q13) flame retardants (-6%). The mean increase for the nine questions from pre- to post-evaluation was 156%. Given the extreme range of improvement pre- to post-evaluation for individual questions, the median was also calculated. The median increase for the nine questions was 52%. The specific aim of 50% improvement was exceeded using both the mean and median calculations.

In administering the post-evaluation questionnaire, due to a malfunction in formatting the question rating the virtual simulation's efficacy, that data was not collected. The question was administered a second time, with 16 participants responding. Ten respondents (63%) rated the virtual simulation intervention "effective," and three (19%) rated the intervention "highly effective."

Qualitative Results

Optional pre-evaluation feedback suggested the need to clarify the wording of the multiple-choice questions on the virtual simulation activity (see Appendix N.). Participants commented on a lack of familiarity with some terms, semantic meaning ("I thought scrubs meant clothing scrubs."), and that some directions were not clear. The post-evaluation comments

underscored the effectiveness of the online modules and virtual simulation activity as a learning tool (“...more interesting to learn than reading through a textbook.”) and applicability to clinical practice (“great food for thought to help develop consistent daily practices.”).

Discussion

Summary

One of the key findings in relation to the specific aim is the effectiveness of the online educational approach and virtual simulation activity. Environmental and occupational health knowledge increased from pre- to post-evaluation for seven of the nine content questions. The mean increase from pre- to post-evaluation was 156%, exceeding the 50% target of the specific aim. Although one question (Q11) had an 1100% increase, the disparity suggests that the participants either misunderstood or misread the question (Q11) during the pre-evaluation.

The project had several strengths. Although some participants were apprehensive at the start of the virtual simulation, their experiential learning outcomes were favorable, as reflected in the post-evaluation comments and knowledge acquisition. The virtual simulation activity had been developed, tested, and used by others prior to the implementation and was well-matched with what nursing students would encounter in a clinical setting. Thus, the virtual simulation activity was easily integrated into an online educational module, adding to the feasibility of implementation and effectiveness of the learning modality. The accessibility and convenience to students of a self-paced, interactive learning module with an activity they could repeat to their satisfaction had greater appeal to students than traditional classroom lectures and textbooks.

A lesson learned from project implementation was to pay close attention to instructional design and development. Several students asked the DNP project lead to clarify the pre-evaluation questions, underscoring the need for simpler terminology and careful consideration of

semantics when designing an online module. For example, only two students answered Q11 correctly in the pre-evaluation, later commenting that they confused antimicrobial scrubs (clothing) with antimicrobial hand scrub (gel). In the post-evaluation, 23 students selected the correct answer.

To improve the educational module for future use, the DNP project lead anticipates making adjustments corresponding to the Analyze, Design, Develop, Implement, and Evaluate (ADDIE) model, a standard framework to create course content (Keating et al., 2022). Student experience with the educational module and virtual simulation activity, along with the learning outcomes, suggests its usefulness in other nursing programs and healthcare institutions. The project took an initial step to inspire the nursing students to advance their environmental and occupational health awareness, and to advocate for a safer working environment for themselves, their co-workers, and their patients. Spreading this message via the environmental and occupational health educational intervention to other institutions elevates recognition of the project university's nursing program and the nursing faculty's contribution to nursing education.

Interpretation

The project established a baseline for the nursing student participants' awareness and knowledge of occupational health. It evaluated the effect of an educational intervention expressed as change from pre- to post-intervention. Quantitative results showing improvements in participants' environmental and occupational health knowledge were supported by qualitative indicators, i.e., positive comments about the educational value of the intervention. Although no process or balancing measures were employed, the agreement between quantitative and qualitative indicators provides confidence that the outcomes were due to the intervention.

The project outcome and its implications for learning are consistent with those observed

in published studies. Education through an online modality with virtual simulation was effective for knowledge acquisition (Cant et al, 2023). Virtually immersing oneself in a situation via a computer offers a type of experiential learning that encourages nursing students to actively acquire knowledge (Liu & Butzlaff, 2021). In the DNP project, participants repeated a virtual simulation activity and worked at their own pace until they were confident of their answers. Knowledge acquisition through repetition via virtual simulation has been shown to be particularly effective for adult learners and stands in contrast to point-in-time learning in traditional classroom education (Volejnikova-Wenger et al., 2021). The observed outcome of the project implementation is consistent with studies that advocate for virtual simulation activities to promote knowledge acquisition through active immersion in a learning task (Cant et al. 2023; Liu & Butzlaff, 2021; Volejnikova-Wenger et al. 2021).

Safer nursing practices can be encouraged through virtual learning experiences that elevate environmental and occupational health risk awareness and knowledge. The American Association of Colleges of Nursing (AACN, 2023) stipulates in Nursing Essentials Core Competency 3.6b that nurses must recognize how climate change impacts environmental and population health. The DNP project virtual learning implementation introduced nursing students to environmental and occupational risks specific to their profession and got them thinking about the broader implications of environmental and occupational hazards. The learning activity also benefited the nursing students' well-being, in accordance with the American Nurses Association Code of Ethics (ANA, 2015) Provisions Five and Six, self-care and safer work circumstances, respectively. Initial steps to achieve safer practices and self-care may occur when awareness and knowledge are elevated. These findings support two frameworks: 1) Changing unhealthy behavior to enhance safer practice supports Pender's Health Promotion Model; and 2) mitigating

hazard exposure aims to protect one's well-being, which endorses Orem's Self-Care Deficit Nursing Theory.

During project implementation, the DNP project lead learned that some participants were concurrently enrolled in the nursing program's environmental health elective. This was not foreseen during the design of the intervention and may have led to a difference between observed and anticipated outcomes. The SWOT analysis, completed during the project's planning phase, showed one of the nursing program's weaknesses to be a lack of environmental and occupational health education in the standard curriculum. Participants' concurrent enrollment in the environmental health elective may have contributed to unexpectedly high pre-evaluation scores (94% correct) on two questions (Q7 on chemicals in bleach; Q13 on flame retardants). The post-evaluation scores for these two questions were lower than the pre-evaluation scores, suggesting the need to review the instructional videos and questions for clarity and concordance. The unexpected decline in the scores at post-evaluation may also be attributed to survey fatigue or misreading the question. Future implementations of the virtual simulation activity will benefit from knowing in advance if participants are taking the environmental health elective concurrently, and then coordinating with the respective faculty on the content questions and how they are phrased.

Addressing environmental health in professional nursing education provides an opportunity for nursing school leaders to align the standard undergraduate curriculum with the AACN population health Domain 3 core competency for professional nursing education (AACN, 2023). Domain 3.6b stipulates that nurses must "[u]nderstand the impact of climate change on environmental and population health" (p. 36) as part of being prepared to protect population health during emergencies. While the DNP project did not

address climate change directly, it demonstrated the feasibility of including environmental and occupational health subject matter within the existing curriculum as a first step in leading change.

As nursing students consider their interests and opportunities in the nursing workforce, their trajectories are shaped by the long-established nursing curriculum on emphasizing nursing skills in clinical settings. Environmental and occupational health is intangible by comparison, and few students are even aware of the opportunities available to them as an environmental or occupational health nurse, or how environmental and occupational health risks impact clinical nursing practice and patient care. Without more exposure to environmental and occupational health in the nursing curriculum, this will not change. Given the few opportunities students have to choose electives, a strategic trade-off would be implementing environmental and occupational health subject matter, such as the DNP project intervention, into undergraduate nursing courses, threading it into the standard nursing curriculum. This would alleviate the cost of establishing an elective that few students would have an opportunity to take given their existing load of required courses.

The SWOT analysis conducted in the initiation phase of the project identified students' lack of knowledge or environmental and occupational exposure risk and the near absence of environmental health education in the nursing curriculum as weaknesses. These observations led to the assumption that nursing students would have very little environmental and occupational risk awareness and knowledge. Whereas, when surveyed, some students did indicate that they had been exposed to this content in their previous ADN education. A second assumption was that a virtual interactive simulation would be

preferred to reading a textbook or sitting in a classroom listening to a lecture. The first assumption was only partially correct, as some participants were concurrently enrolled in an environmental health elective, which may have contributed to subject matter knowledge that was not anticipated. The second assumption was correct, as indicated by participants' comments on their experience with the virtual simulation activity.

An implication for future nursing education is to adapt the intervention into modules that can be used to prepare nursing faculty to educate students and new nurses. The California Board of Registered Nursing (CA BRN) has stipulated that continuing education must be revised to include climate health (2019), which falls under over-arching environmental health. Tailoring the intervention for use as a continuing education unit (CEU) module for professional and staff development would help elevate the level of nursing education and leadership in a key area of population health as recognized by both CA BRN and AACN.

Limitations

The project has several limitations. The sample size of the project cohort was small (n=32). It consisted of a convenience sample of nurses enrolled in the same section of an online, required course, Transition to Professional Nursing, limiting generalizability to other situations and settings. The intervention was integrated into the course curriculum as an assignment for credit. Although the course was conducted online, the nursing students were aware of who was participating and could communicate with each other, which might have influenced their responses. Some of the nursing students were concurrently enrolled in an environmental health elective, which may have given them parallel exposure to the subject matter in the learning module and virtual simulation activity, or a different perspective on the content questions. This limitation may have led to the unexpectedly high percentage of correct answers to certain

questions on the pre-evaluation questionnaire. Lower than anticipated pre- to post-intervention improvement on some content questions may be attributable to misreading the questions, distraction, or survey fatigue, rather than a lack of knowledge acquisition. In the post-evaluation, the question *Rate the efficacy of the simulation experience in comparison to reading this information in a textbook* was misformatted, precluding the collection of that data. The question was administered a second time, but only 16 of 32 participants responded, introducing the possibility of participant bias.

Lack of clarity with some of the instructions reported issues with interpreting the wording and semantics of content questions, and shortcomings expressed about the module's flow all may have affected the outcome in unknown ways. Although all issues were addressed once identified, their impact might not have been mitigated in time. Survey fatigue may have set in by the time participants completed the post-evaluation questionnaire, imposing an additional limitation. One of the barriers to recruiting nurses for research is survey fatigue, as they are often burdened with surveys at work (Bethel et al., 2021). This may extend to nursing students as well, who tire of routinely completing course and instructor evaluations. An element of carelessness may have impacted the two questions where the percentage of students with correct answers decreased from pre- to post-evaluation.

Conclusion

Exposure to potentially toxic substances is ubiquitous, occurring in public areas, households, schools, and businesses, on streets and highways, and near operating or decommissioned industrial sites. In hospitals and other clinical settings, chemical hazards can be found in medication areas, supply closets, and patient rooms; physical hazards manifest as back injury and additional musculoskeletal strain. The U.S. Department of Health and Human

Services includes environmental health as one of its data-driven objectives to improve health and well-being (Office of Disease Prevention and Health Promotion, 2021). The American Association of Colleges of Nursing now includes recognition of how environmental health and climate change impact population health as a core nurse competency (AACN, 2023). Yet, environmental and occupational health has received insufficient inclusion in contemporary undergraduate nursing curricula, contributing to a deficit among nurses in environmental health awareness and knowledge.

This DNP project demonstrated the effectiveness of a virtual simulation educational activity for environmental and occupational health knowledge acquisition in a cohort of undergraduate nursing students. Overall, knowledge as reflected by correct answers to questions on environmental and occupational health hazards improved from baseline to post-evaluation. The self-paced, online virtual simulation activity was well suited to nursing students given its accessibility to repeatedly review the content at their own pace and engage in the learning online modality they preferred over textbooks and classroom lectures. Quantitative and qualitative results underscored the importance of careful word choice and the underlying semantics to enhance learning. Although the project involved a single cohort and the sample size was small, the modular, online, and self-paced characteristics of the intervention suggest its usefulness for multiple cohorts and larger groups of students. Furthermore, the virtual simulation activity is well suited for tailoring to other healthcare settings and interprofessional disciplines, in addition to nursing curricula. The project demonstrated that nursing students who receive formal environmental and occupational health education in their undergraduate program are better positioned to practice safe patient self-care as licensed professionals.

Funding

No funds were received for this DNP project. The sponsoring academic organizations and the DNP student covered the implementation costs of the project's budget.

References

Alligood, M. R (2018). *Nursing theorists and their work* (9th ed.). Mosby/Elsevier.

<https://www.elsevier.com/books/nursing-theorists-and-their-work/alligood/978-0-323-40224-8Links>

American Association of Colleges of Nursing. (2023). *The Essentials*.

<https://www.aacnnursing.org/essentials/tool-kit/domains-concepts/population-health>

American Academy of Colleges of Nursing (2019). *Nursing fact sheet*.

<https://www.aacnnursing.org/news-Information/fact-sheets/nursing-fact-sheet>

American Nurses Association (2015). *Code of ethics for nurses with interpretive statements*.

Bak, M. A. R., Hoyle, L. P., Mahoney, C., & Kyle, R. G. (2020). Strategies to promote nurses'

health: A qualitative study with student nurses. *Nurse Education in Practice*, 48, 102860.

<https://doi.org/10.1016/j.nepr.2020.102860>

Bethel, C., Rainbow, J. G., & Dudding, K. M. (2021). Recruiting Nurses Via Social

Media for Survey Studies. *Nursing Research*, 70(3), 231–235.

<https://doi.org/10.1097/NNR.0000000000000482>

California Board of Registered Nursing. (2019, January). Comprehensive plan for approving and disapproving continuing education opportunities.

<https://www.rn.ca.gov/pdfs/forms/compceplan.pdf>

Cant, R., Ryan, C., & Kelly, M. A. (2023). Use and effectiveness of virtual simulations in

nursing student education: An umbrella review. *CIN: Computers, Informatics, Nursing*,

41(1), 31–38. <https://doi.org/10.1097/CIN.0000000000000932>

- Carnegie, E., & Kiger, A. (2010). Developing the community environmental health role of the nurse. *British Journal of Community Nursing*, 15(6), 298-305.
<https://10.12968/bjcn.2010.15.6.48372>
- Corso, A. (2022). *Emergency Room Visit Cost Without Insurance in 2023*. Mira.
<https://www.talktomira.com/post/how-much-does-an-er-visit-cost>
- Dang, D., & Dearholt, S. (2018). *Johns Hopkins nursing evidence-based practice: Models and Guidelines* (3rd ed.). Sigma Theta Tau International.
- Dang, D., & Dearholt, S. L. (2018). *Johns Hopkins nursing evidence-based practice: Model and guidelines* (3rd ed.). Sigma Theta Tau International.
- Dumas, O., Varraso, R., Boggs, K. M., Quinot, C., Zock, J.-P., Henneberger, P. K., Speizer, F. E., Le Moual, N., & Camargo, C. A. (2019). Association of occupational exposure to disinfectants with incidence of chronic obstructive pulmonary disease among US female nurses. *JAMA Network Open*, 2(10), e1913563.
<https://doi.org/10.1001/jamanetworkopen.2019.13563>
- Grindler, N. M., Allshouse, A. A., Jungheim, E., Powell, T. L., Jansson, T., & Polotsky, A. J. (2018). OBGYN screening for environmental exposures: A call for action. *PloS One*, 13(5), e0195375. <https://10.1371/journal.pone.0195375>
- Healthcare Without Harm (2002). *10 reasons to eliminate glutaraldehyde fact sheet*.
https://noharm-uscanada.org/sites/default/files/documents-files/61/10_Reasons_Gutaraldehyde.pdf
- Healthcare Without Harm (2021). *Phthalates and DEHP*. <https://noharm-uscanada.org/issues/us-canada/phthalates-and-dehp>

- Kang, J., & Seomun, G. (2018). Evaluating web-based nursing education's effects: A systematic review and meta-analysis. *Western Journal of Nursing Research*, 40(11), 1677-1697. <https://doi.org/10.1177/0193945917729160>
- Keating, S. A., Vetter, M. J., Klar, R. T., & Wright, F. (2022). Integrating climate change in the curriculum: Using instructional design methods to create an educational innovation for nurse practitioners in a doctor of nursing practice program. *Journal for Nurse Practitioners*, 18(4), 424–428. <https://doi.org/10.1016/j.nurpra.2021.11.009>
- Laferriere, K., & Crighton, E. J. (2017). “During pregnancy would have been a good time to get that information”: Mothers’ concerns and information needs regarding environmental health risks to their children. *International Journal of Health Promotion & Education*, 55(2), 96-105. <https://doi.org/10.1080/14635240.2016.1242376>
- Liu, Y., & Butzlaff, A. (2021). Where’s the germs? The effects of using virtual reality on nursing students’ hospital infection prevention during the COVID-19 pandemic. *Journal of Computer Assisted Learning*, 37(6), 1622–1628. <https://doi.org/10.1111/jcal.12601>
- Lundberg, K., Jong, M. C., Kristiansen, L., & Jong, M. (2017). Health promotion in practice—District nurses' experiences working with health promotion and lifestyle interventions among patients at risk of developing cardiovascular disease. *Explore (New York, N.Y.)*, 13(2), 108-115. <https://doi.org/10.1016/j.explore.2016.12.001>
- Malekzadeh, J., Amouzeshi, Z., & Mazlom, S. R. (2018). A quasi-experimental study of the effect of teaching Orem's self-care model on nursing students’ clinical performance and patient satisfaction. *Wiley*. <https://doi.org/10.1002/nop2.151>
- McCullagh, M. C., & Berry, P. (2015). A safe and healthful work environment. *Workplace Health & Safety*, 63(8), 328-332. <https://doi.org/10.1177/2165079915584127>

- McElroy, K. G., Gilden, R., & Sattler, B. (2021). Environmental health nursing education: One school's journey. *Public Health Nursing, 38*(2), 258–265.
<https://doi.org/10.1111/phn.12815>
- Mills, J., Wand, T., & Fraser, J. A. (2015). On self-compassion and self-care in nursing: Selfish or essential for compassionate care? *International Journal of Nursing Studies, 52*(4), 791–793. <https://doi.org/10.1016/j.ijnurstu.2014.10.009>
- Moran, K. J., Burson, R., & Conrad, D. (2019). *The Doctor of Nursing Practice scholarly project: A framework for success*. (3rd ed). Jones & Bartlett. ISBN-13: 978-1284156959
- Morgan, L. (2021, May 2). *Law reforms promote nurse-managed care*. *The Regulatory Review*.
<https://www.theregview.org/2021/09/01/morgan-law-reforms-promote-nurse-managed-care/>
- Office of Disease Prevention and Health Promotion (2021). *Healthy People*.
<https://health.gov/healthypeople/objectives-and-data/browse-objectives/environmental-health>
- Office of Economic Cooperation and Development (2019). *Nurses*. [https://www.oecd-ilibrary.org/sites/98e2d5de-en/index.html?itemId=/content/component/98e2d5de-en#:~:text=Nurses%20outnumber%20physicians%20in%20most,United%20States%20\(Figure%208.11\)](https://www.oecd-ilibrary.org/sites/98e2d5de-en/index.html?itemId=/content/component/98e2d5de-en#:~:text=Nurses%20outnumber%20physicians%20in%20most,United%20States%20(Figure%208.11))
- Pesticide Action Network (n.d.). *What's on my food?*
<https://www.whatsonmyfood.org/howmuch.jsp>
- Petiprin, A. (2020). *Orem's self-care deficit nursing theory*. <https://nursing-theory.org/nursing-theorists/Dorothea-E-Orem.php>

- Petiprin, A. (2020). Pender's health promotion model. *Nursing Theory*. <https://nursing-theory.org/theories-and-models/pender-health-promotion-model.php>
- Pizzorno, J. (2022). Common chemical pollutants causing a lot of ill health. *Integrative Medicine: A Clinician's Journal*, 21(5), 8–12.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9831131/>
- Polivka, B. J., & Chaudry, R. V. (2018). A scoping review of environmental health nursing research. *Public Health Nursing*, 35(1), 10-17. <https://10.1111/phn.12373>
- Reinhart, R. (2020, January 6). *Nurses continue to rate highest in honesty, ethics*. Gallup.
<https://news.gallup.com/poll/274673/nurses-continue-rate-highest-honesty-ethics.aspx>
- Rueda, R. L., Roper, P. C., Ruiz, G. C., Rodriguez, A. M., Roman, P., & Sánchez, L. N. (2023). A nursing socio-environmental approach for acute pesticide poisoning: A qualitative focus group study. *Journal of Advanced Nursing*, 79(5), 1754–1764.
<https://doi.org/10.1111/jan.15319>
- Saad, L. (2019, April 4). *Preference for environment over economy largest since 2000*. Gallup.
<https://news.gallup.com/poll/248243/preference-environment-economy-largest-2000.aspx>
- Schenk, E., Butterfield, P., Postma, J., Barbosa-Leiker, C., & Corbett, C. (2015). Creating the nurses' environmental awareness tool (NEAT). *Workplace Health & Safety*, 63(9), 381–391. <https://doi.org/10.1177/2165079915592071>
- Sixclass.org (2017). *Flame retardants*. <https://www.sixclasses.org/videos/flame-retardants>
- Volejnikova-Wenger, S., Andersen, P., & Clarke, K.-A. (2021). Student nurses' experience using a serious game to learn environmental hazard and safety assessment. *Nurse Education Today*, 98, N.PAG. <https://doi.org/10.1016/j.nedt.2020.104739>

World Health Organization. (2016, March 15). *An estimated 12.6 million deaths each year are attributable to unhealthy environments.* <https://www.who.int/news/item/15-03-2016-an-estimated-12-6-million-deaths-each-year-are-attributable-to-unhealthy-environments#:~:text=An%20estimated%2012.6%20million%20deaths%20each%20year%20are%20attributable%20to%20unhealthy%20environments,-15%20March%202016>

Appendix A

Evidence Evaluation Table

Purpose of Article or Review	Design / Method / Conceptual Framework	Sample / Setting	Major Variables Studied (and their Definitions)	Measurement of Major Variables	Data Analysis	Study Findings	Level of Evidence (Critical Appraisal Score) / Worth to Practice / Strengths and Weaknesses / Feasibility / Conclusion(s) / Recommendation(s) /
<p>APA Reference: Araban, M., Tavafian, S. S., Zarandi, S. M., Hidarnia, A. R., Burri, A., & Montazeri, A. (2017). A behavioral strategy to minimize air pollution exposure in pregnant women: A randomized controlled trial. <i>Environmental health and preventive medicine</i>, 22(1), 26. https://doi.org/10.1186/s12199-017-0633-8</p>							
Aim: to assess effectiveness of a theory-based intervention to minimize air pollution exposure among pregnant women.	Design: a parallel group randomized controlled trial Method: participants randomly assigned to either the control or the intervention group according to simple randomization procedures (computerized) random numbers).	N = 110 women recruited and conducted at the prenatal care ward of a teaching hospital in Tehran, Iran.	Independent: one-hour motivational interviewing session Dependent: pregnant women	Demographic and obstetric information; Stages of behavioral changes regarding prevention of exposure to air pollution	All data analyses were conducted using Statistical Package for the Social Sciences (SPSS) version 15.0 (SPSS Inc., Chicago, IL, USA). control and intervention group were assessed using a t-test for continuous variables	After the intervention, however, stage of change, perceived benefits and self-efficacy differed significantly between the two groups, with all of the three variables showing a significant increase in	<p>Level of Evidence: I (per JHNEBP Appendix E) Strengths: RCT; effective impact on participants Weaknesses: Due to the small sample size, we had to collapse stages into two categories. Feasibility: Yes study aligns with behavior change interventions are needed to support education Conclusion: Educational intervention strategies based on Trans-theoretical model can increase preventive behaviors in pregnant women aimed at decreasing exposure to air pollution. Recommendation: mechanisms that contribute to its effectiveness as well as</p>

					and the chi-squared test for binary/categorical variables and proportions. Mean scores between the two groups were compared using an independent t-test or a Mann-Whitney U test. An alpha error of < 0.05 indicated statistical significance.	the intervention group (p < 0.001 for all three constructs) but not in the control group, respectively	highlight its potential for future educational interventions aimed at increasing air pollution risk communication and behavior change. Therefore, health authorities might use it.
<p>APA Reference: Bak, M. A. R., Hoyle, L. P., Mahoney, C., & Kyle, R. G. (2020). Strategies to promote nurses' health: A qualitative study with student nurses. <i>Nurse Education in Practice</i>, 48, 102860. https://10.1016/j.nepr.2020.102860</p>							
Aim: explore student nurses' views on factors that influence health-related behaviors	Design: qualitative study. Method: focus groups conducted with pre-registration student nurses in a	nursing students (n = 500) in the second or third year of their 3-year undergraduate program at the university were invited	Independent variables: factors that influence health-related behaviors and strategies that could improve health Dependent	2-stage coding followed: 1) codes were identified through inductive (open) coding. 2) open codes were mapped against the BCW	Analysis involved mapping to the Behaviour Change Wheel (BCW) framework; consists of 3	Students identified several factors that influenced health-related behaviors. 4 ranked	Level of Evidence: III (per JHNEBP Appendix E) Strengths: rigor from use of a validated data collection method and theoretically informed analysis strategy Weaknesses: 1) sample size relatively small (n = 20); 2) study sample inclusive of

<p>and strategies that could improve health</p>	<p>Scottish university. Framework: Behaviour Change Wheel</p>	<p>student nurses (n=20) participated in 4 focus groups</p>	<p>variables: nursing students</p>		<p>distinct rings: (1) sources of behavior; (2) intervention functions; and (3) policy categories. Consolidated criteria for Reporting Qualitative research (COREQ) followed to ensure transparency and rigor of study reporting</p>	<p>most important: knowledge, culture, time constraints, and stress. Strategies prioritized to improve nurses' health-related behaviors: 1) stimulating a health-promoting environment by reviewing shift work, 2) improving workplace support, increasing staffing levels, subsidizing and 3) role-modeling of healthy food and exercise; 4) creating applied</p>	<p>student nurses at one 3) analysis based on student nurses' perceptions rather than registered nurses. Feasibility: Yes, study aligns with my PICO that environmental interventions are needed to support student nurses' health; pre-licensure nursing education is ideal time to start awareness Conclusion: Student nurses proposed health-promoting curricula, restructuring of healthcare environments, and incentivization of individuals and groups as key intervention strategies to promote health among themselves and their nursing colleagues. Educational and environmental interventions are needed to support student nurses' health. Recommendation: Educational and environmental interventions needed to support student nurses' health</p>
---	---	---	------------------------------------	--	--	--	--

						health-promoting curricula by integrating time and stress management training and lifestyle advice into nursing education.	
<p>APA Reference: Carnegie, E., & Kiger, A. (2010). Developing the community environmental health role of the nurse. <i>British Journal of Community Nursing</i>, 15(6), 298-305. https://10.12968/bjcn.2010.15.6.48372</p>							
<p>Aim: contribute to nursing theory and practice regarding nurses' environmental role, within the provision of holistic care.</p>	<p>Design: Qualitative study</p> <p>Method: convenience sample of four focus groups were interviewed; topics were reviewed by a public health practitioner researcher who interviewed each nurse</p>	<p>Individual interviews with n = 21 stakeholders and n=19 community nurses. Purposive sampling methods were used to identify nurse participants.</p>	<p>Independent: contributions to "health visits"</p> <p>Dependent: community nurse's role</p>	<p>topic guide and supplementary questions utilized during the focus groups; Dialogical tool; documentary evidence, individual interviews with stakeholders and focus groups with community nurses</p>	<p>analysis conducted through a process of constant comparison of data within and across the focus groups; analysis used specific criteria as advised by Glaser and Strauss (1967)</p>	<p>All nurse participants agreed it's imperative within nursing to address environmental issues that influence health and wellbeing</p> <p>Barriers to an environmental health role</p>	<p>Level of Evidence: III (per JHNEBP Appendix E)</p> <p>Strengths: All perceived that the subject under exploration was directly relevant to the public health aspect of their role.</p> <p>Weaknesses: focused on one particular city; process hinged on relevant data that the researcher could physically and legally access</p> <p>Feasibility: Yes, participants concluded environmental health is "imperative" and education is well needed, globally.</p> <p>Conclusion: environmental health continues to be a</p>

							<p>neglected aspect of community health; need recognition and support from nurse education.</p> <p>A clear environmental model has not yet been adopted and remains a 'Cinderella' concept within mainstream nursing. (p. 303)</p> <p>Recommendation: credibility and persuasiveness, "health visitors" need to have developed environmental information base from which to draw.</p> <p>Development of a community environmental role is needed; raises awareness of issues; strengthens the authority of an environmental health discipline within nursing throughout the UK.</p> <p>Future research needed to explore environmental health concerns of other community nurses [globally].</p> <p>Current expertise and increased motivation needed to develop a community environmental role.</p>
<p>APA Reference: Grindler, N. M., Allshouse, A. A., Jungheim, E., Powell, T. L., Jansson, T., & Polotsky, A. J. (2018). OBGYN screening for environmental exposures: A call for action. PloS One, 13(5), e0195375. https://10.1371/journal.pone.0195375</p>							

<p>Aim: determine the frequency of environmental exposure screening by obstetricians and gynecologists (OBGYNs) at initial patient visits.</p> <p>Identify areas of improvement</p> <p>Encourage more providers to consider screening</p>	<p>Design: Cross-sectional study Method: 20-item general survey instrument managed by REDcap;</p>	<p>Physicians (n=312) and clinicians (n=145) from Dept of OBGYN at University of Colorado were invited via email; and a post on social media to a group of physicians (n=2444)</p>	<p>Independent variables: frequency of environmental exposure screening</p> <p>Dependent variables: OBGYN physicians - obstetricians and gynecologists and sub-specialists</p>	<p>OBGYNs: young (37.1y); female (96%), board certified (78%); generalists (65%); residents (56%)</p> <p>20-item survey instrument queried demographics, environmental literacy, and screening practices.</p>	<p>Pearson chi-square; two-sample t-test; adaptive step-up Bonferroni adjustment for sensitivity analysis;</p>	<p>-12% responded; <30% lacked environmental toxin routine and did not screen for any environmental and occupational exposures; 58% reported no regular screenings ; 73% lacked resources to refer patients; 85% uncomfortable obtaining specific history; 96% disclosed insufficient knowledge to advise their patients.</p>	<p>Level of Evidence: III (per JHNEBP Appendix E) Strengths: low response may strengthen conclusion: environmental screening not prevalent Weaknesses: Possible bias due to low response rate; female-predominant social media group; generated survey vs a validated instrument Feasibility: Yes, study aligns with my PICO and suggests improving environmental exposure training and education to promote “comfort” when screening Conclusion: majority of OBGYNs did not incorporate environmental exposure screening into routine practice. Recommendation: to improve physician comfort through training and knowledge may increase screening; adding environmental exposures to screening will improve such patient education.</p>
---	---	--	--	---	--	--	---

APA Reference:

Jeong, G. H., & Kim, H. K. (2020). Pro-environmental health behavior and educational needs among pregnant women: A cross-sectional survey. *Journal of Advanced Nursing (John Wiley & Sons, Inc.)*, 76(7), 1638–1646. <https://doi.org/10.1111/jan.14346>

<p>Aim: investigate pro-environmental health perception, behavior, and educational needs among pregnant women in Korea</p>	<p>Design: Cross-sectional survey using questionnaires Method: Participants were recruited Data collected from participants using paper questionnaires. Researchers recruited convenience samples of women from national healthcare centres and hospitals. The questionnaire was self-administered. Framework: pro-environmental perceptions</p>	<p>N = 358 pregnant women recruited from prenatal classes at two health-care centers and patients receiving prenatal check-ups at two women's hospitals</p>	<p>Independent: pro-environmental health education Dependent: pregnant women</p>	<p>Pro-environmental behavior assessed using multiple regression analysis via SPSS version 21.0 (IBM Corp).</p>	<p>Participants' SES analyzed in terms of number, percentage, mean, and standard deviation. Pro-environmental health perceptions and behavior were analyzed in terms of mean, standard deviation, and range. Pro-environmental health perceptions and behavior were analyzed using Pearson correlation coefficients.</p>	<p>Specific educational needs: particulate matter (23.7%), compared to environmental hormones (8.3%) Pregnant women lacked education in prenatal classes on environmental hazards and effects during pregnancy. Women had concerns about environmental health during pregnancy.</p>	<p>Level of Evidence: III (per JHNEBP Appendix C) Strengths: From a theoretical perspective, this study provided empirical support for Rogers' (1975) protection motivation theory Weaknesses: This investigation was not adopted to the transcultural population; a cultural limitation was present in this perspective. Questionnaire depended only on the participants' opinions which was an open, not validated, and self-reported question without guidance. Feasibility: Yes, the study recommends environmental health education to promote knowledge, and motivation to initiate environmental health behavior Conclusion: Healthcare providers are responsible for delivering information and recommendations and initiating changes in environmental health behavior. Recommendation: Educational programs on environmental hazards in</p>
---	--	---	--	---	--	--	---

	based on Rogers' (1975) protection motivation theory (PMT)					Programs providing information are necessary because information-seeking behavior was uncommon, especially among pregnant women.	pregnancy are necessary to provide information that would enhance knowledge, motivation, and environmental actions. Prenatal education should focus on behavioral encouragement to promote environmental health behaviors because the response efficacy was the most powerful factor ($\beta = 0.28$)
<p>APA Reference: Jerant, A., Lichte, M., Kravitz, R. L., Tancredi, D. J., Magnan, E. M., Hudnut, A., & Franks, P. (2016). Physician training in self-efficacy enhancing interviewing techniques (SEE IT): Effects on patient psychological health behavior change mediators. <i>Patient Education and Counseling</i>, 99(11), 1865-1872. https://10.1016/j.pec.2016.07.002</p>							
Aim: This article explored how physician training in self-efficacy enhancing interviewing techniques (SEE IT) affects patient psychological	Design: RCT Method: analyzed data from 131 patients visiting primary care physicians 14 months after the physicians participated in a randomized controlled trial.	Experimental arm physicians (N = 27) received SEE IT training during three 20 min standardized patient instructor (SPI) visits. Control physicians (N = 23)	Independent: physicians trained in self-efficacy enhancing interviewing techniques (SEE IT) Dependent: patient psychological health behavior change mediators	validated eight-item Perceived Medical Condition Self-Management Scale to measure general self-care self-efficacy; The measure employed a 5-point response scale (1 = strongly disagree to 5 = strongly agree)	Data analyses were conducted using Stata (version 14.1, StataCorp, College Station, TX) Used the GRADE approach using the GRADEPro	Patients visiting SEE IT-trained physicians had higher summary HBCM scores (+0.42, 95% CI 0.07–0.77; p = 0.021). also had greater self-care	Level of Evidence: I (per JHNEBP Appendix E) Strengths: RCT; one of the most socio-demographically varied areas in the U.S., facilitated recruitment of a relatively diverse sample of adult patients with a range of health conditions. Weaknesses: we did not measure actual use of SEE IT by the physicians during the study patients' visits. Doing so would have required audio recording of

<p>al health behavior change mediators (HBCMs).</p>				<p>measured stage of readiness for self-care of health conditions, in general, using a modification of a previously validated single-item measure; patients asked to select one of three response options: reflecting pre-contemplation, contemplation, and preparation stages</p> <p>measured three dimensions of health locus of control, each with a different six-item scale from the general Multidimensional Health Locus of Control (MHLC) measure. The three dimensions were Internal (the sense that health is determined largely by one's own actions)</p>	<p>3.2 software to present the quality of evidence in a 'Summary of findings' table</p>	<p>readiness (AOR 3.04, 95% CI 1.02–9.03, $p = 0.046$) less</p> <p>Chance health locus of control (0.27 points, 95% CI 0.50–0.04, $p = 0.023$), with no significant differences in other HBCMs versus controls.</p>	<p>visits, infeasible due to resource limitations.</p> <p>Feasibility: Yes, this study concluded that behavior change techniques (motivational interviewing) improve health behaviors</p> <p>Conclusion: Improvement in psychological HBCMs occurred among patients visiting SEE IT-trained physicians,</p> <p>Recommendation: If further research shows the observed HBCM effects improve health behaviors and outcomes, SEE IT training might be offered widely to physicians.</p>
---	--	--	--	--	---	---	---

APA Reference:

Kang, J., & Seomun, G. (2018). Evaluating web-based nursing education's effects: A systematic review and meta-analysis. *Western Journal of Nursing Research*, 40(11), 1677-1697. <https://10.1177/0193945917729160>

<p>Aim: evaluate effects of web-based nursing education programs by analyzing articles that report on how such programs affect learners' knowledge and clinical performance levels</p>	<p>Design: randomized controlled trials (RCTs) with a nonequivalent control group Method: RCT group used web-based nursing education for nurses and nursing students. Control group participated in a traditional lecture-based course for nurses and student nurses; included classroom instruction and lecture; and on-site training.</p>	<p>Initial search from databases: CINAHL, PubMed, EMBASE, Cochran, RISS, ProQuest Central (n=659); selected articles were published between the years 2007 and 2014 n=11 articles met criteria and included in the meta-analysis</p>	<p>Independent variables: web-based education Dependent variables: nursing students and licensed nurses' knowledge and clinical performance</p>	<p>-knowledge measured using nursing knowledge measurement tool; -clinical performance measured using the measurement tools for performing nursing tasks</p>	<p>Cochrane's Risk of Bias "Encoding: Cochrane Review Manager (RevMan) software 5.3 and R version 3.2.3 I-squared (I^2) test with a CI of 5% DerSimonian and Laird method (DerSimonian & Laird, 1986) Funnel plot</p>	<p>Results - a significant overall effect of web-based nursing education delivered basic knowledge and clinical performance. limitations of this result include observed variations in clinical skills, including adult respiratory nursing care. Web-based education can be difficult to apply to practical training. However,</p>	<p>Level of Evidence: I (per JHNEBP Appendix E) Strengths: examined more articles that had not yet been published and recently published. Larger pool of studies enables a broader interpretation of various results. Weaknesses: limitations include observed variations in clinical skills; additional studies utilizing enhanced measuring tools are needed; limitation in comparing total effect size because of the differences in variables; web-based education can be difficult to apply to practical training. Feasibility: Yes, practical for referencing methods of learning environmental health Conclusion: Web-based nursing education program has an overall effect on the knowledge and clinical performance of nurses and nursing students, especially blended programs and short (2 or 4 weeks) intervention periods;</p>
---	---	--	--	--	--	--	--

	Systematic article reviews and meta-analyses examined effects of web-based nursing education on participants' knowledge level. Excluded simulation training and scenario-based education					web-based programs combined with traditional methods for teaching skills can be extremely helpful in clinical nursing practice).	convenient for those who cannot enroll in a traditional education environment and provide accelerated feedback to the learner Recommendation: Blended learning is an effective method for teaching new learners. Possibly extend variables to include self-satisfaction and self-efficacy for future studies.
APA Reference: Laferriere, K., & Crighton, E. J. (2017). "During pregnancy would have been a good time to get that information": Mothers' concerns and information needs regarding environmental health risks to their children. <i>International Journal of Health Promotion & Education</i> , 55(2), 96-105. https://10.1080/14635240.2016.1242376							
Aim: highlighted the need for environmental health (EH) education appropriate times, from trusted sources, promotes	Method/design: this study employed qualitative methods involving semi-structured, face-to-face interviews with mothers living in	Purposeful sampling to ensure representation across income, education, language, and ethnic groups, participants were identified	Independent variables: environmental health education Dependent variables: mothers' behavior and awareness	Coding was collected by primary author (consulted w/co-author).	Interviews were digitally recorded with permission and transcribed verbatim, and the transcripts entered into NVivo (v.8)	mother preferred information from prenatal care provided over internet (58%); participants neither read nor	Level of Evidence: III (per JHNEBP Appendix E) Strengths: purposeful sampling of n=326 mothers and their SES although Weaknesses: bias concerns: possible self-selection bias; linguistic barriers; further studies need to include fathers' perspectives Feasibility: Yes, the study is in alignment with the need for routine environmental

<p>accessible and affordable protective actions.</p>	<p>Ottawa, Ontario.</p>	<p>from among n=326 Ottawa survey respondents from mothers</p>			<p>for coding and analysis</p>	<p>heard “anything” about EH risks since pregnancy (46%); few received such information (8%).</p> <p>Key themes: EH awareness, health risks concerns of their children; protective actions, barriers, information needs, and preferences</p>	<p>health screening and to promote education and awareness.</p> <p>Conclusion: majority of mothers reported being more concerned about environmental health risks than prior to having children. Barriers to taking action: including financial costs, perceived lack of control, and mistrust of informational sources.</p> <p>most common source of environmental health information for mothers was the Internet d/t lack of environmental health training prenatal care providers receive. Stress the need to routinely convey environmental health information during antenatal and prenatal visits</p> <p>Raise level of trust in public health messaging; increase awareness of environmental health risks and protective actions</p> <p>Recommendation: Development of effective environmental health education programs that target women, particularly during the prenatal period. Raise environmental health risks awareness to increase consumer pressure on manufacturers/retailers to</p>
--	-------------------------	--	--	--	--------------------------------	--	---

							provide safer products, and force the issue onto the political agenda
<p>APA Reference: Luong Thanh, B. Y., Laopaiboon, M., Koh, D., Sakunkoo, P., & Moe, H. (2016). Behavioural interventions to promote workers' use of respiratory protective equipment. <i>The Cochrane database of systematic reviews</i>, 12(12), CD010157. https://doi.org/10.1002/14651858.CD010157.pub2</p>							
Aim: assess the effects of any behavioral intervention either directed at organizations or at individual workers on observed or self-reported RPE use in workers when compared to no intervention or an alternative intervention .	systematic review of randomized controlled trials (RCTs); included non-RCT study designs for inclusion: controlled trials without randomization, such as controlled before and after (CBA)	N=14 published studies, eight were RCTs; and six were CBA studies	Independent: behavioral interventions Dependent: workers' use of RPE		results of each RCT were plotted as point estimates, such as risk ratios (RRs), indicating changes in binary outcomes such as appropriate use of RPE (yes/no), and means and standard deviations (SDs) for continuous outcomes such as frequency of appropriate use of RPE.	There were seven studies comparing education with no intervention	<p>Level of Evidence: II (per JHNEBP Appendix E) Strengths: Systematic review that conducted RCTs Weaknesses: Allocation, incomplete outcome data, selective reporting. Feasibility: Yes, although the review did not conclude with sufficient evidence, the study determined there is need for interventions to influence behavioral change. Conclusion: behavioral interventions - namely education and training - do not have a considerable effect on the frequency or correctness of RPE use in workers. This may be due to a lack of studies with a low risk of bias. Interventions to promote the correct use of RPE need to be better evaluated to provide evidence for their effectiveness before any</p>

							<p>strong recommendations can be made.</p> <p>Recommendation: A need for better quality studies on effectiveness of different types of interventions. further studies should consider some of the barriers to the successful use of RPE, such as experience of health risk, types of RPE, and the employer's attitude to RPE use.</p>
<p>APA Reference: Malekzadeh, J., Amouzeshi, Z., & Mazlom, S. R. (2018). A quasi-experimental study of the effect of teaching Orem's self-care model on nursing students' clinical performance and patient satisfaction. <i>Wiley</i>. https://10.1002/nop2.151</p>							
<p>Aim: To determine the effect of teaching Orem's self-care model on nursing students' clinical performance and patient satisfaction.</p>	<p>Design: quasi-experimental, non-randomized, two-group design with post-test</p> <p>Method: 66 nursing students were selected via convenience sampling method. The intervention group was trained based on Orem's self-care</p>	<p>N = 66 nursing students; sixth semester, bachelor nursing students, who were in educational hospitals</p>	<p>Independent variables: clinical performance and patient satisfaction Dependent variables: nursing students learning Orem's self-care model</p>	<p>Data collection tools in this study included: (1) a researcher-made questionnaire and (2) questionnaire of students' awareness level of nursing process/Orem's self-care model. Two-way ANOVA test showed significant differences in clinical performance mean scores in</p>	<p>Data analysis was performed in SPSS 16 software. Quantitative variables normality was determined using the Kolmogorov-Smirnov test. Categorical variables were analyzed using chi-squared or Fisher exact</p>	<p>Results showed that teaching Orem's self-care model could improve students' communication skills. self-care is vital and profits both nurses and patients. it can be said that in</p>	<p>Level of Evidence: II (per JHNEBP Appendix C) Strengths: Performance of students in both groups were assessed by the researcher based on performance observation checklist. The overall performance of each student was observed four times during care and at the end of the training. Also, the patients were interviewed for satisfaction of the care given by nursing students using Likert score. Weaknesses: Because of the non-random sampling method in this study, findings may not be generalized to the general population. Therefore, it is</p>

	<p>model and the control group based on the routine nursing process method.</p>			<p>terms of group and type of training ($p < .001$) and patient satisfaction according to group and gender ($p < .001$).</p>	<p>test. Mann–Whitney, <i>t-test</i>, and two-way ANOVA were used to compare continuous variables. The significance level was considered at $p < .05$.</p>	<p>case Orem’s self-care model was taught to students over a longer period, student performance and, consequently, patient satisfaction would enhance more considerably.</p>	<p>recommended that a study with a random sample be conducted. Feasibility: Yes, the theoretical framework of Orem’s self-care model could improve students’ caring skills, thus supports a positive attitude toward self-care. Nursing education and clinical care are closely connected. Nursing education plays an essential role in the ability to practice effectively. It follows that an optimally educated nursing workforce creates optimal patient care. Conclusion: Given the fact that Orem’s self-care model increased the performance of students, it can be stated that this model is more effective than the nursing process in improving the clinical performance of nursing students. Recommendation: If more time is spent on education according to Orem’s self-care model, greater impact would be exerted on students’ performance and hence greater satisfaction on the part of patients. this model of nursing can be used in the education of nursing students with the</p>
--	---	--	--	--	--	--	--

							aim of bridging the gap between theory and practice
APA Reference: McCullagh, M. C., & Berry, P. (2015). A safe and healthful work environment. <i>Workplace Health & Safety</i> , 63(8), 328-332. https://10.1177/2165079915584127							

<p>Aim: to develop and pilot curricular materials to introduce undergraduate nursing students to occupational health nursing.</p>	<p>Design: Multi-phase study</p> <p>Methods: initial testing, expert panel review, and one-group pre-test/post-test.</p>	<p>Convenience sample of nurse educators/faculty (n=14); solicited from a national organization of public/community health educators.</p> <p>n=53 nursing students from baccalaureate nursing education.</p>	<p>Independent variables: curricular materials</p> <p>Dependent variables: faculty and student nurses</p>	<p>Knowledge test 10 multiple-choice items; student satisfaction 11 items rated on a 5-point Likert-type scale (<i>highest rating/superior to unsatisfactory/unacceptable</i>) survey; faculty satisfaction survey 14-item instrument using a 5-point Likert-type scale (<i>highest rating/superior to unsatisfactory/unacceptable</i>)</p>	<p>Quantitative satisfaction survey items were analyzed using descriptive techniques; qualitative items were analyzed using content analysis</p>	<p>Student and faculty feedback was positive; material deepened interest in occupational health nursing and quality of the learning materials.</p> <p>Faculty expressed high interest; intent to include it in their future course planning.</p>	<p>Level of Evidence: III (per JHNEBP Appendix F)</p> <p>Strengths: Expert panel of five occupational health nurse educators and clinicians recruited to critique the revised curriculum.</p> <p>Weaknesses: Small convenience sample.</p> <p>Feasibility: Yes, this review is in alignment with my PICO and suggests occupational health education inclusion is needed in baccalaureate nursing education</p> <p>Conclusion: Occupational health nurses in clinical practice promote inclusion of this subspecialty content in baccalaureate nursing education programs. Practicing occupational health nurses are a valuable resource to nursing faculty</p> <p>Recommendation: Inclusion of occupational health nursing content in basic nursing education is valuable to nurse educators and clinicians. Nurses in all settings will be better prepared to support the occupational health team and promote the health of the nation's</p>
---	--	--	---	---	--	--	--

							workforce as well informed about the role of occupational health nurse
APA Reference: Polivka, B. J., & Chaudry, R. V. (2018). A scoping review of environmental health nursing research. <i>Public Health Nursing</i> , 35(1), 10-17. https://10.1111/phn.12373							
Aim: determine the extent and focus of published environmental health nursing research.	Design: Scoping review Method: peer-reviewed, English-language environmental health nursing research with at least one nursing author	n=548 articles published between 1995 and 2015 in a nursing journal and catalogued in CINAHL.	Independent: EH nursing articles Dependent: EH nursing research	Citations for the 548 articles were coded by the first author for year of publication, journal type, country of focus, focus area, priority population or site, and study design based on the citation and abstract.	The Excel file was uploaded to IBM SPSS Statistics 24 (2016) for descriptive analyses.	EH, nursing research articles were published in 118 nursing journals. n = 329 (63%) articles focused on U.S. populations # of articles: Environmental exposures 59 (10.8) EH education 12 (2.2)	Level of Evidence: II (per JHNEBP Appendix E) Strengths: 548 articles were peer-reviewed and included one nursing author; majority were cross-sectional studies Weaknesses: review was limited to nursing journals; relevant search terms possibly missed; did not address theory development, which is foundational to quantitative research methods and an outcome of qualitative studies. Feasibility: Yes, the results concluded low number of articles on EH education and knowledge; and environmental risk education Conclusion: environmental nursing research has expanded since 1995; results are positive indicators of expansion of environmental health nursing research; re-

						<p>EH knowledge 12 (2.2)</p> <p>Environm ental risk education 1 (0.2)</p>	<p>emphasize nursing's long standing recognition of the environment's critical importance in health outcomes.</p> <p>Recommendation: Replication of this study using non-nursing journals could address this limitation.</p>
--	--	--	--	--	--	---	---

Appendix B

Environmental and Occupational Health Risk Module

Environmental and Occupational Health Risk: Learning Objectives

By the end of this module, you will be able to:

- Identify harmful exposures in the patient care setting
- Describe a safe nursing practice to mitigate potential harmful exposure
- Understand health risks that are associated with chemicals found in personal care products

Environmental and Occupational Health Risk: To Do

This module consists of 3 parts with 5 assignments:

Part I. Environmental and Occupational Health Risk: Virtual Simulation (V-sim).

The purpose of this virtual simulation (v-sim) is to provide you with education about environmental impacts and occupational health hazards. Knowledge and awareness will improve your nursing practice to mitigate potential hazardous exposure in the patient care setting.

You will assess your awareness of environmental and occupational health risks that exist in the healthcare setting. The focus of the virtual simulation (v-sim) on environmental and occupational health risks is to explore the various potential hazards within a patient's room.

You are being asked to participate in sharing your v-sim pre-and post-evaluations. Your evaluation results will provide data to rate the v-sim's effectiveness.

Prior to and upon completion of experiencing the v-sim, you will complete the following:

- Qualtrics Pre-Evaluation: Test your awareness to establish a baseline.
- V-sim Scenario 1: Self-assessment
- V-sim Scenario 2: Knowledge acquisition
- Qualtrics Post-Evaluation: Rate the v-sim's effectiveness and test your knowledge acquisition.

Part II - Environmental and Occupational Health Risk: To Do

Learning Activities: Videos; website

You will also complete the learning activities on environmental health to augment your learning and pique your interest.

1. Watch: EWG's brief video - What are endocrine disruptors? (3:03)
2. Watch: The Story of Cosmetics (08:17)
3. Review: Sustainability Solutions for Health Care

Part III - Environmental and Occupational Health Risk: To Do

Wrap up and Looking Ahead

Debrief on what you learned from the v-sim and learning activities.

LET'S BEGIN.....

Part I. Environmental and Occupational Health Risk: Virtual Simulation (V-sim).

Assignment #1: Awareness and Assessment (V-sim Scenario 1)

Thoroughly read all the instructions before clicking on the assignment links.

Prior to completing the assignment below, obtain a baseline on your environmental and occupational health risk awareness by filling out the Qualtrics Pre-Evaluation.

Then, perform an environmental and occupational health risk self-assessment by following these instructions:

1. To enter the virtual patient's room, click on E&OH Patient Room Assessment (Scenario 1)
2. Spend ~10 minutes to scan the patient's room - navigate using the **green** arrows with your mouse or pad.
3. Assess the patient's room and write a brief list of your assessment on potential environmental and occupational health risks.

Complete Assignment #1:

First - Complete the Qualtrics Pre-Evaluation [Link to an external site]

Please upload and submit a screenshot to show you've completed the survey: END OF SURVEY pre-evaluation.

Second - E&OH Patient Room Assessment V-Sim (Scenario 1) [Link to an external site]

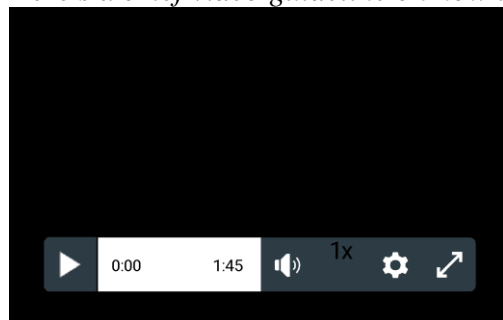
Please list--or upload a screenshot--and submit your brief assessment.

Assignment #2: Test your knowledge acquisition (V-sim Scenario 2)

To learn about environmental and occupational health risk facts, please follow the instructions:

1. Enter the virtual patient's room.
2. Navigate throughout the patient's room using the **green** arrows
3. Visit all 9 of the hotspots to learn about the facts of each potential risk

Here's a brief video guideline on how to navigate in the v-sim:



Click here to enter the patient's room: [E&OH Facts w/Video Hotspots V-Sim \(Scenario 2\)](#).

Complete Assignment #2:

- First - E&OH Facts w/Video Hotspots V-Sim (Scenario 2) [Link to an external site]
- Second - Qualtrics Post-Evaluation [Link to an external site]

Please upload a screenshot to show you've completed the survey: END OF SURVEY post-evaluation screenshot.

Part II - Environmental and Occupational Health Risk: To Do

Learning Activities: Videos; website.

Assignment #3 Watch: EWG's brief video - What are endocrine disruptors?

Watch: EWG's brief video What are endocrine disruptors?

Endocrine disrupting chemicals are all over the place. There are thousands of these chemicals – and they're lurking in our food, food packaging, household cleaners, beauty products, water, and even in our furniture and dust. For ideas about minimizing the effects of endocrine disruptors on you and your family and to check out our full Dirty Dozen list of endocrine disruptors, visit www.ewg.org/dirtydozenendocrine.

Complete Assignment #3

Answer one (1) of the following:

- List 2 potential risks associated with endocrine disrupting chemicals found in our environment.
- List 2 common endocrine disrupting chemical exposures found in our environment.

Assignment #4 Watch: The Story of Cosmetics Watch: The Story of Cosmetics

The Story of Cosmetics, released on July 21st, 2010, examines the pervasive use of toxic chemicals in our everyday personal care products, from lipstick to baby shampoo. Produced with Free Range Studios and hosted by Annie Leonard, the seven-minute film by The Story of Stuff Project reveals the implications for consumer and worker health and the environment, and outlines ways we can move the industry away from hazardous chemicals and towards safer alternatives. The film concludes with a call for viewers to support legislation aimed at ensuring the safety of cosmetics and personal care products.

Complete Assignment #4

Answer one (1) of the following questions:

- Which work industry is exposed to toxic chemicals the most on a daily basis?
- In comparison to the U.S., which country's government requires removal of many toxic chemicals in personal products?

Assignment #5 Reflection: Sustainability Solutions for Health Care Review: Sustainability Solutions for Health Care: SEE HOW WE CAN HELP YOU

Practice Greenhealth is the leading membership and networking organization for sustainable health care, delivering environmental solutions to hospitals and health systems across the United States.

Complete Assignment #5

Choose one (1) topic from "*SEE HOW WE CAN HELP YOU*" and write a reflection on the following:

- In a short narrative or bullet format, explain how the topic you chose will impact you personally and/or professionally. (Limit to 50 words max)

Part III. Module Wrap-up and Looking Ahead

Wrap-up

Time to debrief on what you learned from this module.

Prompt: Based on the new knowledge you've gained from this module list in bullet format:

- Two (2) potentially harmful exposures in the patient healthcare setting.
- One (1) safe practice to prevent potentially harmful exposure in a patient care setting.

Looking Ahead

Congrats! You've completed this module!

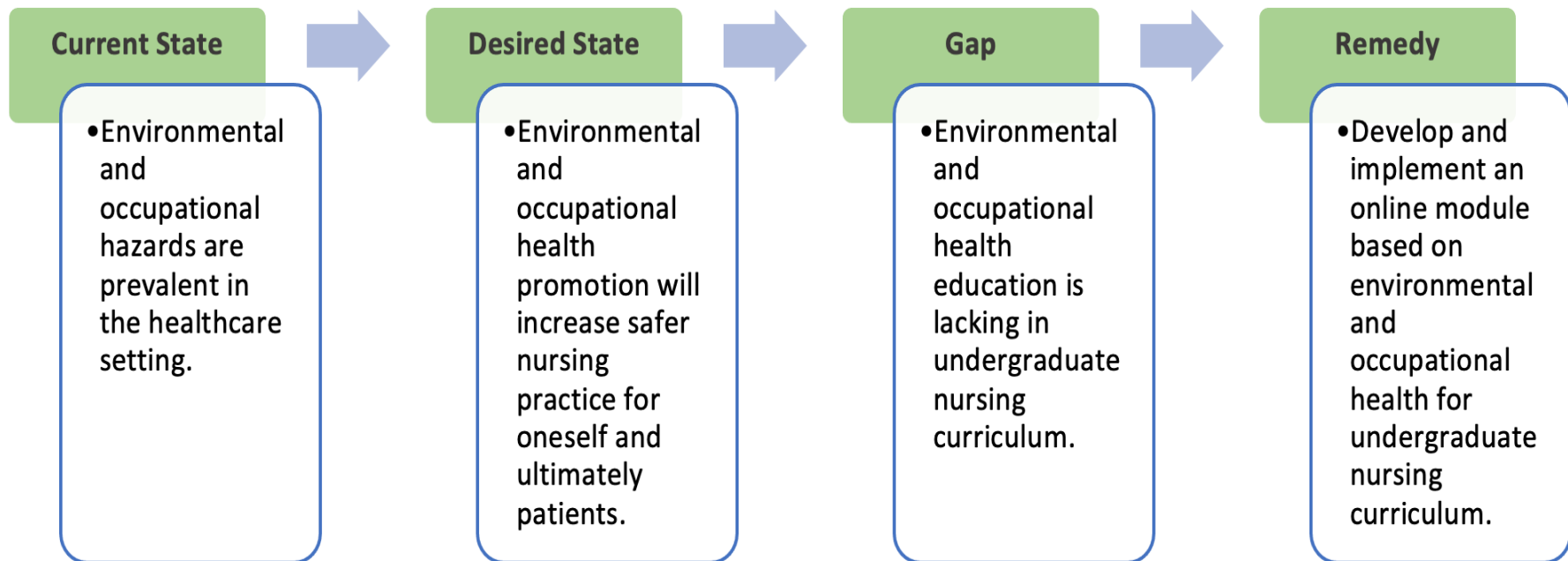
As you move forward in your healthcare career, take into consideration the following thoughts:

- How do these environmental and occupational health risks affect my nursing practice?
- Where can I learn more strategies on how to mitigate these risks?
- What information should I offer my patients?

Hotspot resource links:

- Sharps - [Bloodborne Pathogen](#)
- Lotion - [Safer Cosmetics Database](#)
- Clorox - [10 Reasons to Eliminate Glutaraldehyde](#)
- IV Tubing - [More on DEHP](#)
- Food Tray - [What's on My Food](#)
- Flame Retardant - [4-minute video](#)

Appendix C
Gap Analysis



Appendix D

Work Breakdown Structure

Level 1	Level 2	Level 3
A nursing practice improvement based on environmental and occupational health education	1.1 Initiation	1.1.1 Identify a problem 1.1.2 Conduct gap analysis 1.1.3 Develop an AIM statement 1.1.4 Consider a theoretical model 1.1.5 Investigate an educational modality
	1.2 Planning	1.2.1 Identify stakeholders team members 1.2.2 Initiate first stakeholders meeting 1.2.3 Develop a project intervention 1.2.4 Obtain project approval
	1.3 Execution	1.3.1 Conduct stakeholders kick-off meeting 1.3.2 Conduct faculty training on the intervention 1.3.3 Present educational module to faculty and students 1.3.4 Analyze feedback (pre/post surveys) from Qualtrics 1.3.5 Adjust project intervention per Qualtrics data 1.3.6 Present to chair to implement in future courses
	1.4 Control	1.4.1 Conduct stakeholders' meetings 1.4.2 Update on status and tasks 1.4.3 Adjust tasks as needed
	1.5 Closeout	1.5.1 Conduct final stakeholders' meeting 1.5.2 Present intervention results to CSUEB faculty 1.5.3 Create a plan to disseminate education module 1.5.4 Finalize project for presentation 1.5.5 Deliver project presentation 1.5.6 Finalize project for repository

Appendix E

Gantt Chart

Environmental & Occupational Educational Intervention

DNP Project	Responsible Person(s)	2021												2022												2023												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Initiation																																						
1.1.1 Identify a problem	DM																																					
1.1.2 Conduct gap analysis	DM																																					
1.1.3 Develop an AIM statement	DM																																					
1.1.4 Consider a theoretical model	DM																																					
1.1.5 Investigate an educational modality	DM																																					
Planning																																						
1.2.1 Identify stakeholders team members	DM																																					
1.2.2 Initiate first stakeholders meeting	DM																																					
1.2.3 Develop a project intervention	DM																																					
1.2.4 Obtain project approval	FSD																																					
Execution																																						
1.3.1 Attend stakeholders kick-off meeting	DM/FSD/CP																																					
1.3.2 Conduct intervention faculty training	DM																																					
1.3.3 Present educational module: faculty and student	DM																																					
1.3.4 Analyze Qualtrics pre/post surveys feedback	DM																																					
1.3.5 Adjust intervention per data	DM																																					
Control																																						
1.4.1 Attend stakeholders meetings	DM/FSD/CP																																					
1.4.3 Status and update of tasks	DM/FSD/CP																																					
1.4.4 Adjust tasks as needed	DM																																					
Closeout																																						
1.5.1 Attend final stakeholders meeting	DM/FSD/CP																																					
1.5.2 Present intervention results to CSUEB faculty	DM																																					
1.5.3 Create a plan to disseminate education module	DM																																					
1.5.4 Finalize project for presentation	DM																																					
1.5.5 Deliver project presentation	DM																																					
1.5.6 Finalize project for repository	DM																																					

Legend:
 CP - Community Partner
 DM - Dorie Mercado, MS BSN RN
 FSD - Dr. Francine Serafin Dickson

Appendix F

SWOT Analysis

	Favorable/Helpful	Unfavorable/Harmful
I N T E R N A L	<p>Strengths</p> <ul style="list-style-type: none"> ● Faculty expert developed and currently teaches an established environmental health nursing elective course ● Overall nursing student demographics are generation z to late millennial ● Progressive faculty strive to offer an innovative learning experience 	<p>Weaknesses</p> <ul style="list-style-type: none"> ● Undergraduate students lack/limited knowledge of environmental and occupational harmful exposure ● Undergraduate students lack opportunity to enroll in elective ● Environmental health education is limited to one lecture ● Seasoned faculty lack buy-in
E X T E R N A L	<p>Opportunities</p> <ul style="list-style-type: none"> ● Education module is adaptive to other nursing institutions and healthcare disciplines ● Collaboration among environmental health organizations to promote knowledge and awareness ● Healthy People 2030 is addressing impacts of environmental health ● Nurses advocate for hospital policy change 	<p>Threats</p> <ul style="list-style-type: none"> ● Traditional nursing curriculum is impacted ● Healthcare settings may resist environmental and occupational safety standards in their policies

Appendix G

Communication Plan/Matrix

Stakeholder	Role	Responsibility	Mode
DNP Student	Project Lead	Initiate and manage communication	Email; meet in person or virtually; telephone
USF Advisor	DNP Chair	Support and guide the project lead with DNP process; approve the project	Email; meet virtually; telephone
USF Faculty	Second Reader	Support and guide the project lead with EH expertise	Email; meet virtually; telephone
CSUEB Faculty	Consultant	Support and guide the project lead with EH expertise	Email; meet in person or virtually; telephone
CSUEB Faculty	Faculty of Record for Course	Provide evaluation of the project's content	Email; meet virtually; telephone
CSUEB BSN Student	Participant	Partake and evaluate the intervention	Email; Canvas

Appendix H

Proposed Project Budget

Service/Expense	*Rate/Time	Cost
EH Expert: Virtual simulation development	\$75/hr x 30	\$2,250.00
EH Expert Consult: Salary and time	\$75/hr x 5	375.00
Faculty review: Educational module	\$75/hr x 1	75.00
Faculty training: Virtual simulation module	\$75/hr x 1	75.00
Project Lead: Salary and time	\$50/hr x 800	40,000.00
Total	222 hours	\$42,775.00

*Rates are hypothetical, and hours are approximations

Cost Avoidance

Resource	Unit	*Rate	Cost Avoidance
Bedside Nurse (Sick Pay)	8	\$130/hour	\$1,040
Bedside Nurse (Overtime Pay)	8	195/hour	1,560
ED Triage	1	1,000/visit	1,000
ED Medications/Tests	1	1,000/visit	1,000
ED Room/Care	1	1,100/visit	1,100
ED Physician Fee	2	200/hour	400
Subtotal (monthly)			6,000
Total (annually)			\$72,000

*Pay and emergency department (ED) (Corso, 2022) rates are hypothetical

Return on Investment

Description	Cost
Cost avoidance	\$72,000
Implementation cost	\$42,775
Net Savings Year 1	\$29,225
Net Savings Year 2	\$72,000

Appendix I

Data Collection Tool: Pre/Post Evaluations

Pre-Evaluation [Prior to the virtual simulation]

Demographic Information:

Q1. How many years have you been a registered nurse?

1. 0-1
2. 1-3
3. 3-5
4. 5+

Q2. What patient care setting are you employed in?

1. Inpatient Care
2. Outpatient Care
3. Other [fill in]
4. Not employed

Q3. How would you rate your environmental and occupational health awareness?

- 1) highly aware
- 2) aware
- 3) neutral
- 4) unaware
- 5) highly unaware

Q4. In my ADN program, I learned about environmental health issues.

- 1) highly agree
- 2) agree
- 3) neutral
- 4) disagree
- 5) highly disagree

Multiple choice questions:

Q5. A dressing change with minimal blood should be discarded in:

- a) a biohazard red bag
- b) a recycling bin
- c) a trash bin
- d) any of the above

- Q6. Exposure to any used sharp is a risk of:
- a) bloodborne pathogen contamination
 - b) chemical contamination
 - c) a and b
 - d) none of the above
- Q7. Chemicals in bleach:
- a) may irritate the nasopharynx
 - b) do not irritate the lungs
 - c) are found on a Safety Data sheet
 - d) a and c
- Q8. Disinfectants used in hand sanitizers:
- a) are formulated as a pesticide
 - b) may irritate the mucous membranes
 - c) may become less effective
 - d) all of the above
- Q9. Phthalates used in IV tubing are classified as:
- a) endocrine disruptors
 - b) carcinogens
 - c) a health risk to neonatal males
 - d) all of the above
- Q10. Potential health risks associated with products, such as lotion, are:
- a) reproductive toxicity
 - b) neuro toxicity
 - c) a and b
 - d) none of the above
- Q11. Antimicrobial scrubs are:
- a) effective in preventing hospital-acquired infections
 - b) effective in protecting patients and nurses in hospitals
 - c) not recommended over plain scrubs
 - d) none of the above
- Q12. Hospital food and drinks:
- a) may contain pesticide residue
 - b) are always nutritious for patients
 - c) are never processed
 - d) none of the above
- Q13. Flame retardant chemicals are found in:
- a) curtains
 - b) ambient air
 - c) mattresses
 - d) all of the above

END OF PRE-EVALUATION

.....

Post-Evaluation
[Upon completion of the virtual simulation]

Rate the efficacy of the simulation experience in comparison to reading this information in a textbook.

- 1) highly effective
- 2) effective
- 3) neutral
- 4) ineffective
- 5) highly ineffective

Multiple choice questions:

[same questions (Q5-Q13) as the pre-evaluation]

END OF POST-EVALUATION

Appendix J

Statement of Non-Determination



Doctor of Nursing Practice Statement of Non-Research Determination (SOD) Form

The SOD should be completed in NURS 7005 and NURS 791E/P or NURS 749/A/E

General Information

Last Name: Mercado _____ **First Name:** Dorinda _____

CWID Number: 10208177 _____ **Semester/Year:** Spring 2022 _____

Course Name & Number: *NURS 7005 Population Health Leadership and Teamwork in Project Planning; and NURS 791P Addressing the Needs of Populations with Evidence-Based Interventions* _____

Chairperson Name: Francine Serafin Dickson _____ **Advisor Name:** Francine Serafin Dickson _____

Second Reader Name: Barbara Sattler _____

Project Description

Title of Project: Environmental and Occupational Health Risks: Educating Undergraduate (ADN-BSN) Nursing Students for Safer Practice

Brief Description of Project (Clearly state the purpose of the project and the problem statement in 250 words or less): Environmental and occupational hazardous exposure exists within the healthcare setting and requires nursing action. The project will address an environmental and occupational health awareness and knowledge gap that currently exists among undergraduate nursing students. The project will provide foundational education on environmental and occupational health risk through a virtual reality program implemented in an educational module. The education will promote safer and effective practice and increase the nurse's awareness of a safe inpatient care environment. Subsequently, advocacy for ADN-BSN students and patients will improve health outcomes and encourage healthier living. A pre- and post-evaluations will measure the ADN-BSN nursing students' awareness and knowledge.

1. AIM Statement: What are you trying to accomplish?

Increase environmental and occupational health knowledge by 50% from pre- to post-evaluations among ADN-BSN nursing students at California State University East Bay by June 1, 2023.

2. Brief Description of Intervention (150 words):

- Identify the ADN-BSN course where the educational module will be delivered.
- Develop and deliver an educational module with input from CSUEB faculty around the concept of safe practice based on environmental and occupational health:
 - Voiceover PowerPoint
 - Virtual reality simulation (VIAR 360)
 - Additional learning activities
- Develop and conduct pre- and post-evaluations utilizing multiple-choice questions based on items from the virtual reality simulation.
- Data results will be analyzed using Qualtrics.

4a. How will this intervention be implemented?

- Where will you implement the project?
 - The intervention will be implemented in a California State University East Bay (CSUEB) post-licensure (ADN-BSN) program (Transition to Professional Nursing online course).
- Who is the focus of the intervention?
 - The intervention will focus on CSUEB ADN-BSN students who are practicing RNs.
- How will you inform stakeholders/participants about the project and the intervention?
 - Communication with CSUEB faculty stakeholders and student participants will be conducted via meetings held in person, virtually, and/or email.
- Letter from the agency with approval of your project (see attached).

5. Outcome measurements: How will you know that a change is an improvement?

- Measurement over time is essential to QI. Measures can be outcome, process, or balancing measures. Baseline or benchmark data are needed to show improvement.
- Align your measure with your problem statement and aim.
- Try to define your measure as a numerator/denominator.
- What is the reliability and validity of the measure? Provide any tools that you will use as appendices.
- Describe how you will protect participant confidentiality.

The outcome measurements are as follows:

1. Identification of at least two types of potentially harmful exposures within the inpatient healthcare setting.
2. Acknowledgment of at least one safe practice to prevent potentially harmful exposure within the inpatient healthcare setting.



UNIVERSITY OF
SAN FRANCISCO

School of Nursing and
Health Professions

DNP Statement of Determination

Evidence-Based Change of Practice Project Checklist*

The SOD should be completed in NURS 7005 and NURS 791E/P or NURS 749/A/E

Project Title: Environmental and Occupational Health Risks: Educating Undergraduate

(ADN-BSN) Nursing Students for Safer Practice

Mark an “X” under “Yes” or “No” for each of the following statements:	Yes	No
The aim of the project is to improve the process or delivery of care with established/accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.	X	
The specific aim is to improve performance on a specific service or program and is a part of usual care . <u>All</u> participants will receive standard of care.	X	
The project is not designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does not follow a protocol that overrides clinical decision-making.	X	
The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does not develop paradigms or untested methods or new untested standards.	X	
The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does not seek to test an intervention that is beyond current science and experience.	X	
The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.	X	
The project has no funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	X	
The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., not a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.	X	
If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: <i>“This project was undertaken as an Evidence-based Change in Practice Project at X hospital or agency and as such was not formally supervised by the Institutional Review Board.”</i>	X	

Answer Key:

- If the answer to all of these items is “Yes”, the project can be considered an evidence-based activity that does not meet the definition of research. IRB review is not required. Keep a copy of this checklist in your files.
- If the answer to any of these questions is “No”, you must submit for IRB approval.

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used: <http://answers.hhs.gov/ohrp/categories/1569>



UNIVERSITY OF
SAN FRANCISCO

School of Nursing and
Health Professions

DNP Statement of Determination

Evidence-Based Change of Practice Project Checklist Outcome

The SOD should be completed in NURS 7005 and NURS 791E/P or NURS 749/A/E

This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). **Student may proceed with implementation.**

This project involves research with human subjects and **must be submitted for IRB approval before project activity can commence.**

Comments:

Student

Last Name:

Mercado

Student

First Name:

Dorinda

Student Signature:

Date:

Mar 29, 2022; July 6, 2022

Chairperson Name:

Francine Serafin Dickson

Chairperson Signature:

Date:

March 29, 2022; July 6, 2022

Second Reader Name:

Barbara Sattler

Date:

April 10, 2022; July 7, 2022

**Second Reader
Signature:**

Barbara Sattler

**DNP SOD Review
Committee Member
Name:**

**DNP SOD Review
Committee Member
Signature:**

Date:

Appendix K
Letter of Support



February 7, 2022

Re: Letter of Support – Dorinda Mercado

To Whom It May Concern:

This is a letter of support for Dorinda Mercado to implement her Doctoral of Nursing Practice (DNP) Comprehensive Project on Knowledge and Awareness on Environmental Toxin Exposure in the Patient Setting for Nurses at California State University East Bay (agency).

As Department Chair I give her permission to use the name of our agency in her DNP Comprehensive Project Paper and in future presentations and publications. Kindly contact me if you have any questions or concerns.

Sincerely,



Monika Eckfield, PhD, RN, PHN
Department Chair, Associate Professor, and Chief Nurse Administrator

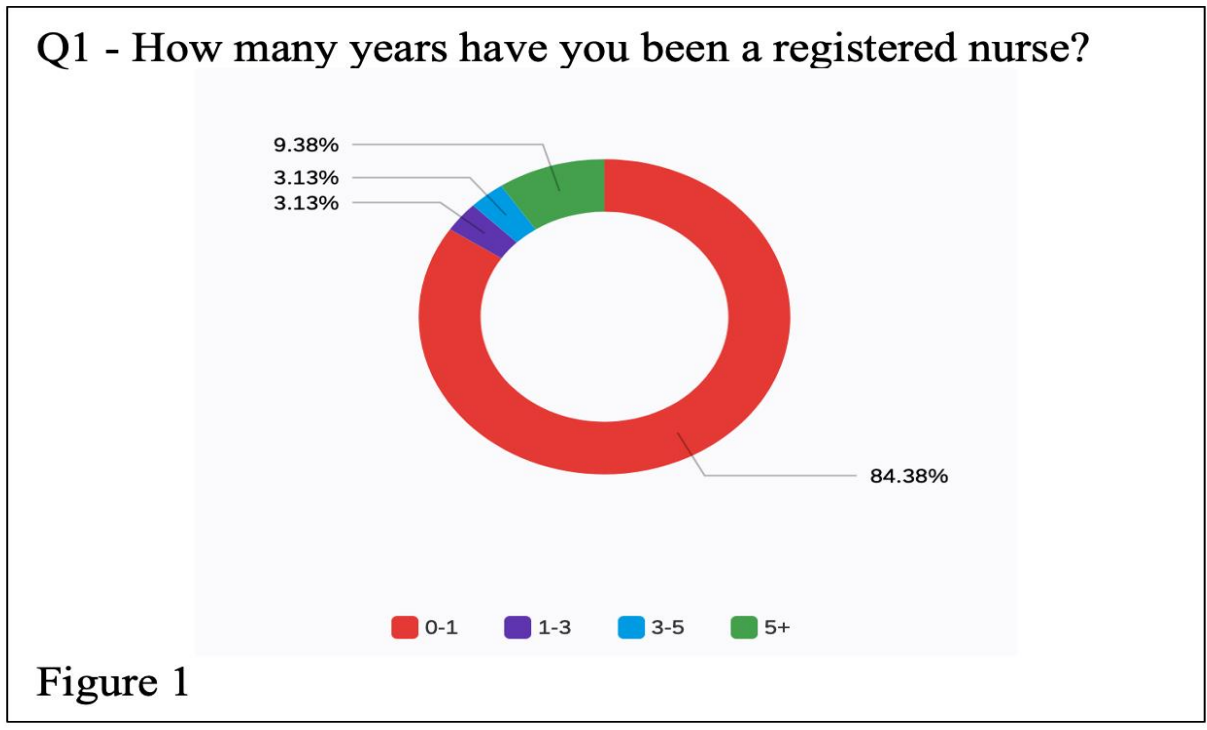
Appendix L

Demographics Results

Employment Years as a Registered Nurse

Figure 1

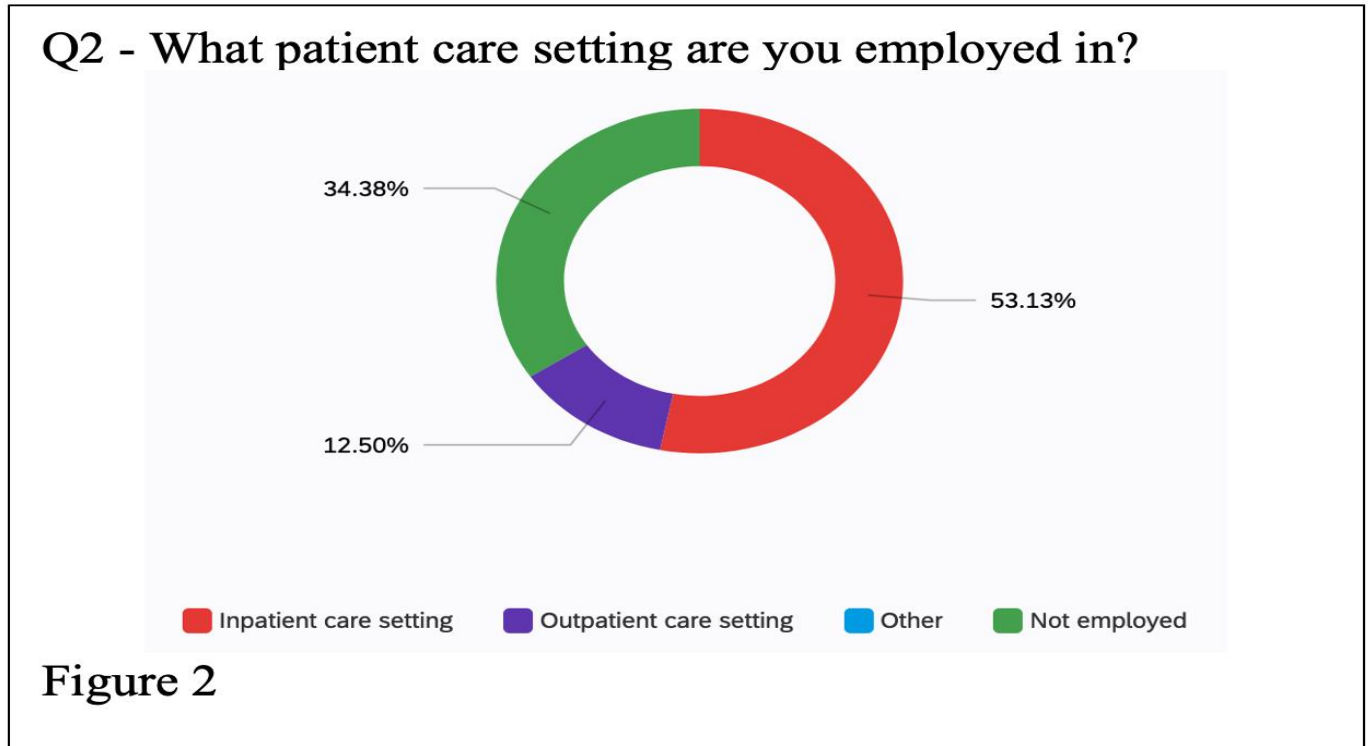
Length of time each student has been a registered nurse.



Employment Setting as a Registered Nurse

Figure 2

Employment setting at the time of participation.

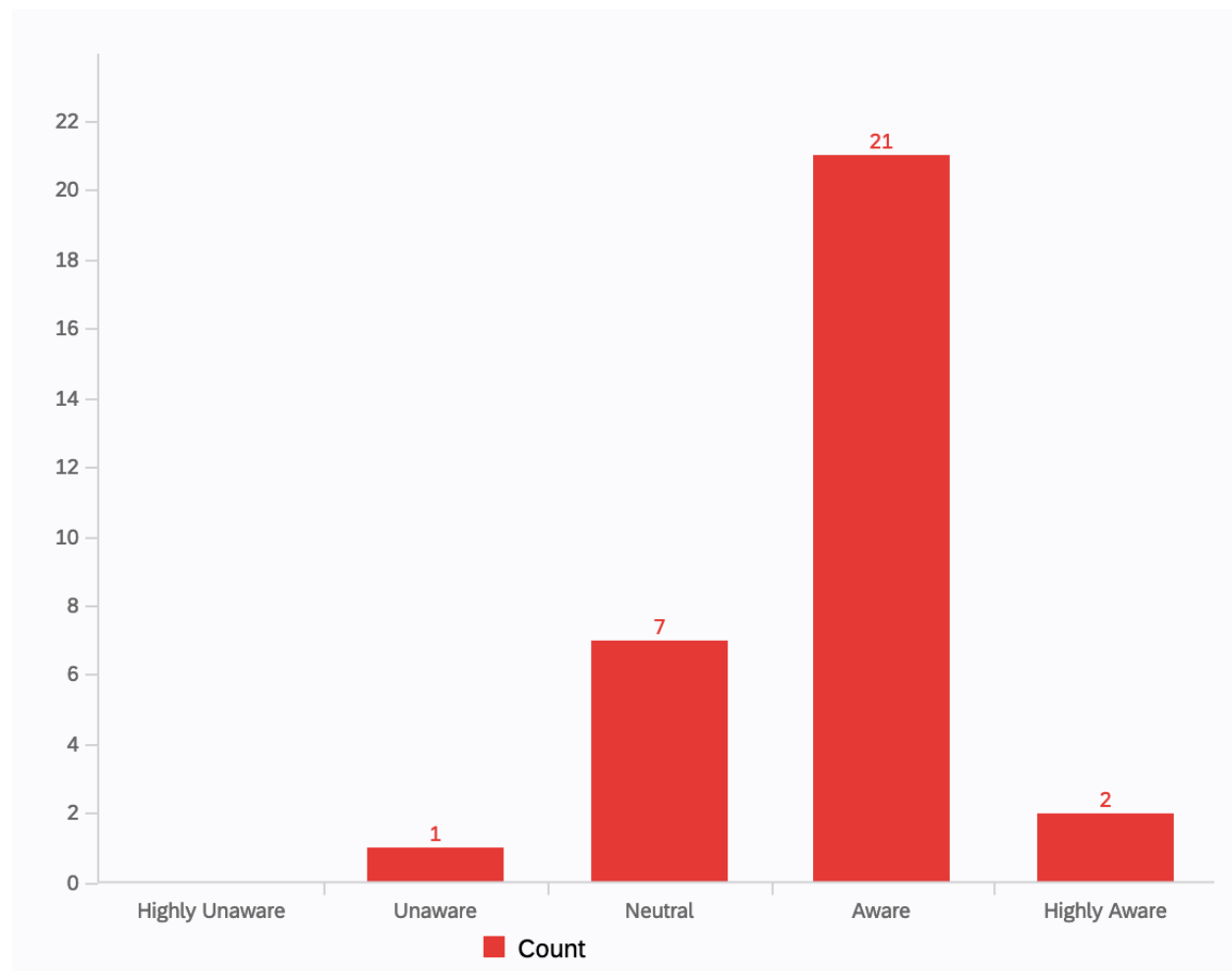


Environmental and Occupational Health Awareness and Knowledge

Figure 3

Nursing student's combined level of environmental and occupational health awareness.

Q3 - How would you rate your environmental and occupational health awareness?

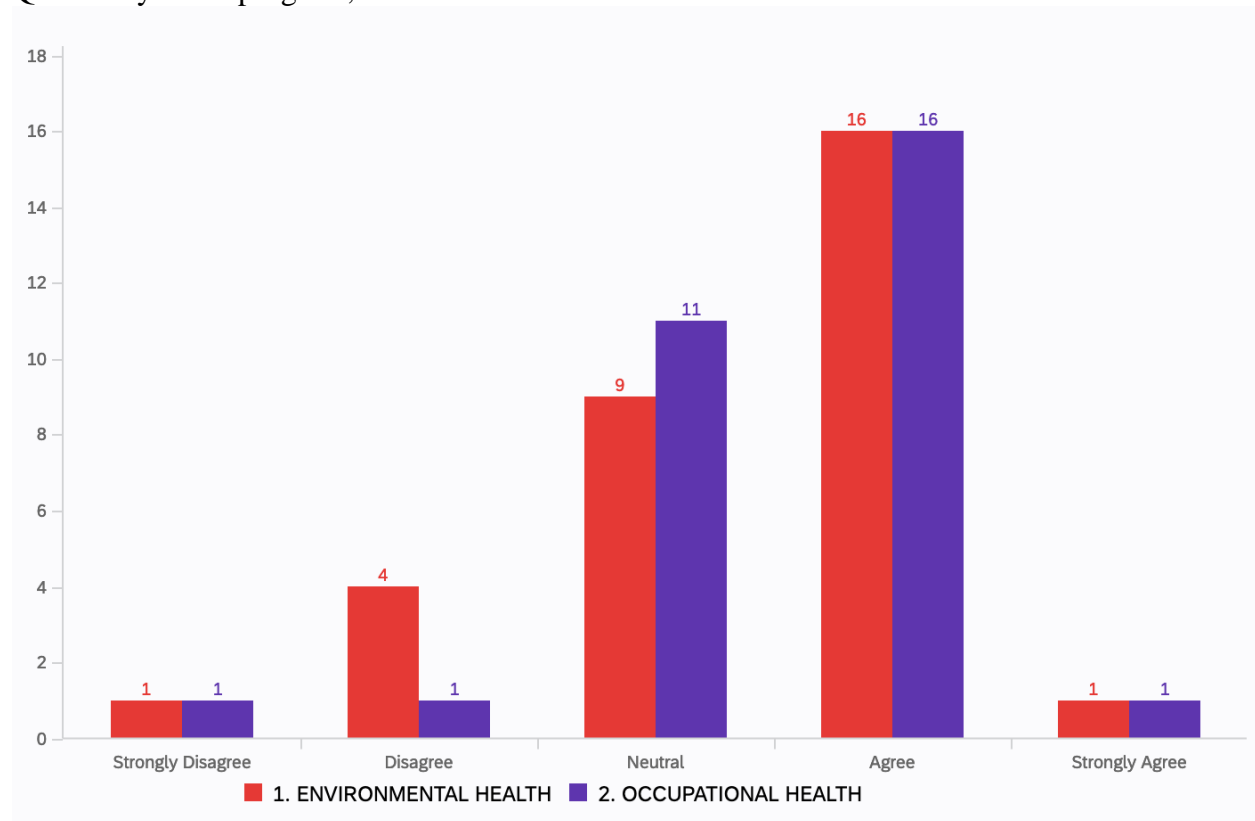


Environmental and Occupational Health Educational Level

Figure 4

Nursing student's environmental and occupational health education level received from their ADN program.

Q4 - In my ADN program, I learned about...

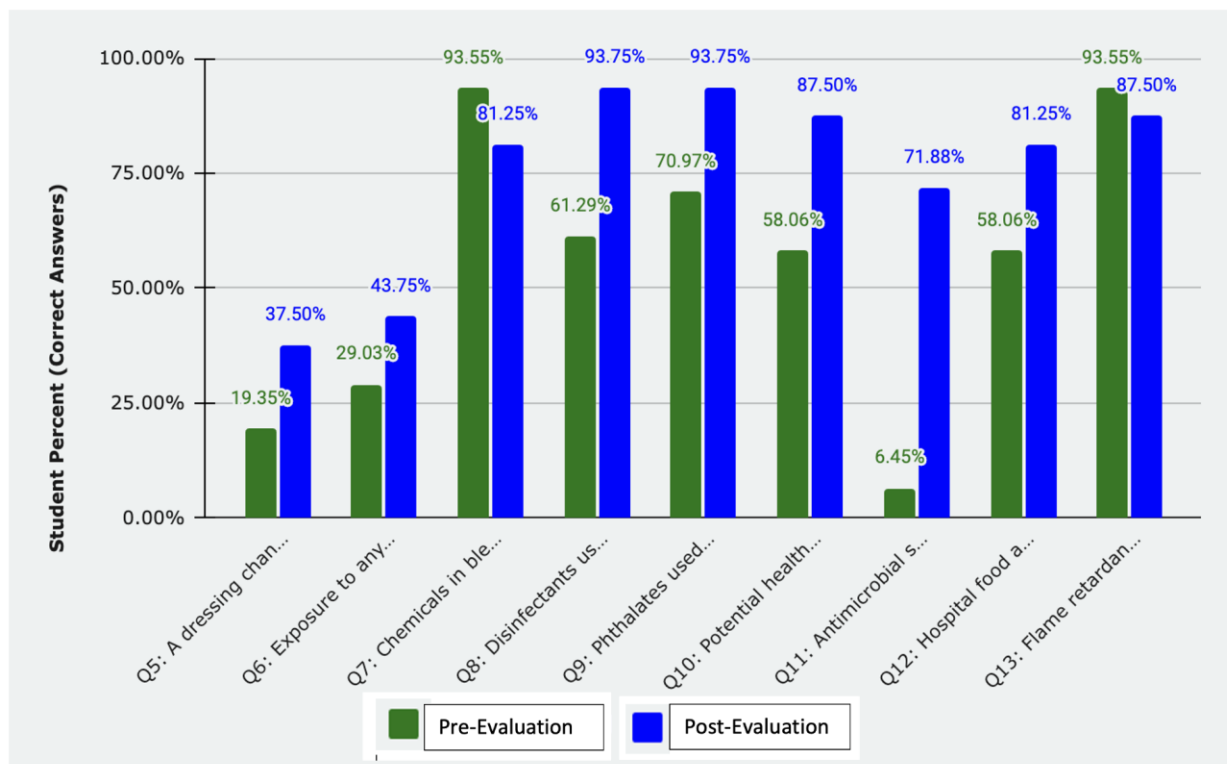


Appendix M

Quantitative Results

Figure M1

Pre/Post-Evaluation Graph: Percent Increase in Correct Answers



Legend:

- Target was a 50% increase in knowledge.
- Percentage reflects the number of students who chose the correct answer in the pre- and post-evaluation.
- Questions 1-4 (Q1-Q4) were demographic questions.

Table M2

Pre/Post-Evaluation Table: Percent Increase in Correct Answers

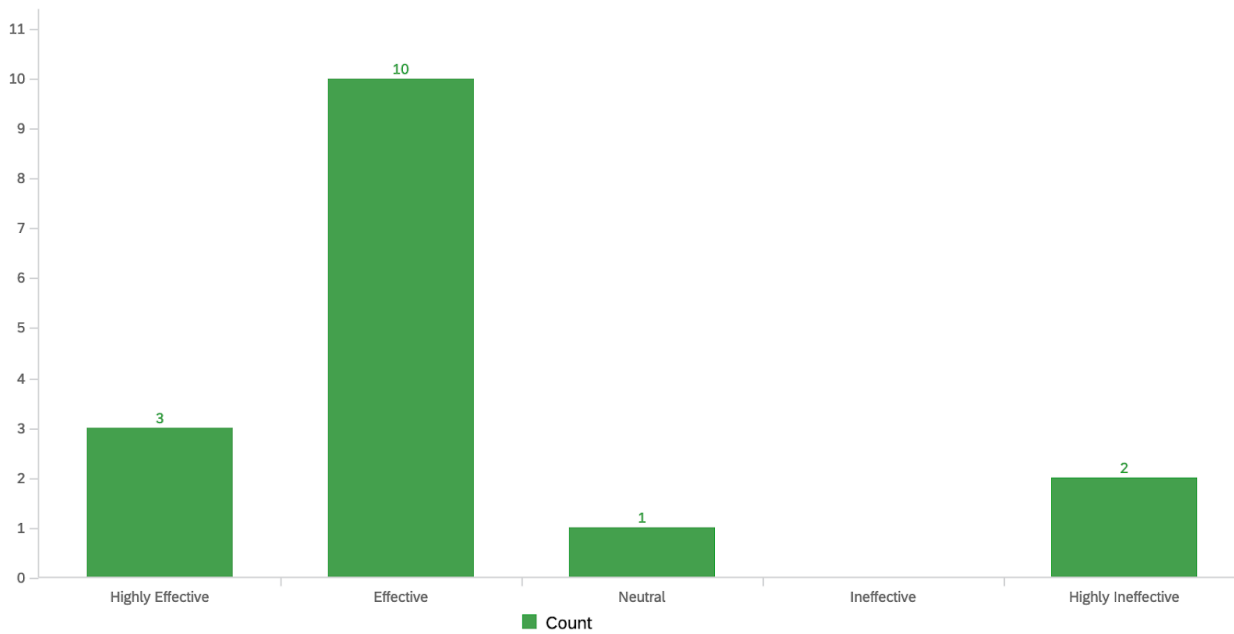
Question/Answer in Blue	Pre-Eval	Post-Eval	Percent Improvement
Q5: A dressing change with minimal blood should be discarded in:			
a) biohazard red bag	81%	63%	
b) recycling bin	0%	0%	
c) landfill bin	19%	38%	100%
d) any of the above	0%	0%	
Q6: Exposure to any used sharp is a risk of:			
a) bloodborne pathogen contamination	29%	44%	52%
b) chemical contamination	0%	0%	
c) a and b	71%	56%	
d) none of the above	0%	0%	
Q7: Chemicals in bleach:			
a) may irritate the nasopharynx	3%	16%	
b) do not irritate the lungs	0%	0%	
c) are found on a Safety Data sheet	3%	3%	
d) a and c	94%	81%	-14%
Q8: Disinfectants used in hand sanitizers:			
a) are formulated as a pesticide	0%	0%	
b) may irritate the mucous membranes	32%	6%	
c) may become less effective	7%	0%	
d) all of the above	61%	94%	54%
Q9: Phthalates used in IV tubing are classified as:			
a) endocrine disruptors	19%	6%	
b) carcinogens	10%	0%	
c) a health risk to neonatal males	0%	0%	
d) all of the above	71%	94%	32%
Q10: Potential health risks associated with products such as lotion are:			
a) reproductive toxicity	10%	0%	
b) neuro toxicity	0%	0%	
c) a and b	58%	88%	52%
d) none of the above	32%	13%	
Q11: Antimicrobial scrubs are:			
a) effective in preventing hospital-acquired infections	45%	13%	
b) effective in protecting patients and nurses in hospitals	36%	3%	
c) not recommended over plain scrubs	6%	72%	1100%
d) none of the above	13%	13%	
Q12: Hospital food and drinks:			
a) may contain pesticide residue	58%	81%	40%
b) are always nutritious for patients	6%	3%	
c) are never processed	0%	0%	
d) none of the above	36%	16%	
Q13: Flame retardant chemicals are found in:			
a) curtains	3%	6%	
b) ambient air	0%	0%	
c) mattresses	3%	6%	
d) all of the above	94%	88%	-6%

Legend:

- Target was a 50% increase in knowledge.
- Percentage reflects the number of students who chose the correct answer in the pre- and post-evaluation.
- Questions 1-4 (Q1-Q4) were demographic questions.
- Answers in blue text are the correct answers.

Figure M3*Post-Evaluation Graph: Efficacy Rating*

Q1 - Rate the efficacy of the simulation experience in comparison to reading this information in a textbook.



Note: Due to a formatting error in the post-evaluation, Q1 was readministered separately two weeks after data collection. N = 16 responded.

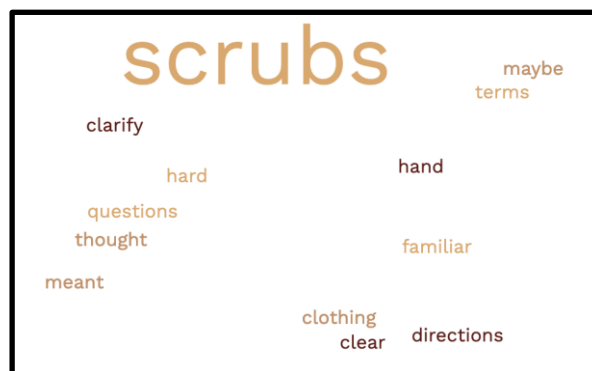
Appendix N

Qualitative Results

Student Comments:

Pre-evaluation Comments:

- *hard questions as I am not familiar with some of the terms*
- *I thought scrubs meant clothing scrubs. Maybe clarify to hand scrubs.*
- *Some directions not very clear.*



Post-evaluation Comments:

- *great food for thought to help develop consistent daily practices. thank you*
- *easier to answer the questions after watching the informative videos*
- *great information! thank you*
- *the v sim and post evaluation give a good insight.*
- *Good awareness*
- *This was a GREAT learning tool!*
- *I was not able to click on the rating, but I found this very helpful.*
- *It is more interesting to learn than reading through a textbook.*

