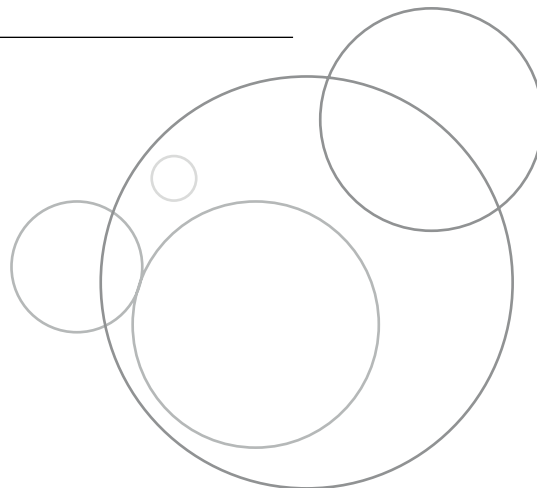

Strategies for Teaching Online RN-to-BSN Students the Health Impacts of Climate Change

Jennifer J. Wasco, DNP, RN 



The impact of climate change on human health is projected to worsen over the next century, threatening the world's population. Nurses need to be knowledgeable about the causes of climate change and its direct and indirect health consequences, to be able to provide appropriate care and to advocate for policy change. More now than ever, nursing faculty are charged with the responsibility to educate future health professionals about this important topic. This article provides an introduction to the impacts of climate change on nursing care delivery and shares the pedagogy of an introductory course developed for an online, postlicensure RN-BSN program based at a university with deep roots in environmental sustainability.

Keywords: online course design; teaching strategies; RN-BSN programming; public health; population health; climate change

Evidence provided by the *Fourth National Climate Change Assessment* and the *Lancet Countdown on Health and Climate Change* indicates that climate change adversely impacts human health (U.S. Global Change Research Program [USGCRP], 2018; Watts et al., 2018). Climate change fuels climbing temperatures, more extreme weather events, rising sea levels, and extremes of precipitation, constructing exposure pathways for negative health outcomes. Extreme heat, poor air quality, reduced access to food and water, changes in infectious diseases, and population displacement are conduits by which climate change affects human health (USGCRP, 2016). The human health impacts of climate change range from respiratory, cardiovascular, and infectious diseases; mental illness; malnutrition, and traumatic injury; to death (USGCRP, 2016).

CLIMATE CHANGE: IMPACT ON HUMAN HEALTH

The first peer-reviewed article addressing the potential impact of climate change on health was published by Leaf in 1989. In 2013, Cook et al. reviewed nearly 12,000 peer-reviewed publications from 1991 through 2011, demonstrating the intense interest in understanding climate changes and its effects. Peer-reviewed findings continue to build on and support established research, demonstrating the continued and worsening adverse health impacts on the world's population.



Jennifer J. Wasco, DNP, RN, is an assistant professor of nursing at Chatham University. She is a doctorally-prepared RN with over 25 years of experience. Her area of scholarship is focused on public health interest in climate change and its burden on human health and the engagement of nurses in sustainability and climate leadership.

Nurses are trusted messengers of health information, and innovative leaders in implementing change who can influence policy; this combination of assets can only be fully realized when all nurses are adequately prepared for the health impacts of climate change.

The impact of heat stress on human health is one of the deadliest weather hazards in the United States. By the end of the century, extreme heat events could lead to more than 150,000 deaths in the 40 largest cities in the US (Greene, Kalkstein, Mills, & Samenow, 2011). Alterations in particulate matter, including allergens and other asthma triggers, are occurring more frequently, increasing the incidence of respiratory illnesses in vulnerable populations (USGCRP, 2016).

Warmer weather has also led to increased frequency of extreme weather events. Between 1979 and 2015, dryness in the western forests of the United States has increased by 55% (Abatzoglou & Williams, 2016); deadly wildfires in California in 2018 resulted in 106 deaths (National Centers for Environmental Information [NCEI], 2019). The impacts on human health from wildfires include effects of air pollution, water contamination, population displacement, and psychological stress (USGCRP, 2016).

Atmospheric warming also has a drastic impact on global sea levels, which are now rising approximately 1/8 inch per year (5 inches in 40 years) as a direct result of melting land-based ice (National Oceanic and Atmospheric Administration [NOAA], 2018). NOAA estimates that by the year 2100, the areas where approximately 20 million U.S. residents live will be at risk for permanent flooding, leading to devastating health outcomes including respiratory illness from increased mold growth, water-borne illnesses, drowning, injury, and population displacement.

Increased average temperatures are associated with increased incidence of vector-borne diseases. Ticks that spread Lyme Disease spend much of their life cycle outside the host; warmer winter temperatures fail to kill the ticks, leading to higher tick populations and increasing prevalence of the disease among humans (Dumic & Severnini, 2018).

CLIMATE CHANGE: IMPLICATIONS FOR NURSING

These examples demonstrate that climate change will play a significant role in shaping health and the way care is provided in the future. The nursing profession needs to be prepared for the health implications of climate change. Current and future nurses will need to be able to identify health issues directly and indirectly related to climate change in daily practice, in settings from large health-care organizations to local community clinics. As the largest group of health professionals, nurses can play a vital role in reducing impacts on human health and influencing change through advocacy. Nurses are trusted messengers of health information and innovative leaders in implementing change who can influence policy (Leffers & Butterfield, 2018). This combination of assets can only be fully realized when all nurses are adequately prepared for these future health impacts. Nurses must be armed with an understanding of the situation to properly plan care for the populations served, and be positioned to address the complex health challenges of climate change (Shaman & Knowlton, 2018).

FACULTY: LEADING CHANGE THROUGH EDUCATION

Nursing education needs to do more to address these challenges effectively. Not all faculty members are formally educated or well-versed on the topic (Leffers, McDermott-Levy, Nicholas, & Sweeney, 2017). Incorporating the concept of

climate change into an established curriculum may require revising the entire program. Fully embracing the health effects of climate change as a central theme of the overall curriculum would be a significant hurdle. Finally, not every academic institution is incorporating climate change and addressing its impacts as a priority. Without the necessary top-down support, the faculty may not see a need for change.

At a private university in Pennsylvania with deep roots in sustainability, faculty in the RN-BSN program developed an elective online course entitled *Climate Change and Human Health*. In addition to teaching nurses about the impact of climate change on human health, the course content aligned with the university's strategic goal of expanding expertise in leadership and sustainability in health, and followed professional nursing organizations' recommendations for preparing nurses to address environmental and global issues. The RN-BSN program follows the American Association of Colleges of Nursing (AACN) *Essentials of Baccalaureate Education for Professional Nursing Practice* (AACN, 2008) in developing curriculum; the 7-week *Climate Change and Human Health* course was an opportunity to offer emerging content supporting the AACN's Essential VII: Clinical Prevention and Population Health.

The goal of the Climate Change and Human Health course is for RN-BSN nursing students to receive education about the health effects of climate change and to evoke a sense of responsibility for the global population and its collective health.

COURSE DESIGN: ACTIVE LEARNING

Climate Change and Human Health was designed to provide RN-BSN students with unique, innovative activities within discussion forums and assignments to master baseline knowledge of climate change and its health impacts, and to demonstrate how nurses can play a role in advocacy to improve the world's health in the 21st century. The two main objectives for this introductory course were to define climate change and its causes, and to analyze how climate change influences human health.

To promote active learning, teaching strategies were designed to increase student motivation and engagement in the learning process. *Small Teaching: Everyday Lessons from the Science of Learning* (Lang, 2016) and *The Spark of Learning: Energizing the College Classroom with the Science of Emotion* (Cavanagh, 2016) were valuable resources in the development of this course.

Replacing textbooks with current publications and current event resources fostered active learning and also avoided the problem of textbooks being dated upon publication (Voge, Hirvela, & Jarzemsky, 2012).

Discussion Forum

Traditional online discussion forums can be uninteresting and repetitive; keeping students engaged in learning and creating a vibrant online learning community guided the development of the course. Current event resources and peer-reviewed publications provided students with up-to-date information through an online environment, a medium that students are familiar with, and promoted learning by "doing something" instead of passive listening. Table 1 shows the schedule of discussion forum topics and related activities.

The first discussion forum addressed the scientific basis of climate change. Students reviewed assigned content and developed an analogy explaining the greenhouse gas effect to peers. According to Haider and Haider (2018) leveraging the

TABLE 1. Discussion Forum Topics and Activities

Week	Discussion Forum Topic	Activity
1	What is climate change?	Students explain the greenhouse effect by providing an analogy.
2	How do human activities influence climate change?	Students capture an image within the community with a mobile device, depicting a human activity influencing climate change.
3	What is the influence of climate change on human health?	Students view a multimedia interview about climate change and human health and analyze the significant takeaway messages.
4	What is the influence of climate change on physical health?	Students engage in scholarly inquiry for one peer-reviewed publication stating climate change does <i>not</i> have an impact on human health.
5	What is the influence of climate change on mental health?	Students conduct an Internet search of mainstream media, identifying specific communities where climate change is having an impact on mental health.
6	What is the influence of climate change on community health?	Students identify an indigenous community affected by climate change, demonstrate the impact, and identify how the community can prepare for the future.
7	What are future directions related to human health and climate change?	Students provide personal thoughts in a professional debate format about the U. S. president's decision to withdraw from the Paris Agreement in 2017.

theory of analogy in science education allows for improved comprehension of a topic. A sample analogy (greenhouse gas effect is similar to a blanket retaining body heat) was provided in the discussion forum prompt to spark students' ideas. One student imaginatively compared the greenhouse gas effect to a solar cover on a swimming pool, trapping the sun's heat to heat the water beneath and acting as a barrier preventing evaporation of the warmer water.

Week two incorporated mobile learning (mLearning) into the discussion forum (Valk, Rachid, & Elder, 2010). Students used a mobile device to take a picture of an activity within their personal or community environment and explained how the activity contributes to climate change. A student provided an image of a parking lot lined with automobiles, and discussed how engine emissions contribute to the greenhouse gas effect, as well as how electric vehicles might mitigate pollution. This approach makes the learning opportunity personally relevant and promotes engagement and investment in the learning process (Cavanagh, 2016).

In week three, students viewed a multimedia interview with a public health expert about the impact of climate change on human health, then analyzed and

reflected on the material, reporting their most important takeaway. Several students cited a longer pollen season with its impact on respiratory issues including asthma.

One of the learning objectives of the discussion forum is to increase students' awareness that there are often opposing viewpoints about a topic, as well as differences in the numbers of publications supporting those viewpoints. Week four challenged students to find a peer-reviewed publication supporting the notion that climate change has little or no impact on human health. The students had difficulty completing this assignment. They discovered that finding peer-reviewed evidence supporting the impact of climate change on health was difficult. Several students found opinion pieces or articles stating that climate change does not cause illness or disease, but they were not peer-reviewed and therefore not accepted according to the discussion forum guidelines. This exercise led the students to understand that overwhelming peer-reviewed evidence supports the reality of climate change and its impact on human health, and raised awareness of non-peer-reviewed material by climate change skeptics that is influencing the public.

In weeks five and six, students used search engines to study mainstream media coverage of the mental health impacts of climate change and impacts on indigenous communities. In week five, after reading, listening to, and watching stories covering natural disasters, students were asked to envision what it would be like to be fearful of water, of the rise in temperature, or of being homeless. In week six students identified an indigenous community impacted by climate change and developed a plan for adapting to future impacts. This assignment encouraged students to think creatively about possible solutions and emphasized the current challenges these communities already face.

Week seven involved personal reflection in which students considered and debated the U.S. president's decision in 2017 to withdraw from the Paris Agreement, showing the importance and relevance of advocacy and global partnership to influence change. The reflection topic can change based on current events; for example, the Paris Agreement can be replaced with the Green New Deal.

Assignments Outside of Discussion Forums

The course includes two assignments in addition to the discussion forums. One is to develop an infographic addressing a topic related to climate change, and discuss the topic as it relates to society. An infographic is a visual representation of information, data, or knowledge that conveys complex information in a manner that can be consumed and understood easily (Martin et al., 2019). The cognitive experience of developing an infographic allows expression and demonstrates mastery of a concept through inquiry-based learning (Gebre, 2018).

The guideline for this assignment was to describe the identified problem, define climate change, explain the influence of climate change on the selected topic, prepare an adaptation solution for a population, and present a call to action using a combination of visual images and data, providing references for statistics and facts included in the infographic. Sample issues from which students chose their topics were sea level rise, heat waves, droughts, flooding, hurricanes, impact on agriculture/crops, impact on animal farming, wildfires, and tick population increase.

The second assignment was to create a public service announcement (PSA) using a slide presentation incorporating a voice-over message, promoting

In week six students identified an indigenous community impacted by climate change and developed a plan for adapting to future impacts; this assignment encouraged students to think creatively about possible solutions and emphasized the current challenges these communities already face.

PSA ASSIGNMENT GUIDELINES

A PSA is a commercial aimed at educating the general public about issues of concern. To start this assignment; consider the following:

- Choose a topic and identify a goal for your presentation—*Example: Childhood Asthma*
- Establish your target audience—*Example: Moms*
- Hint: Ensure your content is relatable and appropriate to this audience
- Remember to use facts as well as emotion to drive home the information
- Deliver one core message with clarity—*Example: Climate Change = Asthma Epidemic*
- Hint: Make sure you are using real language to provide an effective message
- Motivate the target audience to “take action”—*Example: Sign a petition; explain to the viewer how do this*
- Consider creating a resources slide for your audience; this is different from the Reference Slide—*Example: Moms Clean Air Force Take Action website*
- Consider providing a contact slide; how can they reach you?
- Hint: Practice narrating the slides; this allows you to become comfortable with your content

Figure 1. Assignment: Public service announcement guidelines.

Note. PSA = public service announcement.

awareness of the influence of climate change on human health. Students chose a category of health that is impacted by climate change (e.g., respiratory illness), then focused on a specific health impact on a population (e.g., childhood asthma). The PSA included specific strategies to improve personal and public health outcomes. As Voge et al. (2012) suggested, this type of assignment maintains standards similar to those required to write a paper, but employs the power of creativity in the use of images or sound to demonstrate learning. Figure 1 shows the guidelines given to students for this assignment.

The weekly discussion forums and two assignments merge active learning techniques and the use of cognitive tools to enhance the student experience. Course content can be readily updated as new information becomes available: the course can remain as current as the research supporting it, while still fostering the required learning.

STUDENT FEEDBACK

The end-of-course feedback from the students has been positive. Many students related that the course affected how they viewed climate change in light of population health concepts. Comments included:

- I enjoyed learning about different topics of climate change, not just the basics.

- It opened up my eyes as to how climate change affects the world.
- It is brought things into a new perspective about the changing climate and our health.

Demand for the course is growing. The most recent offering of the course needed to be divided into two sections and had a waiting list.

COURSE DESIGN: FUTURE CONSIDERATIONS

Experience with the course over several semesters has shown that the number of questions being asked in the discussion forum posts could be narrowed down to one succinct question to drive home the week's main point, and the number of required posts could be reduced without loss of educational quality. Course elements that worked particularly well included the weekly faculty welcome messages that set the tone for the coming week's aims, and the impromptu posting of current events, emphasizing the fluid nature of the topic.

CONCLUSION

The goal of the *Climate Change and Human Health* course is for RN-BSN nursing students to receive education about the health effects of climate change and to evoke a sense of responsibility for the global population and its collective health. Nursing faculty at other institutions can leverage the active learning pedagogical techniques and digital cognitive tools described in this article to develop similar courses that foster creative learning in the online classroom. Incorporating the health effects of climate change in nursing curricula will serve as a foundation for creating opportunities for a healthier future.

REFERENCES

- Abatzoglou, J. T., & Williams, A. P. (2016). Impact of anthropogenic climate change on wild-fire across western US forests. *Proceedings of the National Academy of Sciences of the United States of America*, 113(42), 11770.
- American Association of Colleges of Nursing. (2008). *Essentials of baccalaureate education for professional nursing practice*. Retrieved from <https://www.aacnursing.org/Education-Resources/AACN-Essentials>
- Cavanagh, S. R. (2016). *The spark of learning: Energizing the college classroom with the science of emotion*. Morgantown, WV: West Virginia Press.
- Cook, J., Nuccitelli, D., Green, S., Richardson, M., Winkler, B., & Painting, R. (2013). Quantifying the consensus on anthropogenic global warming in the scientific literature. *Environmental Research Letters*, 2(8). doi:10.1088/1748-9326/8/2/024024
- Dumic, I., & Severnini, E. (2018). Ticking bomb: The impact of climate change on the incidence of Lyme disease. *The Canadian Journal of Infectious Diseases & Medical Microbiology*. Advance online publication. doi:10.1155/2018/5719081
- Gebre, E. (2018). Learning with multiple representations: Infographics as cognitive tools for authentic learning in science literacy. *Canadian Journal of Learning and Technology*, 44(1), 1–24. doi:10.21432/cjlt27572
- Greene, S., Kalkstein, L. S., Mills, D. M., & Samenow, J. (2011). An examination of climate change on extreme heat events and climate–mortality relationships in large U.S. cities. *Weather, Climate, and Society*, 3(4), 281. doi:10.1175/WCAS-D-11-00055.1

Week four challenged students to find a peer-reviewed publication supporting the notion that climate change has little or no impact on human health; this exercise led the students to understand that overwhelming peer-reviewed evidence supports the reality of climate change and its impact on human health, and raised awareness of non-peer-reviewed material by climate change skeptics that is influencing the public.

- Haider, M., & Haider, M. (2018). How to support the process of forming analogies to facilitate model-building in science education. *Journal of Education and Human Development*, 7(1), 63–71. doi:10.15640/jehd.v7n1a8
- Lang, J. M. (2016). *Small teaching: Everyday lessons from the science of learning*. San Francisco, CA: Jossey-Bass.
- Leaf, A. (1989). Potential health effects of global climatic and environmental changes. *New England Journal of Medicine*, 321(23), 1577–83. doi:10.1056/NEJM198912073212305
- Leffers, J., & Butterfield, P. (2018). Nurses play essential roles in reducing health problems due to climate change. *Nursing Outlook*, 66(2), 210–213. doi:10.1016/j.outlook.2018.02.008
- Leffers, J., McDermott-Levy, R. M., Nicholas, P. K., & Sweeney, C. F. (2017). Mandate for the nursing profession to address climate change through nursing education. *Journal of Nursing Scholarship*, 49(6), 679–687. doi:10.1111/jnu.12331
- Martin, L. J., Turnquist, A., Groot, B., Huang, S. Y. M., Kok, E., Thoma, B., & van Merriënboer, J. J. G. (2019). Exploring the role of infographics for summarizing medical literature. *Health Professions Education*, 5(1), 48–57. doi:10.1016/j.hpe.2018.03.005
- National Centers for Environmental Information. (2019). *U.S. billion-dollar weather and climate disasters: Summary stats*. Retrieved from <https://www.ncdc.noaa.gov/billions/summary-stats>
- National Oceanic and Atmospheric Administration. (2018). *Is sea level rising?* Retrieved from <https://oceanservice.noaa.gov/facts/sealevel.html>
- Shaman, J., & Knowlton, K. (2018). The need for climate and health education. *American Journal of Public Health*, 108, S66–S67. doi:10.2105/AJPH.2017.304045
- U.S. Global Change Research Program. (2016). *The impact of climate change on human health in the United States: A scientific assessment*. Retrieved from <https://health2016.globalchange.gov/>
- U.S. Global Change Research Program. (2018). *Fourth national climate assessment: Impacts, risks, and adaptation in the United States, Volume II*. Retrieved from <https://nca2018.globalchange.gov/>
- Valk, J., Rachid, A. T., & Elder, L. (2010). Using mobile phones to improve educational outcomes: An analysis of evidence from Asia. *International Review of Research in Open and Distance Learning*, 11(1), 117–140. doi:10.19173/irrodl.v11i1.794
- Voge, C., Hirvela, K., & Jarzemy, P. (2012). The (digital) natives are restless: Designing and implementing an interactive digital media assignment. *Nurse Educator*, 37(2), 56–61. doi:10.1097/nne.0b013e3182461b2e
- Watts, N., Kelman, I., Wheeler, N., Cai, W., Gong, P., Campbell-Lendrum, D., . . . Ebi, K. L. (2018). The 2018 report of the lancet countdown on health and climate change: Shaping the health of nations for centuries to come. *Lancet*, 392 North American Edition (10163), 2479–2514. doi:10.1016/S0140-6736(18)32594-7

Disclosure. The author has no relevant financial interest or affiliations with any commercial interests related to the subjects discussed within this article.

Correspondence regarding this article should be directed to Jennifer J. Wasco at jwasco@chatham.edu