ORIGINAL RESEARCH

Integrating a climate change and health module into a master's-level health policy course

Lisa Whitfield-Harris*, Clara Granda-Cameron

Thomas Jefferson University College of Nursing, Philadelphia, PA, United States

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ABSTRACT

Objective: To examine the effectiveness of integrating a climate change, health, and nursing advocacy module into an existing master's-level health policy course.

Methods: *Design:* Pre–post intervention study. Sample: Convenience sample of 192 nursing students enrolled in an online, asynchronous health policy course at a northeastern U.S. university; 72 (37.5%) completed both surveys. *Measurements:* The Climate, Health, and Nursing Tool (CHANT), a validated 22-item instrument assessing climate-health Awareness, Concern, Motivation, Home Behaviors, and Work Behaviors (5-point Likert scale). *Intervention:* A structured module comprising peer-reviewed readings, a video presentation, and a policy-focused discussion board assignment added to a required health policy course.

Results: Paired-samples t tests revealed significant pre-to-post improvements in overall CHANT scores (M = 3.25 to 3.72), $t(71) = 6.57$, $p < .001$, and in the Awareness, Motivation, Home Behaviors, and Work Behaviors subscales ($p < .001$ for all). No significant change was observed in Concern, which showed high baseline scores.

Conclusions: Embedding climate-health content within a required nursing course is a feasible, effective strategy for improving students' knowledge and engagement. Experiential pedagogies are needed to develop affective competencies.

Key Words: CHANT survey, Climate change, Environmental health, Health policy, Nursing education

1. INTRODUCTION

Climate change is widely recognized as a global threat to population health in the 21st century. In 2023, global temperatures reached the highest levels recorded in over 100,000 years, and heat-related mortality among adults aged 65 years and older increased approximately 85% compared with 1990–2000.[1] Rising temperatures, extreme weather events, worsening air quality, food insecurity, and the spread of vector-borne diseases are contributing to significant morbidity and mortality worldwide. Although climate change affects all populations, its health impacts are not experienced equally. Climate-related illnesses disproportionately affect individuals whose social, economic, and environmental circumstances increase vulnerability to adverse outcomes.

The National Institute of Environmental Health Sciences[2] has emphasized that climate change endangers health across all sectors of society, disproportionately affecting vulnerable populations. Beyond older adults, children, low-income communities, and racial and ethnic minorities, the range of communities experiencing climate-induced health equity disparities is significantly broader. Disproportionate health impacts are acutely observed among outdoor occupational

*Correspondence: Lisa Whitfield-Harris; Email: lisa.whitfield-harris@jefferson.edu; Address: Thomas Jefferson University College of Nursing, Philadelphia, PA, United States.

workers exposed to extreme heat and poor air quality, pregnant women vulnerable to heat-induced adverse birth outcomes, individuals living with physical or developmental disabilities, and populations managing chronic mental or physical illnesses.[2] Evaluating these compounding vulnerabilities through a social determinant of health (SDOH) perspective and a health equity lens reveals significant disparities in housing quality, economic stability, occupational exposures, access to healthcare, transportation, and community resources, which influence exposure to climate hazards and an individual's ability to respond and recover. These inequities contribute to disproportionate disease burden and underscore the importance of climate change as both a public health and health equity issue.

Nurses and nursing students increasingly encounter climate-related health effects in clinical settings, including respiratory illnesses associated with wildfire smoke and air pollution, cardiovascular risk from extreme heat, food insecurity contributing to malnutrition, vector-borne diseases, and mental health consequences following disasters and displacement resulting from extreme weather events.[1,2] Despite this clinical relevance, Hathaway and Maibach[3] documented persistent knowledge gaps among health professionals and nurse educators. Nurses represent the largest segment of the healthcare workforce and are uniquely positioned to address climate-related health threats through clinical care, public health interventions, patient education, policy advocacy, and systems leadership.

Recognizing this responsibility, national and international nursing organizations have called for integration of environmental health and climate change content into nursing education. The National Academies of Medicine's The Future of Nursing 2020–2030[4] and the American Association of Colleges of Nursing's The Essentials: Core Competencies for Professional Nursing Education[5] emphasize integration of population health, systems thinking, and health equity competencies that align closely with climate-health education. The American Nurses Association Scope and Standards of Practice[6] and the National League for Nursing[7] highlight the importance of preparing nurses to address environmental determinants of health and advocate for climate-responsive healthcare systems. These recommendations also identify environmental health as an important component of nursing education. Consistent with these mandates, Wang et al.[8] demonstrated the feasibility of embedding sustainability-focused content within existing nursing courses establishing a practical pathway for achieving broad competency coverage without adding credit burdens.

Researchers have emphasized the importance of integrating climate change and health topics into nursing curricula. Despite increasing recognition of the importance of climate-health education, integration into nursing curricula remains inconsistent. Common academic barriers include limited curricula space, insufficient faculty expertise or confidence in climate change and environmental health topics, competing educational priorities, lack of institutional or administrative resources or support, and an absence of standardized pedagogical models.[9,10] Tiitta et al.[11] described various strategies of climate change integration into nursing education in a scoping review using 47 studies. The strategies were grouped in three major categories: teaching methods (e.g., scenario-based learning, integration in online programs), curriculum content (e.g., curriculum redesigns, dedicated climate change courses), and innovative approaches (e.g., use of case studies, simulations, blended designs). Similar findings were reported in a second scoping review (16 studies and 11 gray literature sources).[10] This review highlights nursing schools' efforts to incorporate climate change topics into nursing education either through theory or clinical practice.

While student advocacy has emerged as a catalyst for curricular reform in some nursing programs, many educators continue to seek practical strategies for incorporating climate-health content without requiring extensive curricular restructuring. Consequently, evidence describing effective approaches to embedding climate-related content into existing nursing courses remains limited.

Other challenges include limited student awareness of the seriousness of climate change and its effects on the populations they serve. Students may perceive a separate climate change course as an additional burden within an already demanding curriculum. Embedding climate change courses into nursing education is not a "one size fits all" approach as it is influenced by the schools' programs, resources, and goals. One approach is to include climate change topics in the existing curriculum to provide education on the largest number of competencies.[9] Despite growing recognition of the need for evidence-based models to integrate climate-health content into the nursing curriculum, additional evaluations of curricular interventions are needed. Another suggestion is the integration of climate-health content into existing coursework, particularly courses focused on health policy, population health, and advocacy. This approach allows nursing programs to address emerging competencies while maintaining curricular feasibility. Previous studies have demonstrated the feasibility of incorporating environmental health and sustainability concepts into nursing education; however, few studies evaluated the effectiveness of these educational interventions using validated psychometrically tested outcome measures.[11–13] The use of a psychometrically tested in-

strument is important because standardized measures are needed to assess changes in nurses' climate-health awareness, concern, motivation, and behaviors across educational interventions. To address this gap, this study examined the impact of incorporating a climate change, health, and nursing advocacy module into a master's-level health policy course using the Climate, Health, and Nursing Tool (CHANT) to assess changes in climate-health awareness, concern, motivation, and behavioral intentions among graduate nursing students.

Research question

Does integrating a focused climate change, health, and nursing advocacy learning module into an existing master's-level health policy course significantly improve nursing students' climate-health awareness, concern, motivation, and related behaviors, as measured by the CHANT survey?

2. METHODS

2.1 Design

A one-group pretest–posttest design was used to evaluate the integration of a climate change and health module into a required, fully asynchronous online master's-level health policy nursing course in Fall 2020 at a private university in the northeastern United States. A total of 192 nursing students were enrolled in the health policy course and invited to participate through course announcements in the learning management system and during class orientation. Participation was voluntary, did not affect course grades or program standing, and could be discontinued at any time. The University's Institutional Review Board determined the project to be exempt from full review. Consent was implied based on survey completion.

2.2 Sample

A convenience sample of first-year nursing students enrolled in an online, asynchronous Master of Science health policy course at an urban university located in the northeastern United States was recruited.

2.3 Measures

The CHANT was used to measure primary outcomes.[14] The CHANT consists of 22 items assessing climate-health knowledge and perceptions across five domains: Awareness (5 items; factual knowledge about climate change and health), Concern (5 items; personal worry about health, financial, familial, and planetary impacts), Motivation (3 items; readiness to change practice and prepare for health impacts), Home Behaviors (5 items; energy conservation, waste reduction, and sustainable food choices), and Work Behaviors (4 items; energy conservation and workplace advocacy). Descriptions of each subscale are listed in Table 1. Responses are scored on a 5-point Likert-type scale; higher scores reflect greater engagement of the domains. Mean subscale and total scores were recoded to range from 1 to 5 per published guidelines. The CHANT tool was developed for nursing populations and demonstrated sound psychometric properties in exploratory[14] and confirmatory factor analyses.[15]

2.4 Intervention

Following the University's Institutional Review Board determination of exempt status, a module titled Health Policy and the Impact of Climate Change on Health was embedded within the required online health policy course, which was consistent with the university's transition to remote instruction. Students were notified of the survey via the Canvas learning management system. The module was informed by principles of adult learning theory, which emphasize learner engagement, reflection, application of knowledge to practice, and problem-centered learning experiences. The module was available for two weeks and included (1) peer-reviewed readings on climate-health impacts and nursing advocacy;[16,17] (2) educational resources from the Nurses Climate Challenge;[18] and (3) a discussion-board reflection exercise in which students analyzed climate-related health challenges and policy approaches and discussed nurses' roles in caring for and advocating for affected populations. Students posted one original response and replied to at least two peers. The module activities were reviewed for participation. The discussion board was graded by a rubric but did not count toward course grades. The pre- and post-intervention surveys and informed consent were administered via Qualtrics software. Students created anonymous identifiers to link pre- and post-survey responses collected before the module opened and after completion of all module activities. Student learning was assessed through discussion board responses and completion of a policy-focused analysis assignment. The module remains in the course and is updated before the course is offered.

To ensure the curriculum supported clear competency milestones, three specific, measurable student learning objectives were established for the module. Upon completion of the module, students were expected to be able to: (1) analyze the disproportionate health impacts of climate change on vulnerable populations utilizing a health equity framework; (2) evaluate current federal and state environmental policy responses impacting public health; and (3) synthesize the advanced practice nursing advocacy role in driving local and national climate mitigation strategies.

2.5 Data analysis

Descriptive statistics characterized the sample. Paired t-tests compared total and subscale scores using SPSS Statistics, Version 27 (two-tailed, $alpha$ = .05).[19] Mean differences were calculated for each subscale; Cohen's d and a 95% confidence interval were calculated for the overall score. A full report is listed in Table 2.

Table 1. CHANT survey scale

Categories	Items
Awareness	
	1) The planet has warmed significantly since the 1850s, causing climate change.
	2) The warming which causes climate change is due in large part to human behaviors which add greenhouse gases (GHGs) to the atmosphere (such as use of gas and coal to heat buildings, fuel for transportation, and modern agriculture).
	3) Health care delivery is responsible for approximately 10% of total greenhouse gas emissions in the US that contribute to warming.
	4) Climate change increases the likelihood of adverse health conditions such as heat stroke, asthma exacerbation, Lyme disease, and others.
	5) Vulnerable populations such as the very young or old, and other at-risk groups (homeless, impoverished, minorities, etc.) experience more adverse health impacts from climate change.
Concern	
	6) Health impacts.
	7) Financial impacts (rebuilding after storms or fires, health costs, etc.).
	8) Overall impacts on you, your family, or someone you know today.
	9) Overall impacts on future generations.
	10) Changes to the planet (other species, forests, oceans, etc.).
Motivation	
	11) I want to change my practice to reduce GHG contributions.
	12) I want to teach patients/clients/community members about how climate change impacts health.
	13) I want to prepare for health impacts of climate change at my workplace.
Home Behavior	
	14) Use non- fossil fuel based energy sources (such as purchase wind or solar energy, panels, buy energy offsets, etc.).
	15) Conserve energy (such as use energy efficient appliances, keep moderate temperature settings, turn off lights and electronics, etc.).
	16) Use less gasoline (fuel-efficient vehicles, reduce unnecessary trips, bike- walk, etc.).
	17) Reduce waste (buy less, reuse more, recycle more).
	18) Choose foods that require fewer resources to grow/produce (local, seasonal, fewer animal products, less packaging).
Work Behavior	
	19) Conserve energy (such as turn off lights and electronics, etc.).
	20) Commute to work using active (bike, walk), shared, or public transportation.
	21) Reduce waste (plastic, paper, linen, clinical supplies, etc.).
	22) Ask leaders at your workplace to support policies, products and/or processes that create fewer greenhouse gases (GHGs).

3. RESULTS

3.1 Sample characteristics

All enrolled students were invited to complete the survey. All 192 enrolled students completed the pre-intervention survey. Of these, 72 students (37.5%) completed the post-intervention survey and provided matched responses suitable for paired analysis. The remaining 120 students (62.5%) did not provide complete paired survey data. Because par-

ticipation was voluntary, reasons for non-completion were not systematically collected. Consequently, the potential for nonresponse bias must be considered when interpreting the findings.

Table 2. Demographics

Characteristics	N = 72 (%)
Primary Professional Setting	
Hospital/Acute Care	66 (91.7)
Outpatient	5 (6.9)
Other	1 (1.4)
Gender Identification	
Female	67 (93.1)
Male	5 (6.9)
Race	
White	53 (73.6)
African American	7 (9.7)
Asian	10 (13.9)
Other	2 (2.8)
Hispanic/Latino ethnicity	
Yes	5 (6.9)
No	67 (93.1)

Participants were predominantly female (93.1%), White (73.6%), and employed in hospital or acute care settings (91.7%). Detailed demographic characteristics are presented in Table 3.

3.2 CHANT outcomes

Following completion of the climate change and health module, significant improvements were observed across several dimensions of climate-health awareness and engagement. Overall CHANT scores increased significantly from pre-intervention (M = 3.25, SD = 0.63) to post-intervention (M = 3.72, SD = 0.71), t(71) = 6.57, $p < .001$. These findings suggest that integrating climate-health content into a graduate health policy course positively influenced students' climate-health competencies and related behaviors. Significant pre-to-post gains were observed in the Awareness, Motivation, Home Behaviors, and Work Behaviors subscales. No statistically significant change was observed in the Concern subscale, which demonstrated high baseline scores (M = 4.12, SD = 0.58). Detailed results are summarized in Table 2.

Table 3. CHANT survey: Student pre-post intervention paired *t* test

CHANT Scale	Pre-Intervention M (SD)	Post-Intervention M (SD)	*t*(df)	*p*
Overall	3.25 (0.63)	3.72 (0.71)	6.57 (71)	< .001
Concern	4.04 (0.92)	4.24 (0.90)	1.80 (71)	.076
Motivation	3.80 (0.94)	4.31 (0.90)	4.84 (71)	< .001
Home behavior	2.92 (0.64)	3.23 (0.73)	4.86 (71)	< .001
Work behavior	2.33 (0.82)	2.85 (0.87)	5.31 (71)	< .001
Awareness	3.21 (0.86)	4.04 (0.92)	7.76 (71)	< .001

The Concern subscale did not demonstrate a statistically significant increase following the intervention. Baseline concern scores were high prior to the educational module (M = 4.12, SD = 0.58), indicating that students entered the course already recognizing climate change as an important health issue. The absence of significant post-intervention change suggests that while the module increased knowledge, motivation, and behavioral intentions, students' level of concern was already elevated before participation.

Students demonstrated greater understanding of climate-health issues following the intervention and reported increased motivation to address climate-related health concerns within professional practice. Improvements were also observed in reported personal and workplace behaviors associated with environmental sustainability and climate-health advocacy. Overall, these findings suggest that a brief, curriculum-integrated climate change and health module can improve nursing students' understanding of climate-related health issues and strengthen motivation for nursing advocacy and environmentally responsible practice. The results support the feasibility of incorporating climate-health content into existing graduate nursing courses without substantial curricular restructuring.

4. Discussion

Integrating a brief, asynchronous climate-health module into an existing health policy course was associated with statistically significant improvements in students' climate-health awareness, motivation, and self-reported home and workplace behaviors. Four of the five CHANT subscales demonstrated statistically significant preintervention-

to-postintervention improvements, suggesting that targeted curricular integration may offer a feasible approach to strengthening climate-health education. The module was delivered over two weeks within a 15-week required course and students were introduced to climate-health content without the need for an additional course. These findings build on previous literature supporting the integration of environmental health content into existing nursing curricula and align with professional recommendations for strengthening climate-health education.[4–7]

Concern scores did not change significantly, possibly because they were already high at baseline. In contrast, the module was associated with improvements in motivation and self-reported behavior scores. For students who already recognize the seriousness of climate change, education may be most effective when it emphasizes actionable skills, including advocacy, policy analysis, and practice change, rather than the threat itself.

4.1 Implications for nursing education

These findings support growing recommendations from nursing organizations to incorporate climate-health content into nursing curricula. The AACN Essentials[5] emphasize population health, systems thinking, and advocacy as foundational competencies for contemporary nursing practice. Similarly, the Future of Nursing 2020-2030 report identifies climate change as an emerging challenge requiring a nursing workforce prepared to address environmental influences on health.[4] The positive outcomes in this study suggest that climate-health education can be successfully integrated into existing coursework without requiring stand-alone courses or major curricular redesign.

A notable strength of this intervention is its feasibility. Rather than creating a separate course, climate-health content was embedded within an existing health policy course, allowing students to examine climate change through a policy, advocacy, and systems perspective. This approach may be attractive to nursing programs facing competing curricular demands, limited instructional time, and faculty concerns regarding content overload. The findings suggest that meaningful learning outcomes can be achieved through strategic integration of climate-health concepts into courses that address population health, leadership, and health policy.

4.2 Interpretation of CHANT findings

The significant improvements in Awareness and Motivation scores indicate that students developed a greater understanding of the relationship between climate change and health and an increased willingness to engage with climate-related health issues in professional practice. Improvements in Home and Work Behaviors subscales suggest positive changes in students' self-reported environmentally sustainable practices and professional engagement following the educational intervention. These findings are encouraging because nursing education seeks not only to increase knowledge but also promote behaviors and attitudes that support evidence-informed practice and professional responsibility.

The lack of significant improvement in the Concern subscale may reflect high baseline concern regarding climate change among participants. Students entered the course with elevated concern scores, leaving limited opportunity for measurable improvement. This finding suggests that educational interventions may be more successful in increasing knowledge, self-efficacy, and action-oriented behaviors than in changing perceptions of climate-related risk.

4.3 Alignment with educational theory and competency development

The results support educational approaches that emphasize applied learning, reflection, and policy analysis. Climate-health education requires students to connect scientific evidence with clinical practice, advocacy, and systems-level decision making. The discussion board and policy-focused activities used in this intervention aligned with competencies related to leadership, health policy, population health, and professional advocacy and provided opportunities for students to apply climate-health knowledge to contemporary nursing and health policy issues. These activities are increasingly important to prepare nurses to address complex and evolving health challenges.

4.4 Implications for curriculum development

Many nursing programs report challenges incorporating emerging content areas into already crowded curricula. The findings from this study suggest that integrating climate-health content into existing courses may represent a practical and sustainable strategy for addressing this challenge. Faculty may not need to create new courses; rather, climate-health concepts can be incorporated into health policy, community and population health, leadership, and quality improvement courses. This approach may facilitate broader integration of climate-health competencies across undergraduate and graduate nursing programs while allowing faculty to adapt content into existing courses.

4.5 Comparison with previous evidence

These results are consistent with growing calls from professional nursing organizations for intentional integration of climate-health content into nursing curricula and are consistent with previous research.[4,5,8] The use of a validated instrument, the CHANT tool by Schenk et al.[14] distinguishes

this study from earlier descriptive efforts and supports comparability across future studies.

The absence of a significant change in the Concern subscale may reflect relatively high baseline scores (M = 4.12), potentially limiting the magnitude of measurable improvement following the intervention. This interpretation is consistent with climate communication research suggesting that information alone does not necessarily increase affective engagement.[20] Nursing students may already acknowledge the seriousness of climate change yet require different pedagogical approaches to translate concern into deeper critical engagement or they may experience competing demands within an already intensive curriculum.[10] Improvements in Work Behaviors were modest and should be interpreted in the context of organizational constraints nurses face in clinical settings. The scalable, asynchronous online format may enhance adoption of similar modules across diverse nursing programs.

4.6 Limitations

Data collection was restricted to the 2020 cohort, and longitudinal tracking of subsequent student performance was not conducted. The single-cohort, single-institution design and absence of a control group preclude causal inference. The analytic sample (n = 72; 37.5%) was smaller than the enrolled cohort (n = 192), and response bias cannot be excluded. Participants were demographically homogeneous, predominantly female and White, and largely employed in hospital or acute care settings (91.7%) in the northeastern United States. These characteristics limit generalizability to more diverse nursing populations. Data collection occurred during the COVID-19 pandemic. This concurrent global health crisis may have influenced student engagement and distracted participants or shifted their perceived priority away from the climate change crisis. Because funding and administrative tracking resources were limited to the 2020 pilot period, longitudinal tracking data were not collected for subsequent cohorts. While the module has been successfully maintained as a permanent fixture in the required health policy curriculum through 2026, the lack of long-term tracking data prevents confirmation of whether these brief behavioral and motivational improvements are sustained over time.

4.7 Recommendations for future research

Future studies should employ larger, more diverse samples and comparative designs across institutions. Longitudinal research is needed to determine whether module-related improvements persist over time and translate to clinical practice. Pedagogical innovations, including clinical simulation, case-based learning focused on climate-related illnesses, and community-engaged projects, should be evaluated for their effectiveness in improving the Concern subscale and deepening affective engagement.

5. Conclusion

Nurse educators play a central role in preparing the next generation of clinicians to recognize and respond to climate-related health threats.[7] The findings of this study suggest that intentionally embedding climate-health content into required courses represents a practical, potentially scalable strategy for supporting competency development among graduate nursing students. Faculty in both undergraduate and graduate nursing programs can use existing professional standards[5,6] to position climate change as a core nursing education priority rather than supplementary content. Program directors and curriculum committees should consider how climate-health competencies can be mapped across existing course sequences to build progressive learning without adding curricular burden.

This study found that integrating a climate change and health module into a required health policy course was associated with significant improvements in nursing students' climate-health awareness, motivation, and self-reported behaviors. The CHANT survey is a practical, validated tool for tracking outcomes across nursing programs. As climate-related health threats intensify, nurse educators have a responsibility to equip graduates with the knowledge and skills to protect vulnerable populations. This study offers a replicable model for embedding climate-health content within existing curricula. Continued research is needed to identify pedagogical innovations that deepen effective engagement and support ongoing competency development in nursing education.

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Authors contributions

Dr. Whitfield-Harris and Dr Granda Cameron were both responsible for drafting the manuscript. Dr. Whitfield-Harris was responsible for the revisions and communicating with the editor. Dr. Granda Cameron was responsible for the study design and data collection. All authors read and approved the final manuscript. There were no special agreements on authorships.

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