

Interprofessional Climate Change Curriculum in Health Professional Programs: A Scoping Review

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Abstract: Background: We conducted this scoping review to (1) comprehensively compile the published literature on interprofessional education focused on climate change and health, (2) assess the quality and outcomes of the existing curriculum interventions, and (3) highlight potential areas for further growth. By evaluating published curricular interventions, our goal was to highlight effective and validated developments that could be utilized by health professional educators seeking to include topics on climate change in the curriculum. Methods: We searched Ovid MEDLINE databases (MEDLINE, In-Process, In-Data-Review and Other Non-Indexed Citations, and Epub Ahead of Print), Embase, Clarivate Web of Science, and EBSCOhost Education Abstracts from inception through March 2023. Resulting articles were screened for relevance, and data were extracted from the included studies. The Medical Education Research Study Quality Instrument (MERSQI) was used to assess the quality of each included study. Findings: We screened 688 unique articles, and 6 met inclusion criteria. Publications dated from 2013 to 2023. Three studies included students or healthcare professionals from at least three health profession education programs. The mean MERSQI score was 8.17 (SD = 1.34; range 6–10). Curricular interventions varied by study, and topics included effects of climate change on human health, effect of climate change on extreme weather events and infectious disease exposures, and role of health professionals in climate change communication. Studies did not utilize a two-group comparison design. Most studies used an assessment tool with content validity evidence, but no study provided evidence of validity for internal structure or relationships to other variables. Studies reported that curricular interventions improved outcomes related to both climate change and interprofessional education. Interpretation: Despite the growing call for health professional education focused on climate change and health, there remains a gap in the interprofessional curricular interventions that have been assessed.

Keywords: health professional education; climate change and health; curricular interventions



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1. Introduction

The World Health Organization (WHO) identifies climate change as the “single biggest health threat facing humanity [1]”. Climate change affects and will continue to impact human health through extreme weather events, worsening water and air quality and increasing vector-borne illnesses, psychological stress, and resource insecurity. Importantly, the healthcare sector of the United States contributes to 8–9% of the country’s greenhouse emissions [2]. Given the tangible health concerns stemming from climate change, as well as the role of healthcare in the crisis, health professional students must be versed and reflective on the dynamic relationship between health and climate change. Importantly, students across allied health fields will ultimately be tasked in their professional careers with collaborating to create and implement solutions responsive to climate change and focused on sustainability.

Responding to climate change requires an interdisciplinary approach, melding expertise and collaboration from multiple disciplines into harmonized, shared solutions. Likewise, curricula should train students to value and actively participate in interdisciplinary efforts. Interprofessional education (IPE) provides students with an early opportunity to learn alongside future colleagues, share perspectives, and contemplate solutions that transcend the expertise of each individual participant's discipline. Research reports that engaging in IPE during health professions training promotes open-mindedness, flexibility, and collaboration among students and may thereby improve patient care [3].

Presently, a chief challenge in incorporating climate change topics into health IPE includes the revision and evaluation process needed for any curriculum change amid an already rigorous, time-intensive curriculum [4]. In recent years, many health professional programs have undertaken efforts to incorporate information on climate change into lecture presentations and research [4–6]. A few institutions have developed certificate programs and elective courses that students can opt into [4,6–10]. While the momentum is building for other programs to follow suit, it is imperative that interventions be evaluated before being widely disseminated and adopted by additional institutions.

The goals of our scoping review are to (1) comprehensively compile the published literature on IPE focused on climate change and health, (2) assess the quality and outcomes of the existing curriculum interventions, and (3) highlight potential areas for further growth. By evaluating published curricular interventions, we aim to highlight effective and validated developments that could be utilized by health professional educators seeking to include topics on climate change in their curriculum.

2. Methods

2.1. Protocol and Registration

The protocol for this scoping review was similar to that used in previous scoping reviews of education in health professional schools [11–13]. Our review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines [14]. We conducted an initial search of PubMed on 6 October 2022 to locate any existing relevant articles, which were reviewed for Medical Subject Headings (MeSH) terms and keywords to include in our literature search strategies. We conducted a second search in March 2023 to check for any additional publications since our initial search.

2.2. Eligibility Criteria

To be included in this review, papers needed to focus on IPE, with topics on climate change and health. Peer-reviewed journal papers were included if they were written in English, were original research, included students in health profession education programs (e.g., medical, doctoral, advanced practice, midlevel, or allied health professions), and described didactic or experimental climate change education conducted in an interprofessional setting (at least two health education programs). Papers were excluded if they were qualitative, reviews, abstracts, letters, or articles that reported an educational intervention without subjective or objective evaluation.

2.3. Information Sources and Search Strategy

A medical librarian with expertise in systematic searching composed a search utilizing a mix of MeSH terms, keywords, and subject headings to represent the concepts of health IPE related to climate change. The databases MEDLINE via PubMed, Embase via Elsevier, Web of Science via Clarivate, and Education Abstracts via EBSCO were searched from inception to March 2023. Each database search was optimized by using a combination of IPE and climate change terminologies and proximity operators to increase the sensitivity of the search. The searches did not include restrictions such as language or publication type. All studies resulting from the search were compiled into EndNote and then imported into Covidence for deduplication and screening by the authors.

2.4. Selection of Sources of Evidence

Five independent reviewers screened the titles and abstracts of all initial papers. The same five reviewers then evaluated the full text of all publications identified as potentially relevant publications. All evaluations at each stage were performed in duplicate by two independent reviewers. Data extraction was performed in duplicate by two independent reviewers using an online data-extraction form. Disagreements on study selection and data extraction were resolved by a third reviewer and by discussion with other reviewers when needed.

2.5. Data-Charting Process

A data-charting form was developed based on the Best Evidence in Medicine coding sheet to determine which variables to extract [15]. The data were independently charted by four reviewers, and then the results were discussed among all reviewers.

2.6. Data Items

The extracted data included the author, year, journal of publication, article type, study location, sample size, purpose of the study, type of health professional/student included, number of institutions involved, description of the intervention, whether it was conducted in person or online, the length of intervention, topics of education, intervention facilitator, outcome assessment tools, validity of assessment tool, and overall main findings.

2.7. Critical Appraisal of Individual Sources of Evidence

The Medical Education Research Study Quality Instrument (MERSQI), which measures the study quality of experimental and observational studies, was used to assess the quality of the included articles [16]. The instrument scores articles from a range of 5 to 18 by totaling scores for ten items across six domains focused on study design, sampling, type of data, evidence of validity, data analysis, and outcomes. Three reviewers graded all included studies independently, and a fourth reviewer was available to discuss and resolve any conflicts.

3. Results

Our electronic literature database search retrieved 757 citations. After removing duplicates, we screened the titles and abstracts of 688 articles. Of these 688 articles, 675 (98%) did not meet inclusion criteria and were excluded from full-text review. Of the thirteen studies that underwent full-text review, six were ultimately determined to be eligible for inclusion in our scoping review [17–23]. The data extracted from these six studies are presented in Appendix A. The MERSQI results of all studies are presented in Tables 1 and 2.

Table 1. Aggregate MERSQI results. Results include domains (1. study design, 2. sampling, 3. types of data, 4. evaluation of assessment tool, 5. data analysis, 6. outcomes) and item scores for the six studies fulfilling the inclusion criteria for the interprofessional climate change education in health professions programs, published as of March 2023.

MERSQI Item	Possible Item Score	Mean (SD) Domain Score	No. (%) of Studies
1. Study Design		1.08 (0.19)	
Single-group cross-sectional or single-group post-test only	1		5 (83)
Single-group pre- and post-tests	1.5		1 (17)
Non-randomized, 2 groups	2		0 (0)
Randomized control trial	3		0 (0)

Table 1. Cont.

MERSQI Item	Possible Item Score	Mean (SD) Domain Score	No. (%) of Studies
2. Sampling			
Institutions		0.83 (0.47)	
- 1 institution	0.5		4 (67)
- 2 institutions	1		0 (0)
- >2 institutions	1.5		2 (33)
Response Rate		1.08 (0.45)	
- <50% or not reported	0.5		2 (33)
- 50–74%	1		1 (17)
- >74%	1.5		3 (50)
3. Type of Data		1 (0.0)	
Assessment by study subject	1		6 (100)
Objective measurement	3		0 (0)
4. Evaluation of Assessment Tool			
Content		0.83 (0.37)	
- Not reported	0		1 (17)
- Reported	1		5 (83)
Internal Structure		0 (0.0)	
- Not reported	0		6 (100)
- Reported	1		0
Relationships to Other Variables		0 (0.0)	
- Not reported	0		6 (100)
- Reported	1		0 (0)
5. Data Analysis			
Complexity of Analysis		1.17(0.37)	
- Descriptive only	1		5 (83)
- Beyond descriptive	2		1 (17)
Appropriateness of Analysis		1 (0.0)	
- Inappropriate	0		0 (0)
- Appropriate	1		6 (100)
6. Outcomes		1.17 (0.37)	
Satisfaction, attitudes, perceptions, opinions, general facts	1		5 (83)
Knowledge, skills	1.5		0 (0)
Behaviors	2		1 (17)
Patient/healthcare outcomes	3		0 (0)
	18	8.17	

Table 2. MERSQI results for the six papers meeting the study inclusion criteria. Results include domain (1. study design, 2. sampling, 3. types of data, 4. evaluation of assessment tool, 5. data analysis, 6. outcomes) and item scores for the 6 studies fulfilling the inclusion criteria for the interprofessional climate change education in health profession programs, published as of March 2023.

MERSQI Item	Possible Item Score	Shendell 2011	Charlesworth 2013	Mahoney 2014	Winer 2019	Katzman 2021	Hatfield 2023
1. Study Design							
Single-group cross-sectional or single-group post-test only	1	1		1	1	1	1
Single-group pre- and post-tests	1.5		1.5				
Non-randomized, 2 groups	2						
Randomized control trial	3						
2. Sampling							
Institutions							
- Single institution	0.5	0.5		0.5	0.5		0.5
- Two institutions	1						
- 2 or more institutions	1.5		1.5			1.5	
Response Rate							
- <50% or not reported	0.5			0.5			0.5
- 50–74%	1		1				
- >74%	1.5	1.5			1.5	1.5	
3. Type of Data							
Assessment by study subject	1	1	1	1	1	1	1
Objective measurement	3						
4. Evaluation of Assessment Tool							
Content							
- Not reported	0			0			
- Reported	1	1	1		1	1	1
Internal Structure							
- Not reported	0	0	0	0	0	0	0
- Reported	1						
Relationships to Other Variables							
- Not reported	0	0	0	0	0	0	0
- Reported	1						

Table 2. Cont.

MERSQI Item	Possible Item Score	Shendell 2011	Charlesworth 2013	Mahoney 2014	Winer 2019	Katzman 2021	Hatfield 2023
5. Data Analysis							
Complexity of Analysis							
- Descriptive only	1	1	1	1		1	1
- Beyond descriptive	2				2		
Appropriateness of Analysis							
- Inappropriate	0						
- Appropriate	1	1	1	1	1	1	1
6. Outcomes							
Satisfaction, attitudes, perceptions, opinions, general facts	1	1		1	1	1	1
Knowledge, skills	1.5						
Behaviors	2		2				
Patient/health care outcomes	3						
	18	8	10	6	9	9	7
Total Average	8.17	Standard Deviation	1.34				

3.1. Synthesis of Results

The data were extracted into an Excel database for analysis. Descriptive statistics were calculated within the Excel database, and findings were reported according to PRISMA [14]. Findings are summarized in Figure 1.

3.2. General Description

The six included studies were published between 2013 and 2023. Three studies published on IPE research were conducted in the United States [18,19,23]. Of the remaining three studies, two were published in Africa, and one was published in Australia [17,20,21]. Two studies were published in a medical or interprofessional curriculum and education-focused journal [19,23]. Three studies were published in either an environmental, global, or public health-focused journal [17,20,21]. Finally, one study was published in a medical specialty-specific journal [18]. Two studies included participants from two or more institutions [17,19]. Three included students or healthcare professionals from at least three different health profession education programs [17–19].

3.3. Study Quality

None of the studies used a two-group comparison design. However, one study conducted pre- and post-tests [12]. The mean MERSQI score of the six articles was 8.16 out of a total of 18 possible points (SD = 1.34, range 6–10). Articles with MERSQI scores greater than the mean possessed several indicators of higher research quality, including single-group pre- and post-tests; sampling two or more institutions; response rates greater than or equal to 75%; validity evaluation (reported content); investigation beyond descriptive data analysis; and/or education outcomes beyond satisfaction and attitudes.

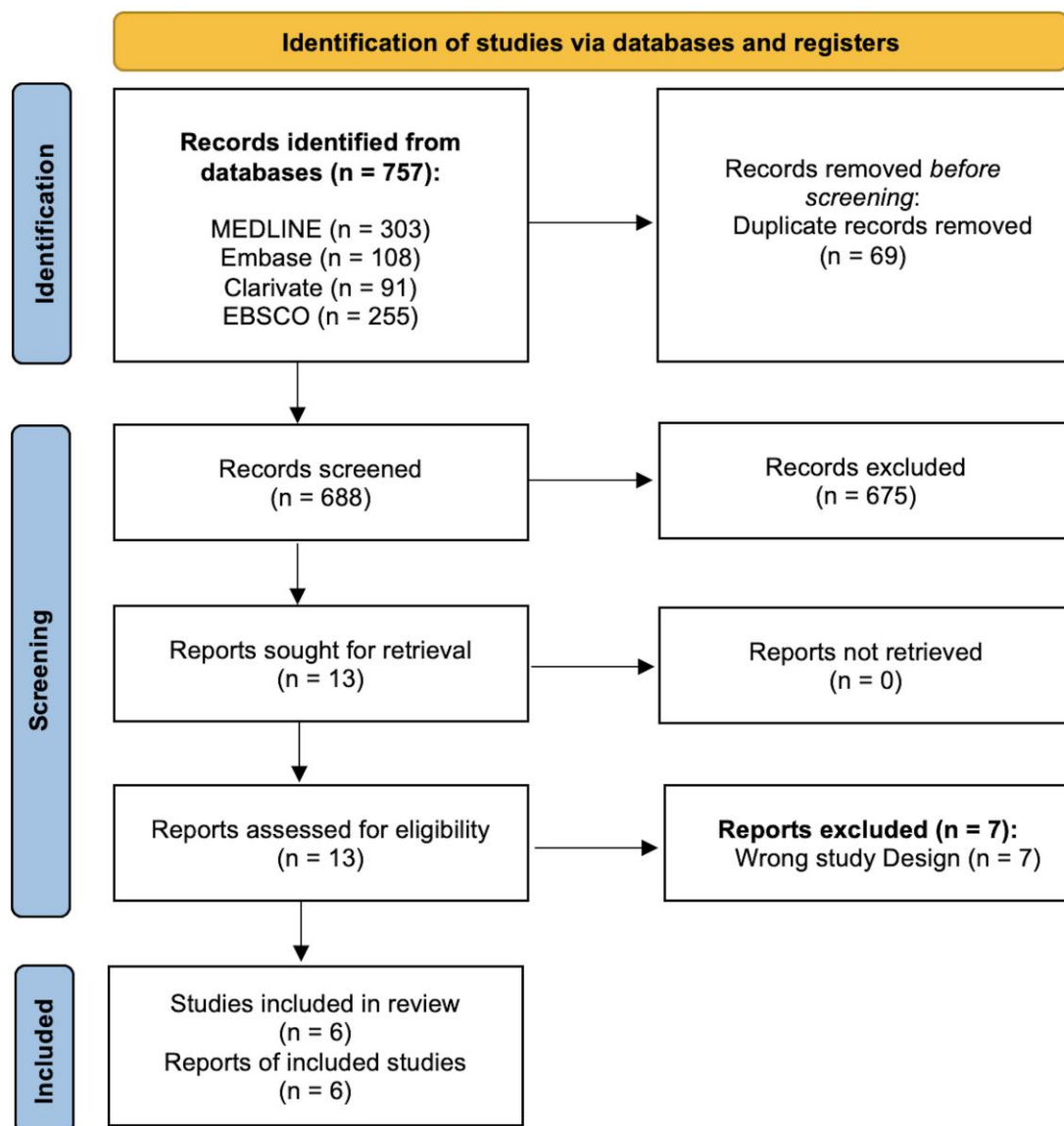


Figure 1. PRISMA Flow Diagram for Scoping Review on Interprofessional Climate Change Curriculum.

3.4. Climate Change Educational Intervention and Outcomes

Articles reported on educational interventions for a wide range of topics, including the science of climate change and planetary health, effects of climate change on human physical and mental health outcomes, extreme weather and disaster preparedness, water- and vector-borne diseases, the ecological footprint of healthcare, food systems, gaps of climate change education for health professionals and communication by health professions, advocacy, and policy involvement. All papers reported on the effects of climate change on human health, including two papers on the role of health professionals in climate change communication and four on the effects of climate change on extreme weather events and infectious disease exposures [18,19,21,23].

Educational interventions included watching lectures and informational videos; writing and responding to peer blog posts; working within small interdisciplinary groups to create a communication product; and participating in question-and-answer sessions, simulated cases, journal clubs, facilitated discussions, case studies, and a standardized patient interaction. Three of the studies involved working in small groups to facilitate discussion or to complete projects [18,20,23], four incorporated lectures [17–19,21], and three used case studies or standardized patient interviews [19,21,23].

Most studies used an assessment tool with content validity evidence [17–19,21,23]. However, no study provided evidence for the validity of internal structure or relationship to other variables. One study explored educational outcomes beyond satisfaction and attitudes and evaluated behaviors three months post-intervention to assess if participants completed the aim of subsequently facilitating a similar session themselves [17]. Four studies reported on outcomes related to changes in understanding of climate change and IPE concepts [18–20,23].

Studies reported that the educational interventions improved students' awareness about climate change and justice [17,18,21] and the ability to have climate-related health discussions with patients [17,19,21]. Studies also reported that IPE improved students' recognition of healthcare roles and attitudes toward interprofessional collaboration [18–20,23]. Appendix A summarizes the main findings from each study.

4. Discussion

The goal of this scoping review is to highlight the progress and challenges of incorporating climate change topics into health IPE. From our research, it is apparent that educators and trainees alike recognize the need for current and future health professionals to appreciate and understand the relationship between climate change and health. However, the subsequent curricular introductions and revisions may be challenging to implement, given the existing rigor and breadth of the training curricula. The evaluation of attempted interventions and the dissemination of these results are imperative prior to wider adoption by other institutions.

We chose to specifically focus on IPE interventions, due to the proven merits of interprofessional learning. Beyond education focused on climate change and health, trainees consistently report appreciating interdisciplinary education, and they potentially learn and retain information better, compared to traditional learning mechanisms [3]. Mitigation of climate change calls upon diverse expertise, and therefore, trainees and professionals should partake in dynamic learning experiences that simulate future work environments.

In our literature search, we found a scoping review by McKinnon et al. [24]. Their review included articles published from 2000 to 2021 that focused on practicing health professionals and the involvement and education of these providers on climate topics. A main finding was that only 16 of the 111 papers reviewed offered insight into an interprofessional approach for climate education. The authors noted that over half of the papers reviewed emerged after 2020, demonstrating a recent trend of utilizing interprofessional frameworks to learn about climate change and a need to understand best educational practices. Because McKinnon et al. included a wide variety of types of papers—discussion papers, quantitative and qualitative studies, and systemic, scoping, and integrative reviews—they did not comparatively evaluate outcomes. Therefore, our scoping review complements the findings of McKinnon et al. by scoring interventions using the MERSQI and focusing more on the outcomes of implemented interprofessional health curricula. Our review also includes papers published after McKinnon et al. completed their search.

An important realization of our scoping review is that as health professions programs incorporate education on climate change in their curricula, there will be a similar need to provide this education to current healthcare workers in order to achieve a shared literacy on this topic. Healthcare worker education should be performed in an interprofessional manner. If not, the discrepancy in knowledge between health professions students exposed to the climate curriculum and the providers they work with during training may pose a barrier to students integrating their climate knowledge into patient care. Rabin and Philipsborn provided a useful framework for how climate change content can be incorporated into many different stages of training to help facilitate a common language between students and providers [25,26].

Of the 688 articles we initially screened, those lacking an interprofessional framework were excluded. However, we recognize many institutions may be actively implementing and evaluating IPE curricular assessments. It would also be valuable to systematically

assess the climate change curricula that have been specifically developed for and implemented in single-profession settings, such as Nursing, Physician Assistant, and Doctor of Medicine programs. Understanding any similarities and differences in how different professions approach the topic of climate change education could guide the future development of IPE efforts.

While implementing curricular interventions, it is also important to acknowledge the difference between multidisciplinary learning and true IPE. The most accepted definition states that IPE “occurs when two or more professions learn with, about, and from each other to enable effective collaboration and improve health outcomes [27]”. While each of the papers included achieved the goal of multiple professions learning with each other, few reached the criteria of learning about and from each other. In the studies assessed in this review, the best example of IPE was demonstrated by Winer et al., where medical and veterinary students worked on a standardized patient case together, both sharing how their respective fields would tackle the case and handle the problem [23]. Such teaching modalities enhance the IPE experience beyond simply bringing learners from multiple professions to hear a lecture or to have a discussion. The spirit of IPE should be kept in mind moving forward when implementing these curricula.

The limitations of our study include excluding studies not published in English, and therefore, we may have excluded studies highlighting IPE interventions on climate change and health in other languages. Additionally, by including only studies that mention IPE, we are potentially underestimating the breadth of climate change programs in health education [25,28]. Of the studies included, most had small sample sizes, and only two had two or more institutions participating in the intervention [17,19]. Only one study conducted pre- and post-tests [17], while no study compared outcomes for two separate groups. None of the studies reported the validation of internal structure or relationships to other variables of their evaluation instrument. Only one study included data analysis beyond a descriptive nature [23]. The heterogeneity of the studies limits the consistency of the results. We did not search all available literature databases; therefore, we may have inadvertently not included all articles on this topic.

To successfully implement climate change topics in health IPE, it will be necessary to have an explicit set of learning objectives and expected outcomes. Additionally, the development and use of validated assessment tools to measure the success of climate change curricula are necessary to ensure that outcomes data are collected objectively and systematically. Such tools may take the form of pre- and post-tests, surveys, and critical reflection assessments. Given the impact climate change is having on vulnerable groups and the need for action-oriented solutions, IPE could extend beyond a classroom setting and include service-learning opportunities and partnering with community groups to understand lived experiences. Further, prospective studies evaluating the effects of these novel curricular interventions should include a comparison group who did not partake in the curriculum to better quantify improvements and to identify potential unintended consequences of curricular changes.

Beyond undergraduate health professional education, it would be valuable to survey current graduate medical trainees and members of the workforce across all disciplines to assess the existing level of knowledge of health-related climate change topics. Based on the results of climate change education implementation at the undergraduate medical education level, additional teaching modalities should be developed for graduate medical education and continued medical education credit to engage resident trainees, attending physicians, and other healthcare professionals in this work. The effects of climate change are universal, and as such, solutions require engagement from all levels of the healthcare workforce.

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Data Availability Statement: Not applicable.

Conflicts of Interest: All authors declare no competing financial, personal, or professional interest.

Appendix A

Extracted data from each paper meeting inclusion criteria

Includes author, study location, sample size, type of health professional/student included (affiliation), intervention description, intervention education topics, assessment(s), and overall main findings.

Author, Year, Location, Study Size	Purpose	Affiliation	Intervention	Education Topics	Assessment	Main Findings
Shendell, 2011, [21] Nigeria, 27	To conduct a short-course, multipart training, incorporating classroom and field components, for current and prospective Nigerian health professionals seeking enhanced awareness, knowledge, and skills in environmental and occupational science, epidemiology, exposure assessment, and prevention	MPH students, medical residents	One week training including lectures, case studies, movies/videos and photos, assignments, in-class discussions, field exercises and evaluations	<p>Lecture topics on indoor air and environmental quality, outdoor air quality, industrial and oil refinery dominant areas; quality assurance and quality control for environmental monitoring and database assimilation, management, and analysis; and children's environmental health</p> <p>Hands-on sessions using real-time environmental monitoring equipment and various field research supplies</p> <p>Three community-based field trips to residential areas affected by air pollution from traffic, waste disposal/burning sites, and a private-sector drinking water bottling plant to conduct air and environmental quality assessments</p>	<p>-Small and large group debriefing discussions with review of data collected</p> <p>-Practice time with monitoring and field equipment</p> <p>-Course evaluations using Likert scale (1–5) and written comments</p>	<p>-Successfully planned and delivered lectures and activities in the community</p> <p>-78.3% of participants reported objectives and goals were met</p> <p>-91.3% reported they would recommend the training to others</p>

Author, Year, Location, Study Size	Purpose	Affiliation	Intervention	Education Topics	Assessment	Main Findings
Charlesworth, 2013, [17] Australia, 33	To assess the feasibility of implementing an educational intervention on sustainable health care delivered to public health registrars in Australia	Fellows and trainees of the Australasian Faculty of Public Health Medicine (AFPHM); general practitioners and specialists	A single 4-h workshop using a presentation with approximately 130 PowerPoint slides and interactive exercises performed at the beginning and the end of the session. One in-person site and 7 sites linked by video conference	Themes: Climate change, sustainability, and health Sources: Materials were adapted and from a previously implemented educational program designed by the UK National Health Service (NHS) Sustainable Development Unit. Alterations made to tailor materials for an Australian audience	-Baseline and post-intervention questionnaire using a Likert scale (1–4), yes/no, or open-ended questions -5 participants selected for a 30-min telephone interview 3 months after workshop to assess adherence to pledged actions	-Participants moved up “one” point on the Likert scale for self-reported levels of awareness and advocacy over the course of the workshop -97% of respondents rated the workshop as ‘extremely useful’ or ‘useful’ -2/5 subjects interviewed 3 months after the session reported facilitating a similar session of their own following the intervention -The most common reason that subjects did not adhere to their pledged actions after the session was “lack of time”
Mahoney, 2014, [20] Kenya, 16	To understand Kenya’s primary health care system, environmental and social determinants of health, and foster professional teamwork	Nursing students, family medicine residents, district nurses, community health workers	Small group activities including home visits, facilitated discussions, and journal clubs	“Environmental and social determinants of health”	Five focus group discussions qualitatively assessed using theme analysis	-Nursing students favored journal clubs. -Medical students favored the home visits -S/EDoH were learned collaboratively -IPE within a primary healthcare team may improve quality and access to care, and increase appreciation for one another
Winer, 2015, [23] University of California, Davis, 238	To develop and evaluate an evidence-based approach to an environment-related clinical case that could be used by medical and veterinary professions	Medical and veterinary students	Mandatory pre-reading a week before the session, followed by a single small group, case-based exercise with both medical and veterinary students centered around a standardized patient presenting with a medical condition	Readings of relevant articles from journals in their respective fields. Case study focused on environmental and zoonotic risk factors for T. gondii.	Anonymous survey on the effectiveness of the exercise on changing student attitudes towards One Health and interprofessional education using a Likert scale (1–5) and open-ended questions	-92% of veterinary student and 73% of medical students strongly agreed that One Health was relevant to their area of practice -96% of veterinary and 89% of medical students believed that IPE fosters future interprofessional collaboration -Most students in both disciplines reported that their respect for and understanding of the other profession increased significantly, as did their team problem solving skills

Author, Year, Location, Study Size	Purpose	Affiliation	Intervention	Education Topics	Assessment	Main Findings
Katzman, 2021, [19] 45 US states, 25 countries, 625	To increase knowledge, self-efficacy, and communication skills related to human health impacts of climate change among health professionals	MD, DO, NP, PA, nurse, PhD, MPH, community health workers	8 weeks, weekly meetings for 75 min. Each session had two brief (15–25 min) evidence-based didactic lectures, including moderated question and answer sessions. Five sessions also included a simulated case to match the session's content and illustrate the relationship between climate change and health	Week 1: Gaps in climate change education; Science of Climate Change Week 2: Connecting Climate Change and Human Health Outcomes Week 3: Global Warming, Extreme Heat, and Vulnerable Populations Week 4: Climate Change, Air Quality, and Respiratory Illness Week 5: Climate-driven Ecological Change and Water- and Vector-borne Diseases Week 6: Climate Change and Mental Health; Animal Agriculture, Greenhouse Gas Emissions, and the Co-benefits of a Plant-based Diet Week 7: Extreme Events, Impacts to Healthcare Facilities, and Disaster Preparedness Week 8: Climate Change Communication and Future Solutions	-Zoom polls during sessions -Post-session evaluation with response options ranging from strongly disagree to strongly agree; contained a free text field at the end of the survey	-17% of participants completed the course (attended 6/8 sessions) -Reported that the sessions shared evidence-based content that they intended to use during communication with IPE team members and patients ->90% of participants reported that they strongly agreed or agreed that the sessions increased their understanding of or confidence regarding a session's topic
Hatfield, 2023, [18] Oregon Health and Science University, 40	To fill gaps within university curricula and provide health professionals and students with the skills necessary to recognize and respond to the climate crisis	Undergraduate medical students and allied health professionals (e.g., dentistry, nursing, nutrition, and public health)	Asynchronous, 66-h course; watch mini-lectures, write blog posts, respond to peer blog posts, work within small interdisciplinary groups of 4 to 5 students to create a communication product (brochure, podcast, or video)	Modules: (1) Climate change and planetary health; (2) Ecological footprint of hospitals and healthcare; (3) Climate change, heat waves, and extreme events; (4) Vector and water borne diseases; (5) Mental health impacts and responses; (6) Communication, outreach, and advocacy; (7) Food and food systems; (8) Climate justice; (9) Healthy behavior and greenhouse gas emissions; (10) Climate change in Oregon and release of group projects	Course evaluations using Likert scale (1–6) and written comments	-Course evaluations exceeded averages for other IPE courses (mean 5.38 + / – 16 versus 4.86 in all IPE courses) -Students reported raised awareness about climate change, justice, advocacy -Reported increased ability to communicate this information to future patients -All participants felt enabled to work more effectively as a member of the healthcare team and appreciate other healthcare professionals

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