Education for Sustainable Healthcare: Opportunities and Barriers in Undergraduate Health Professions Education in South Africa

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This thesis is presented in fulfilment of the requirements for the degree of Doctor of Philosophy in the School of Public Health, Faculty of Health Sciences, University of Cape Town.

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Abstract of thesis

The escalating global crisis of climate change and environmental degradation is having severe public health impacts. One key response requires faculties of health sciences globally to review how they prepare their health professional graduates to address the changing needs of the communities they serve. Health professions education has generally not kept pace with changing societal needs, and current curricula are often too fragmented and static to prepare graduates as effective climate health leaders and agents of change.

Education for sustainable healthcare (ESH) is a field in health professions education focused on the interdependence of human health and planetary ecosystems, and on making healthcare systems more environmentally sustainable. ESH incorporates the principles of planetary health, which recognises that informed stewardship of earth's natural systems is essential for human health and well-being. ESH also includes education about environmentally sustainable healthcare, which is high-quality healthcare that is less polluting and wasteful of natural resources than conventional healthcare. There is, however, little evidence about ESH from low- and middle-income countries, which are generally most impacted by climate and environmental breakdown.

The aim of this thesis was to identify the opportunities and barriers to ESH in undergraduate health professions education in South Africa, illustrated by a case study at the University of Cape Town Faculty of Health Sciences (UCT FHS). A mixed methods study of three sequential phases addressed four objectives. Phase 1 was a national survey of key educators to assess the status of ESH-related teaching and learning activities in undergraduate health professions education in South Africa. Phase 2 recruited a national Delphi panel of educators for the second objective of appraising the ESH learning objectives, activities, and assessments proposed by the International Association for Health Professions Education (AMEE) Consensus in 2021. The Delphi panel also helped achieve the third objective, to assess perceptions of educators about the opportunities and barriers to ESH in South Africa. The third phase was a Planetary Health Report Card (PHRC) assessment of the UCT FHS, by interviewing key educators and completing standardised scorecards. This phase addressed the fourth objective, to assess perceptions of educators about the opportunities and barriers to ESH in the UCT FHS.

The thesis is structured into seven chapters. Chapter 1 provides the rationale, aim, objectives, design, and structure of the thesis. Chapter 2 reviews the literature on the health impacts of climate change, and the contribution of ESH towards social and environmental accountability in health professions education. It presents the conceptual framework of the thesis for evaluating environmental accountability in health professions education institutions, derived from the Conceptualisation, Production, and Usability (CPU) model for socially accountable medical schools. Chapter 3 describes the national audit survey in Phase 1, which found that ESH curriculum development is emerging in South Africa and is enabled by strong institutional leadership and by staff and student involvement. Chapter 4 analyses the findings of the national Delphi panel in Phase 2. It reached consensus on a set of learning objectives, activities, and assessments for health professions education in South Africa and identified enablers of ESH curricular development, among them faculty leaders, capable educators, and multidisciplinary collaboration. Chapter 5 presents the baseline findings of the PHRC assessment of the curricula, research, community engagement, student leadership, and campus sustainability of the UCT FHS. The PHRC identified curriculum overload, “siloed” learning, limited educator capacity, and health system challenges as key barriers, and recommended longitudinal integration of ESH across all curricula. Chapter 6 presents the discussion of the overall findings of the study. It proposes a framework for guiding ESH curricular development, which integrates recommendations in six focus areas for faculty leaders and educators within three domains of the CPU model. The key barriers and enablers of ESH identified by this study, and examples of opportunities in the UCT FHS, are also discussed. Chapter 7 concludes with the contribution of the study to knowledge about ESH and the implications for future research.

The thesis has helped to build the evidence about ESH from a LMIC perspective. It has identified barriers and opportunities within South African undergraduate health professions education, and has proposed learning objectives, activities, and assessments for the South African context. A PHRC assessed opportunities for ESH integration in the UCT FHS, a first in the global South. The thesis proposes an integrated ESH curricular development framework within a social accountability model for HPE institutions, with potential applicability to low- and middle-income countries.

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Preface

I confirm that I have been granted permission by the University of Cape Town's Doctoral Degrees Board to include the following publications in my PhD thesis, and that all co-authors have agreed that I may include the following publications:

1. Irlam J, Dreyer A, Filies G, Govender L, Jacob N, Jayakumar J, Lokotola CL, Naidoo R, Reid SJ, Rother H-A. (2023). Education about Planetary Health and Sustainable Healthcare: a national audit of health professions education curricula in South Africa. African Journal of Health Professions Education 2023; 15(4). https://doi.org/10.7196/AJHPE.2023.v15i4.326.

2. Irlam J. Reid SJ, Rother H-A. (2024). Education about Planetary Health and Sustainable Healthcare: a national Delphi panel assessment of its integration into health professions education in South Africa. African Journal of Health Professions Education 2024;16(1). https://doi.org/10.7196/AJHPE.2024.v16i1.327.

3. Irlam JH, Reid S, Rother HA. Education about planetary health and sustainable health care in low- and middle-income countries: A planetary health report card assessment of perceptions at the University of Cape Town Faculty of Health Sciences. Education for Health (January-March 2024) 37 (1). https://doi.org/10.62694/efh.2024.17.

Signed by candidate

James Irlam

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CHAPTER 1 Introduction

This chapter provides a rationale for the thesis, and presents the aim, four objectives, study design, and the structure of the thesis.

Rationale

Climate change is amplifying environmental risks to global health in the 21st century (1-4), with disproportional impacts in low- and middle-income countries or LMICs (5, 6). It is therefore important and urgent to educate health professionals to protect public health from climate change, to promote adaptation to a changing climate, and to increase the environmental sustainability of healthcare services (7, 8). This recognition is based on the understanding that climate advocacy is part of the duty of health professionals. A framework of seven criteria has been developed to evaluate the extent of health professionals' obligation to advocate for reducing the health threats of climate change (9). These criteria recognise the unique expertise and experience of health professionals in treating its social and health impacts, their influence in promoting more environmentally sustainable healthcare, and the generally high levels of public trust placed in them. The authors conclude that there are reasonable grounds for claiming that climate advocacy is professionally appropriate for all health professionals (9). The Climate and Health Alliance of Australia maintains that health is an effective way to communicate climate change to diverse groups, and that health professionals should be empowered to talk publicly about climate and health (10).

Sustainable healthcare (SH) is healthcare of high quality that does not compromise the ability of the healthcare system to meet future health needs. By promoting health and better delivery of healthcare rather than late intervention, SH benefits patients and the planetary ecosystems on which human health depends (11, 12). Education for sustainable healthcare (ESH) has been defined as the organization of health professions education (HPE) to develop knowledge, skills and attitudes about the interdependence of human health and planetary ecosystems, including the impacts of rapid climate and environmental changes on health and healthcare, as well as the impacts of healthcare on the environment (8, 13, 14). ESH, therefore, incorporates the principles of global health and the more expansive concept of planetary health (PH), which encompasses

the health and wellbeing of all life and life-support systems on our planet (8, 15). International practice and research are growing about the integration of sustainability into HPE curricula, but mostly in high-income countries (8, 16-20). This is borne out by a systematic review in 2023 of the international evidence for, and barriers to, SH education, which included 23 studies, mostly from the UK, and none from LMICs (21).

South Africa (SA) is classified as an upper-middle-income country by the World Bank, based on its Gross National Income per capita, but the more widely recognized term LMIC includes SA in many other classifications. The country is highly vulnerable to environmental and climate risks to health (22-25), and has historically high levels of poverty and very high income inequality, as indicated by its Gini coefficient of 0.63 (26). SA's climate change policies and plans recognise the need to build capacity in climate change awareness and adaptation (27-29). Such capacity development includes education and training of the health workforce at all levels on climate change and health, which the World Health Organization (WHO) has been doing for over 25 years in creating an international community of practice (30). A robust and evidence-based case for integrating ESH into SA HPE curricula is required, however, to firmly establish the growing relevance of PH and SH to health and healthcare (8, 20, 31-33). Key enablers of ESH in HPE worldwide are strong institutional leadership; increasing general awareness of climate and environmental crises; greater advocacy by the health sector; more case studies and learning resources available via global ESH networks; and opportunities for change offered by periodic curriculum reviews (11, 13). Common barriers, however, are perceptions that HPE curricula are too overloaded for extra content, and that current environmental health content is poorly integrated, aligned, and assessed. Educators and students often doubt what health professionals can do about climate and environmental degradation, especially when faced with seemingly more urgent and immediate challenges in public health and health systems (11, 13).

South Africa is no exception to the dearth of research about ESH in LMICs. A study with key informants in SA about the role of health professionals in protecting health from climate change found that common constraints are high workloads in an overburdened health system, a lack of leadership, little knowledge and foresight of climate-health impacts, and a mainly biomedical focus in HPE curricula (34). Students surveyed in 2019 at the University of Cape Town Faculty of

Health Sciences (UCT FHS) mostly thought that environmental sustainability in healthcare should be better integrated into their curricula, using diverse methods like facilitated discussions, peer-to-peer teaching, case studies, and electives (35). Both of the above studies recommended larger and more representative studies of ESH in SA (35), and how the role of health professionals in SA compares with that of other countries (34). This study was intended to help fill the gap in evidence about ESH arising from LMICs, and is a timely response to a call for integrating planetary health and environmental sustainability into African HPE curricula (36).

Aim

The aim of this thesis was to identify the opportunities and barriers to ESH in undergraduate HPE in SA, illustrated by a LMIC case study at the UCT FHS.

Objectives

1. To assess the status of ESH-related teaching and learning activities in all SA faculties of health sciences;
2. To analyse a Delphi panel assessment of ESH learning objectives, activities, and assessments for HPE in SA;
3. To assess perceptions of health professions educators about the opportunities and barriers to ESH in SA; and
4. To assess perceptions of UCT FHS educators about the opportunities and barriers to ESH in the UCT FHS.

Study Design

The thesis used a mixed methods study design of three sequential phases (Figure 1.1):

- Phase 1 (September to December 2021) was an audit of ESH teaching and learning activities in undergraduate HPE in all SA faculties of health sciences.
- Phase 2 (April to May 2022) was a national Delphi panel assessment of ESH learning objectives, activities, and assessments for HPE in SA.

- Phase 3 (August to December 2022) was a Planetary Health Report Card (PHRC) assessment of the UCT FHS.

Figure 1.1: Sequential phases of the mixed methods study design

The methods used in each phase of the study are described in chapters 3 to 5, which each include a published journal paper.

Structure of the Thesis

The thesis is structured into seven chapters.

Chapter 1 provides the rationale, aim, objectives, design, and structure of the thesis.

Chapter 2 presents a review of the literature that summarises the evidence of anthropogenic climate change, its major health impacts, and the co-benefits to climate and health of effective societal responses to climate change. It identifies the linkages between social and environmental accountability in HPE, and describes the Conceptualisation, Production, and Usability (CPU) model for socially accountable medical schools. Developments in ESH, globally, in SA, and at the institutional level of UCT FHS are reviewed. The chapter concludes with the conceptual framework of the thesis, derived from the CPU model, for assessing environmental accountability in HPE institutions.

Chapter 3 analyses the findings from a national audit of health professions education curricula in SA, towards meeting the first study objective of assessing the status of ESH-related teaching and learning activities in all SA faculties of health sciences.

Chapter 4 presents a national Delphi panel assessment of the integration of ESH into health professions education in SA, towards the second objective of assessing ESH learning objectives, activities, and assessments for HPE in SA; and the third objective to assess perceptions of the Delphi panelists about the opportunities and barriers to ESH in SA.

Chapter 5 presents a baseline Planetary Health Report Card (PHRC) assessment of the UCT FHS towards the fourth objective of the study, which analysed perceptions of UCT FHS educators about the opportunities and barriers to ESH in the UCT FHS.

Chapter 6 analyses the overall findings of the mixed methods study in Chapters 3 to 5. It proposes a framework for guiding ESH curricular development, which integrates recommendations within six focus areas, adapted from the AMEE Consensus, and within three domains of the CPU model. The key barriers and enablers of ESH identified by this study, and examples of opportunities from the UCT FHS case study, are discussed, with potential applicability to HPE in LMICs. The limitations of the study are reviewed.

Chapter 7 concludes the thesis with its contribution to knowledge about ESH and the implications for future research.

Table 1.1. Thesis objectives addressed by the published studies

Objectives	Published Study
1. To assess the status of ESH-related teaching and learning activities in all SA faculties of health sciences	Irlam, J, Dreyer, A, Filies, G, et al. Education about Planetary Health and Sustainable Healthcare: a national audit of health professions education curricula in South Africa. African Journal of Health Professions Education 2023; 15(4)
2. To analyse a Delphi panel assessment of ESH learning objectives, activities, and assessments for HPE in SA	Irlam, J, Reid, S and Rother, H-A Education about Planetary Health and Sustainable Healthcare in low- and middle-income countries: Planetary Health Report Card assessment of perceptions at University of Cape Town Faculty of Health Sciences. Education for health 2024; 37(1).
3. To assess perceptions of health professions educators about the opportunities and barriers to ESH in SA	
4. To assess perceptions of UCT FHS educators about the opportunities and barriers to ESH in the UCT FHS	Irlam, J, Reid, S and Rother, H-A Education about Planetary Health and Sustainable Health Care in Low- and Middle-Income Countries: A Planetary Health Report Card Assessment of Perceptions at the University of Cape Town Faculty of Health Sciences. Education for health 2024; 37(1)

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CHAPTER 2 Literature Review

In this chapter key evidence of anthropogenic climate change and its major health impacts is summarised, as well as how effective societal responses can benefit both the climate and public health. The linkages between social and environmental accountability in HPE are identified, and the Conceptualisation, Production, and Usability (CPU) model for socially accountable medical schools is described. The chapter reviews developments in ESH both globally and in SA, and the status of ESH within the UCT FHS. The chapter concludes by presenting the conceptual framework of the thesis for assessing environmental accountability in HPE institutions, which is derived from the CPU model.

Evidence of Climate Change

Evidence of anthropogenic climate change has been continually compiled and published in six major assessment reports by the authoritative Intergovernmental Panel on Climate Change since 1988. This evidence includes increases in levels of atmospheric carbon dioxide; increases in air, land, and sea temperatures; changing precipitation patterns; extreme weather events; unprecedented melting of ice and snow; and steadily rising sea levels (1). The impacts of humanity on the planet are so profound that a new planetary epoch called the Anthropocene has been proposed. It is popularly defined as an age in which anthropogenic impacts since the Industrial Revolution, and especially since the Second World War, have been the dominant force shaping the planet's physical, chemical, and biological systems (2). Critics of the Anthropocene concept have argued for a deeper historical understanding instead, which recognises the nature and origins of our ecological crisis in the exploitative accumulation of capital that has characterised the 'Capitalocene', or 'age of capital' pre-dating the Industrial Revolution by several centuries (3).

In November 2019, more than 11 000 scientists from over 150 countries declared a global climate emergency, based on 40 years of data on the impacts of human activities on the climate (4). These impacts include rapid increases in global heating greenhouse gases, or GHGs (such as carbon dioxide, methane, and nitrous oxide); rising surface and ocean temperatures; rising sea levels; more frequent and intense weather events; and rapidly shrinking ice in mountain glaciers

and in the polar and Greenland ice sheets. Many health professional bodies have also declared a climate crisis (e.g. the World Organization of Family Doctors; the International Council of Nurses), and others have repeatedly called for greater environmental sustainability in healthcare (e.g. the World Medical Association, Environmental Physiotherapy Association, and the Australian Medical Association) (5).

In late 2023, over 200 health journals simultaneously published a call for the United Nations (UN), political leaders, and health professionals to recognise that "*climate change and biodiversity loss are one indivisible crisis and must be tackled together to preserve health and avoid catastrophe"* (6). The call strongly recognised the interdependence of natural planetary systems. For example, the destruction of plant life by drought, wildfires, floods, and other effects of global heating, creates a negative feedback loop characterised by more soil erosion, and therefore less carbon storage capacity leading to higher global temperatures (7). The call concluded that "*health professionals must be powerful advocates for both restoring biodiversity and tackling climate change for the good of health. Political leaders must recognise both the severe threats to health from the planetary crisis as well as the benefits that can flow to health from tackling the crisis. But first, we must recognise this crisis for what it is: a global health emergency"* (6).

Health Impacts of Climate Change

The rapid heating of the planet is amplifying existing environmental risks to human health via multiple exposure pathways. These pathways include worsening air pollution, changing vector ecology, increasing aero-allergens, poorer water quality, disrupted water and food supplies, and more extreme heatwaves, rainfall events, and tropical storms. Malnutrition, infectious diseases, asthma, cardio-respiratory diseases, and the mental health burden of environmental disruption to people's livelihoods are all prevalent and growing examples of climate-health impacts (8-11). The direct and indirect causal pathways towards these impacts are summarised by the Lancet Commission on Climate Change and Health in Figure 2.1 (12). Climate-health impacts differ markedly from region to region due to the diversity of factors that make some people and population groups more vulnerable than others, such as those living in extreme poverty and degraded environments, those with poor access to health services, and those with pre-existing health conditions (13, 14). LMICs are generally more vulnerable to the damaging effects of

climate hazards and have a lower coping capacity than higher income countries. Eight of the ten countries most impacted by extreme weather events in 2019, for example, were LMICs, leading to higher loss of life and property and widespread hardship (15).

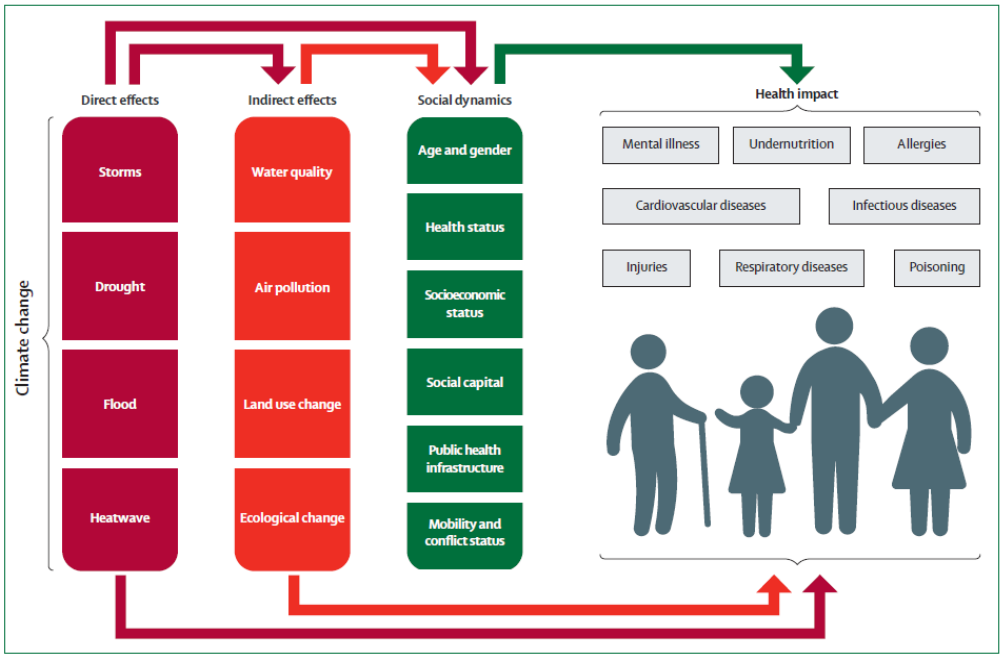

Figure 2.1: The direct and indirect impacts of climate change on health (46)

South Africa is a highly climate-vulnerable country that is already burdened by huge inequalities, ill-health and a failing public health sector (13). It has also long been one of the leading emitters of GHGs, due to its heavy dependence on fossil fuels, primarily coal, for energy generation (16). Increases in average air temperatures and in the frequency of hot days, more intense drought, and rainfall events, rising sea levels and ocean temperatures, and more extreme wildfires are projected to significantly worsen the burden of disease, both directly and indirectly (17). Interpersonal and domestic violence, for example, which is already endemic in much of SA, will increase due to rising temperatures and increasing migration to crowded urban areas that have generally worse environmental health and socioeconomic status (18). Like many other regions of the world, particularly vulnerable populations in the Western Cape province include children and the elderly, those working in the heat with little access to cooling, those with chronic and mental illness, and poor people who are often highly exposed to extreme weather and yet have worse access to healthcare (18).

The disproportionate and inequitable impact of climate on poor and vulnerable people has prompted calls worldwide for climate justice (19-21), which resonate strongly in SA as a struggle against 'climate apartheid', where the wealthy can afford to protect themselves from the worst climate impacts, while the poor suffer most (22, 23). Many climate-health impacts also show gender differentials, especially where the socioeconomic status of women is particularly low (24). Droughts, floods, storms, and other extreme weather events kill more women than men, and generally at a younger age, and undernutrition and malaria affect women disproportionately too. Gender-sensitive assessments, gender-responsive interventions, and gender mainstreaming in climate policies are therefore needed to promote more equitable and effective mitigation and adaptation to climate change (24).

Climate and Health Co-benefits of Climate Change Responses

Climate change is widely recognised as the greatest threat to health in the twenty-first century, yet it also presents a great opportunity for interventions to mitigate climate change and benefit public health (12, 25-28). Mining and combustion of fossil fuels, for example, are causing air pollution, global heating, and climate change, yet replacing them with clean renewable energy sources makes strong public health and climate sense, as well as yielding economic benefits as the costs of renewable energy technologies fall rapidly (23, 29). Furthermore, 'green' buildings, hospitals and health centres have a reduced environmental impact, and are generally healthier workplaces that are more resilient to future climate shocks (21, 30). Meat-based diets are energy, water- and land-intensive, so promoting plant-based diets has multiple environmental benefits and may decrease the risk of cardiovascular diseases and cancers (31, 32). Active mobility, such as walking and cycling instead of using private cars, reduces transport emissions, improves urban air quality, and promotes physical and mental health and wellness (12).

Obesity, undernutrition, and climate change are current pandemics that cluster in time and place, interact at the biological, psychological, and social levels, and that have common macro-scale drivers and determinants. To mitigate this 'global syndemic', a Lancet Commission proposed nine broad recommendations and twenty associated actions, which show the large potential benefits for planetary health of simultaneous action on these pandemics (33). The Commission recognised that to influence the societal norms and institutional policies of workplaces and communities,

many agents of change are needed, such as elected officials, employers, parents, customers, and health professionals. This is especially important to counter the powerful vested interests of commerce and the resultant policy inertia that often undermines the public good and planetary health. Health professionals have a key role to play at the individual and public health levels, such as integrating nutrition within national policies, programmes, and budgets; promoting active and public transportation policies and infrastructure; and encouraging environmentally sustainable lifestyles among their peers and patients. Yet medical schools globally, and particularly in LMICs that are often most impacted by the syndemic and extreme weather impacts (15), are not preparing health professionals sufficiently to fulfil these roles (34, 35). Therefore, training health and non-health professionals to promote active mobility and more nutritious diets, as well as to advocate for healthy public policy, has benefits for public health and for climate mitigation and adaptation, with special attention needed in LMICs (33, 36).

The General Assembly of the World Medical Association in 2019 adopted a resolution on the climate emergency that recognised that health professionals must advocate to protect the health of citizens around the world (19). It demanded accelerated action on climate change, which includes acknowledging the environmental footprint of the global healthcare sector and reducing its waste and pollution. A guide for Australian health professionals on communicating climate-health impacts argues that if the health sector leads on climate advocacy, then decision-makers and the public will respond, as people care deeply about their health and generally trust health professionals (37). The COVID-19 pandemic showed how severely human impacts on the environment affect public health, how rapidly political will and resources could be mobilised, and how health professionals were generally trusted voices at the forefront of the response (5, 38). The 2020 WHO Manifesto for a Healthy Recovery from COVID-19 targeted multiple root causes to prevent such pandemics becoming more frequent and severe in future (21). Their prescriptions have many potential co-benefits for public health and for climate mitigation and adaptation. These include safeguarding the environment; ensuring universal access to clean water; ending tax subsidies for polluting fossil fuels; transitioning to renewable energy; promoting sustainable food systems and plant-based diets; and building more liveable cities with better public transport, active mobility, and public green spaces. These prescriptions emphasise

how important health professionals are in protecting health from climate impacts, using their authority, knowledge and experience at the systemic level within governmental ministries and institutions of learning and research (39). Although rapid climate change and the COVID-19 pandemic have exposed the failures of most nations to prepare adequately for these converging crises, they also offer unprecedented opportunities for shared solutions. These include working towards better climate and health equity, building community and health system resilience, mitigating GHG emissions, and educating health professionals as trusted climate and health advocates (4, 38, 40).

Health professionals have an ethical responsibility to protect the health of their patients and the public (5). Health sciences students, for example, as the health professionals and healthcare leaders of the future, should therefore be educated on how to effectively promote individual, public, and environmental health; to prevent, diagnose, and treat climate-sensitive diseases and climate-health impacts; and to advocate for climate mitigation and adaptation (41-45). This includes advocacy for 'green' healthcare and mitigating its significant ecological footprint from high consumption of energy and generation of waste, for example (30, 38, 46).

Social and Environmental Accountability in Health Professions Education

The World Medical Association first called for the integration of key climate change concepts and competencies into undergraduate, graduate and continuing medical education curricula in 2009 (47). Responding to this call requires HPE faculties to change how they conceptualise their graduates and educate their students to effectively address the needs of a changing society. Yet according to the landmark 2010 Lancet report, *Health Professionals for a New Century: Transforming Education to Strengthen Health Systems in an Interdependent World*, current curricula are generally too fragmented, outdated, and static to prepare graduates as effective leaders and agents of change (48).

In 2009 the *Conceptualisation, Production and Usability* (CPU) model was developed for evaluating social accountability in HPE institutions (49). Its premise is that their activities should be primarily directed by the needs of society, which should be reflected in how socially

accountable graduates are conceptualized, produced, and best utilised to meet those needs (Figure 2.2).

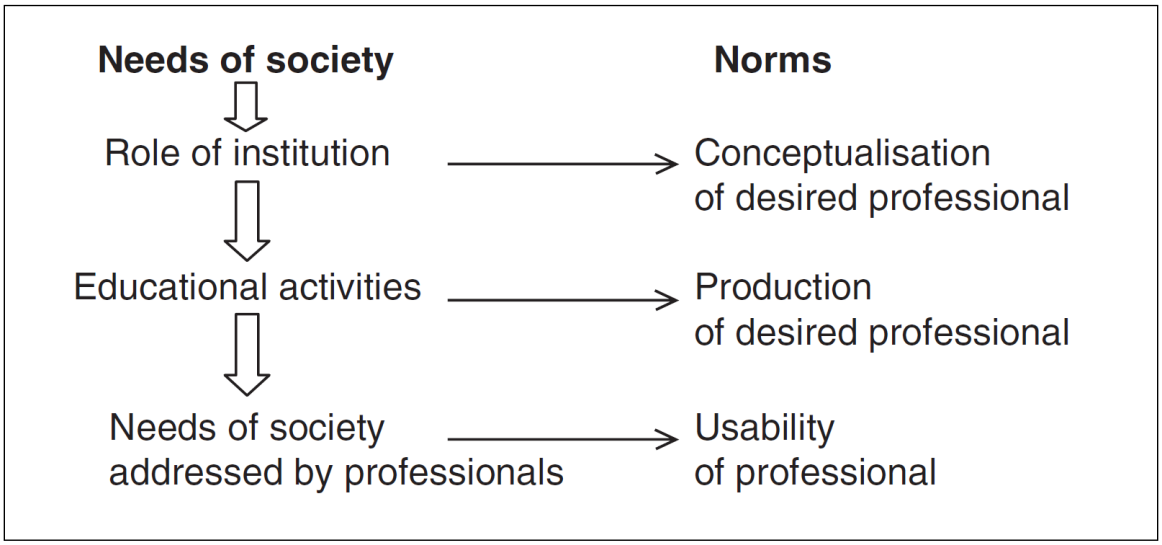

Figure 2.2: The conceptualisation–production–usability (CPU) model for socially accountable health professions education institutions (49)

These three interdependent domains, with their related sections and 31 sub-items, have been presented in a framework for deriving norms, indicators, and criteria for measuring social accountability (Figure 2.3). Although the CPU model does not explicitly mention environmental accountability, it may be implied in statements about serving the priority health needs of populations (domain C, *References*, item 1.2), and about risk reduction and health promotion in the field (domain U, *Impact*, item 11.2). The first domain of **Conceptualisation** concerns the type of health professional required to best deliver healthcare that is of high quality, equitable, effective, and relevant to the priority health needs of communities. This implies that HPE institutions should reflect the values of the health system in their vision, mission, and partnerships, as well as in their governance structures, strategic planning, management, and allocation of resources. The second domain of **Production** includes the key training and learning components of the institution, with respect to its educational programmes and curricula, community engagements, healthcare services, and its recruitment of and support for its educators and students. The learning outcomes and objectives and content of curricula should be consistent with required health professional profiles, and curricula should include early and

longitudinal clinical exposure to priority health needs, should employ complex problem-solving approaches to learning, and should feature lots of community-based practice. Finally, the domain of **Usability** includes initiatives by the institution to ensure that their graduates are properly valued and well utilised for optimal impact in the healthcare system and in the communities they serve.

The 2010 Global Consensus on Social Accountability of Medical Schools described a socially accountable school as one which "recognizes the various social determinants of health - political, demographic, epidemiological, cultural, economic and environmental in nature – and directs its education, research and service delivery programs accordingly" (50). Social accountability can be distinguished from the related concepts of social responsibility and social responsiveness in terms of the Social Obligation Scale, which shows the progression towards true faculty partnerships with societal and health system stakeholders for deeply contextualized HPE (Figure 2.4). A socially accountable faculty therefore aims to produce graduates who are both excellent health professionals and effective agents of change within the health system (51).

	Responsibility →	Responsiveness →	Accountability
Social needs identified	Implicitly	Explicitly	Anticipatively
Institutional objectives	Defined by faculty	Inspired from data	Defined with society
Educational programs	Community-oriented	Community-based	Contextualized
Quality of graduates	«Good» practitioners	Meeting criteria of professionalism	Health system change agents
Focus of evaluation	Process	Outcome	Impact
Assessors	Internal	External	Health partners

Figure 2.4: The Social Obligation Scale (51)

Pearson and others (2015) explored how professionalism relates to social change and social accountability in the context of global environmental degradation and climate change (52). They defined an environmentally accountable institution as being both environmentally responsible and responsive, and aware of global health challenges and of the environmental impact of its activities. They therefore recommended that the teaching of professionalism, of social and

environmental accountability, and of environmental stewardship, should be strengthened to address increasing environmental challenges. Furthermore, a guide to socially accountable medical schools recognised that environmental and social accountability are inextricably interlinked and that addressing global environmental and climate change should be a priority (45). Effective institutional policies to reduce the environmental impact of transport and energy, and educating graduates to promote resource-efficient and sustainable healthcare systems, were cited as examples of environmental accountability. An application of the CPU model for social accountability at the Faculty of Medicine of the Suez Canal University in Egypt found a commitment to respond to community health problems and needs in its mission and objectives, but no explicit reference to environmental action apart from '*improvement of the environment*' (53).

Figure 2.3: The CPU framework: Domains, Sections, and Items (49)

Conceptualisation

1 References

1.1 Values: explicit reference to values (i.e. quality, equity, relevance, effectiveness)

1.2 Population: reference to population features and priority health needs

1.3 Health system: reference to health system development for greater coherence and integration

1.4 Health personnel: reference to qualitative and quantitative needs (see 1.1, 1.2, 1.3)

2 Engagements

2.1 Mandate: mission and institutional objectives consistent with References

2.2 Field: involvement in health management of a territory and given population

2.3 Partnership: institutionalised partnership with key stakeholders, locally and nationally

2.4 Expected outcome: definition/justification of profile (list of competencies) (see References above)

3 Governance

3.1 Strategic planning: engagements incorporated in a widely accepted development plan

3.2 Management: validation, co-ordination and evaluation of implementation of plan

3.3 Resources: mobilisation of internal and external resources consistent with Engagements (see 2)

Production

4 Field operations: education, research and services activities consistent with Engagements (see 2)

5 Educational programme

5.1 Objectives and content: consistent with profile of health professional (see 2.4)

5.2 Curriculum structure: early and longitudinal exposure to priority health issues in the community

5.3 Learning process: solving complex health problems, both for individuals and communities

5.4 Practicals: sites prioritising primary health care and linkage with other levels of health service

6 Students

6.1 Recruitment: equal opportunity and priority to students from underserved communities

6.2 Career: orientation and assistance to access jobs related to priority health issues

6.3 Evaluation: reference to the entire spectrum of competencies (see 2.4)

7 Teachers

7.1 Source: involvement of a variety of teachers from the health and social sectors

7.2 Abilities: teachers serving as role models, in reference to the profile (see 2.4)

7.3 Support: training and incentives to improve abilities in public health and medical education

8 Research: related to health system management (see References, section 1, and Usability, sections 10, 11

9 Service: excellence in primary health care services (see Usability, sections 10, 11)

Usability

10 Employment

10.1 Job opportunities: advocacy and partnership for emergence of priority health professions

10.2 Settlement: retention and distribution of graduates according to needs (see 1.1, 1.2)

10.3 Quality of services: maintenance of competences of graduates (see 2.4)

10.4 Practice: improving working conditions at primary health care level (see sections 4, 9, 10)

11 Impact

11.1 Partnership: relationship with stakeholders for improved management of health system

11.2 Effects on health: risk reduction and health promotion in the field (see 2.2, 2.3, 4)

11.3 Promotion: dispatching results on usability to decision-making bodies, both local and national

The ASPIRE Social Accountability Panel of AMEE has developed 51 criteria for Excellence Awards in Social Accountability in HPE that aim to exemplify best practice for improving the educational process and outcomes of international institutions (54). The criteria are categorised within four domains: Organization and Function of the School; Education of Doctors; Research Activities; and Contribution to Health Services. ASPIRE has explicitly broadened the scope of social accountability to include environmental accountability, or the obligation of HPE institutions to actively develop, promote, and protect environmentally sustainable solutions to the health concerns of the communities they serve. Twenty-one of the 51 Award criteria refer to environmental accountability or to environmental determinants and their impacts on health. Applicants provide supporting evidence of their plans, actions, and health impacts of their education, research, graduates, and partnerships, plus an independent report of student perceptions of their faculty's performance. The Award confers reputational benefit and recognition of leadership in social and environmental accountability, but applications are costly and may require considerable effort and time.

Many other organizations and institutions have also responded to the challenge of building capacity for more environmentally accountable and sustainable HPE by publishing core competencies and educational and training guides (55-58). The 2023 *Academic Health Institutions' Declaration on Planetary Health* from the Association of Faculties of Medicine of Canada (AFMC), for example, calls for institutions to take adaptive and regenerative measures to fulfil their mandate for social and environmental accountability (59). Its international signatories, besides many academic health institutions, include influential organizations like the Planetary Health Alliance (PHA), World Medical Association, Global Climate and Health Alliance, and the World Federation of Public Health Associations.

Educating Health Professionals for Sustainable Healthcare

The vision of education for sustainable healthcare emphasises environmental accountability through the active stewardship of resources, while providing faculty development for a health workforce that is knowledgeable and well-prepared to address environmental impacts on health (60). ESH practice has been growing worldwide for more than a decade, with emerging networks and curricula based on ESH frameworks with standard learning outcomes and objectives. The set

of learning outcomes for environmental sustainability in medical education developed by the UK-based Education for Sustainable Healthcare network (61), is a frequently cited example (5, 42, 43, 62-67). These learning outcomes were first developed from a review of the literature by students and educators with experience of teaching environmental sustainability, and were then refined by a national Delphi panel of UK medical educators, clinicians, and students (68). The final learning outcomes, published in November 2014, sought to describe how the environment and human health interact at different levels; to demonstrate the knowledge and skills needed to improve the environmental sustainability of health systems; and to discuss how the duty of a doctor to protect and promote health is shaped by the dependence of human health on the local and global environment (67, 69).

The learning outcomes above informed the development of the UK General Medical Council's (GMC) *Outcomes for Doctors* (70). Sustainable healthcare features in GMC Professional Knowledge outcomes related to Health Promotion and Illness Prevention, and graduates are expected to evaluate the global determinants of health and healthcare delivery, and to explain the impacts of global changes on health. A UK study of Global Health Education in Medical Schools that assessed timetabled teaching against 42 global health learning outcomes (71), found that the significant absence of learning opportunities and outcomes related to future climate-health impacts presented a large opportunity for updating curricula (72). An important outcome of these developments was the publication in 2021 of *Education for Sustainable Healthcare: A curriculum for the UK* (73). Its rationale included the GMC mandate for such education, the rising demand from students, the practical suggestions for sustainability offered by the international student-led Planetary Health Report Card (PHRC) initiative, and the fact that many medical schools were already preparing students to address the climate and ecosystem crises. The Planetary Health Report Card (PHRC) is a global student-led initiative that utilises a set of minimum criteria for scoring the status of planetary health across five areas in HPE institutions: curriculum, research, support for student initiatives, community outreach, and campus sustainability (74). At Lancaster University, for example, the PHRC found that planetary health has been well integrated longitudinally via workshops, lectures, and electives, and that ESH integration into new and existing courses is being incentivised (75). The authors of the ESH

curriculum for the UK noted various implementation challenges, like training educators to integrate ESH within overcrowded medical curricula, and making them aware of relevant educational resources. These challenges were informed by an earlier qualitative exploratory study of how best to integrate ESH into diverse curricula in the UK and beyond, which utilised key stakeholder organizations, semi-structured interviews with SH educators, and document analysis (76). A theoretical framework depicting relationships between the barriers, enablers, and identified solutions informed its recommendations for integration of ESH. These included timetabling sustainability as a cross-cutting longitudinal theme, training educators alongside students, relating sustainability to clinical care as much as possible, and using multiple modalities of teaching and assessment.

Many important lessons can be derived from international developments in ESH. An evaluation of UK medical schools found a variety of pedagogies that effectively improved undergraduate knowledge and skills in sustainability, and that good collaboration between schools enabled rapid and effective implementation of new teaching sessions (41). Case studies from the UK, Brazil, and the USA of diverse ESH pedagogies and formats included student evaluations of positive influences on their knowledge and attitudes (77). A six-week module in a first-year US medical school, for example, that included lectures on common environmental health topics and a *Healthy Living* application for assessing individual environmental footprints, significantly increased student preparedness to discuss environmental health and climate change with their patients (78). In Colombia, however, 53% of medical schools surveyed had introduced climate change and health into their public health or epidemiology courses, yet had not made it a priority nor had qualified educators to teach it (79). Surveys in 2019-2020 of perceptions of medical students from 2817 medical schools in 112 countries about formal and non-formal elements of climate change, air pollution and health in their programs (34), found that 15% of schools had incorporated climate change and health into their curricula. Students led climate-related activities in a further 12% of medical schools. The surveys revealed inconsistencies between the impact of environmental changes, the level of community health needs, and the adequacy of medical education to address these challenges. For example, in China, India, and Bangladesh, where air pollution is a major health risk to many poor and vulnerable communities, there are no

or fewer HPE curricular opportunities to prepare health professionals for their responsibilities towards these communities, than in wealthier countries where more curricula do address inequitable global impacts of climate on health (36).

Student and faculty engagement is key to designing effective ESH curricula. This is borne out by a 2017-2018 survey of 160 institutional members of the Global Consortium on Climate and Health Education (GCCHE) to assess climate-health curricular offerings (9). The most common challenges in integrating climate-health content into curricula included lack of staff time and funding for curriculum development, lack of materials, little staff expertise, limited curriculum space, competing institutional policies, and local climate politics. Most respondents reported positive interest from students, despite considerable variation in overall findings across institutions. In the USA, Emory University students led a process of creating climate and health learning outcomes and objectives linked to existing content for first year medical students (80). Involving highly motivated student leaders in climate and environmental health, as well as expert faculty mentors to help identify linkages to the existing curriculum, significantly enabled institutional support. A 2020 review of case studies in the US, UK and Australia further emphasised the importance of student and faculty partnerships in applying an 'environmental sustainability lens' to learning and teaching, and in enhancing capacity development for ESH (60). Engaging with the personal values of stakeholders about the environment and their advocacy for system change was considered integral to eco-ethical practice.

An international collaboration to build an environmentally accountable medical curriculum agreed that sustainability should be integrated into a spiral curriculum (42). This builds learning throughout the programme about advocating for and implementing change, and develops an understanding of environmental sustainability as an essential part of professionalism, scholarship, leadership, and management. Learning objectives covering core content for environmentally accountable medical curricula were developed through a highly participatory process, which were recommended for integration of environmental sustainability concepts into curricula worldwide. The Education for Sustainable Healthcare network has developed planetary health and sustainability literacy in clinical training, defined as the knowledge, skills and mindsets needed to make informed and effective decisions towards a sustainable future (81). This training

is based on learning outcomes and objectives that consider the environmental impacts of healthcare, and the environment in clinical ethical reasoning (44, 68).

A comprehensive and quality-assessed systematic review in 2023 aimed to synthesise educational approaches within HPE curricula and to critically evaluate their impact on participants' knowledge or skills or attitudes towards SH (82). The 23 included studies of seven health professions (medicine; nursing/midwifery; pharmacy; podiatry; paramedicine; dentistry; public health) were of variable quality, and most frequently located in the UK. The authors acknowledged the potential for language bias, as 43 non-English language articles were excluded. No studies from LMICs were included, although these may have been overlooked if they were not published in English. There was also possible social desirability bias arising from self-reporting in studies, which could overestimate the impact of their interventions Nevertheless, the review found that student knowledge, attitudes, and skill-based outcomes were improved by a diversity of educational approaches, mostly workshops and clinical skills sessions, with no evidently superior approach. Individual and organizational barriers to delivering SH education and applying it to clinical practice included perceptions of climate change as a distant problem that individuals can barely impact, lack of time and confidence and interest, institutional resistance to change, lack of focus on sustainability, little formal guidance, and the complexity of changing systems. Key recommendations were prioritising capacity development of educators, more educational opportunities for students and clinicians, and reviews of effective SH practices. In order for concepts of SH to be integrated into prior knowledge and beliefs and then applied in clinical practice, an integrated multi-session design is recommended to achieve higher-level learning outcomes. Educational frameworks that advocate for integrated curricular approaches are therefore required (42, 83).

Recent scoping reviews of planetary health and sustainable healthcare in other health professions reveal the growth of ESH beyond the medical profession and the proliferation of curriculum examples. Sibindi et al (2024) reviewed 31 papers that examined nurses' roles and eco-nursing competencies related to climate change. Their roles encompassed research, education, advocacy, leadership, and clinical practice, supported by many existing core competencies (131). Future research is required to geographically contextualize these roles and

competencies to local disease burdens. A scoping review of the relationship between physiotherapy and planetary health found 34 papers (132). It concluded that there is strong support for advocacy for environmentally sustainable practice in the profession, and that more empirical research is needed into accessible and effective interventions. The Environmental Physiotherapy (EPT) Agenda 2023 is a project of the Environmental Physiotherapy Association to maximise the profession's contribution to planetary health, such as integrating EPT education into physiotherapy training. Over 90 physiotherapy education institutions, supported by over 35 international organizations, are currently developing EPT Agenda 2027, to introduce planetary health, environmental, and sustainability education into international physiotherapy training (133). A review of 19 articles about occupational therapy and environmental sustainability identified roles for occupational therapists that include creating environmentally sustainable occupations, establishing sustainable practice, and advocating for environmental sustainability in occupational therapy education (134). Hess and Rihtman (2023) propose a framework for occupational therapy skills to support likely efficacy (135). They conclude that clinical reasoning should include environmental and sustainable reasoning; that the environmental impacts of person-centred care should be questioned; and that curricula should integrate opportunities for interdisciplinary advocacy for sustainable health care. A 2024 bibliometric analysis concluded that occupational therapists and physiotherapists can contribute to planetary health by improving patient care and quality of life; integrating sustainability into rehabilitation; developing clinical competence and professional skills; and using evidence-based practices and quality improvement (136). Based on their analysis of 10 case studies, the authors developed a framework of planetary health in occupational therapy and physiotherapy, based on the SDGs, to support future research and practice.

Traditional knowledge systems have long recognised the inter-relationships between planetary and human health (84). Western medical education and practice, however, have too often focused on the biomedical aspects of health and neglected indigenous recognition of the interconnectedness of planetary health with human health and wellbeing (5). Planetary health, however, recognises that good stewardship of earth's natural systems is essential for human health and survival (44, 85, 86). The consequences of the rampant exploitation of planetary

resources have been multiple ecological crises, such as biodiversity loss, climate change, ocean acidification, freshwater depletion, and soil degradation that threaten earth's life support systems. ESH practice therefore needs to engage better with the values of diverse knowledge systems and indigenous traditional perspectives to deepen its local relevance and longevity. Redvers *et.al.* (2020), who included international members of indigenous communities, have argued that HPE has generally adopted a mechanistic and anthropocentric approach to environmental sustainability, with little consideration of cross-cultural factors and the values of differing worldviews (87). Therefore, including indigenous perspectives in designing ESH curricula, and fostering respect for decolonized learning in diverse education environments, enables a more inclusive approach (87-89). Engaging diverse perspectives and ways of knowing, across generations and across stages of personal and professional development, is especially important for effective global responses to the interlinked climate and environmental crises (90).

The AMEE Consensus Statement on Planetary Health and Education for Sustainable Healthcare

The *Consensus Statement on Planetary Health and Education for Sustainable Healthcare* from the Association for Medical Education in Europe, now the International Association for Health Professions Education (AMEE), describes necessary changes and approaches in HPE for an interprofessional workforce that can deliver sustainable healthcare and promote planetary health to meet the UN's 2030 Sustainable Development Goals (SDGs) (91). Developed by health professionals, educators, and students, the Consensus Statement asserts that health professionals must deliver system-wide changes to address these crises, and that faculty development, eco-ethical leadership, and planetary health action across disciplines are urgently needed. ESH needs to integrate planetary health as a transversal curricular theme, and incorporate values, knowledge, and skills appropriate to understanding the system-wide connections between health and healthcare and the planet. Figure 2.5 depicts an ideal where knowledge and values, informed by indigenous perspectives and a wider planetary health paradigm, guide ESH practice (5).

Figure 2.5. The relationship between planetary health, Indigenous perspectives and the knowledge, values and practices incorporated into ESH (5)

Such practice requires knowledge and skills to promote sustainable development, as called for by SDG 4.7: “education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture’s contribution to sustainable development” (92). Three of the SDGs, namely SDG 4 (Quality Education), SDG 12 (Responsible Production and Consumption), and SDG 13 (Climate Action), include education targets and use the same indicator to measure and report progress by 2030 i.e. the “extent to which global citizenship education, and education for sustainable development are mainstreamed in national education policies, curricula, teacher education, and student assessment”. These targets and indicators are based on past work in education for sustainable development, and provide a useful standardised approach for reporting on HPE at international, national, institutional, and program levels (93).

The AMEE Consensus Statement has received widespread support for enacting a vision for ESH, and has suggested learning outcomes and objectives and activities, forms of assessment, and implementation recommendations that have influenced curriculum development and professional bodies worldwide. The AMEE Consensus identified specific examples of learning activities and opportunities and assessment approaches for transdisciplinary, action-based learning that require skills in critical thinking, communication, leadership and change management with multiple stakeholders. These include activities with a clinical, public health or wider sustainability focus, designed to advance understanding of ecological impacts on health for creative problem-solving. Interventions for climate adaptation and development of resilience, as well as mitigation of the environmental impact of healthcare are also included, requiring better stewardship of resources and health promotion about topics like the co-benefits of exercise and plant-based diets. The Consensus concluded with recommendations for implementing and evaluating ESH, specific to HPE educators, institutional leaders, health professional accreditation bodies, and health professional organizations (5). These inspired a *Position Statement on Integrating Planetary Health and Environmental Sustainability into African Health Professions Education Curricula,* which recognises that "*education on planetary health and environmentally sustainable healthcare develops agency to address the connections between healthcare and planetary systems*" (94).

The Planetary Health Education Framework

The Planetary Health Alliance (PHA) is an international consortium of over 380 partners for understanding and addressing the human health impacts of global environmental change, which offers a wealth of open-access PH education resources (95), as one response to the PHA's intersectoral call for health practitioners to "*incorporate planetary health concepts and values into the main curriculum and professional codes of conduct all future health practitioners"* (96). The Planetary Health Education (PHE) Framework has been designed to guide the education of citizens, practitioners, and professionals to address complex PH challenges (97). The framework has five foundational domains that are deemed to cover the core of PH knowledge, values, and practice: *Interconnection within Nature*; *The Anthropocene and Health*; *Equity and Social Justice*; *Movement building and Systems change*; and *Systems thinking and Complexity*. Each domain

includes key PH themes and concepts and suggested process outcomes. The framework is intended as a common foundation for diverse education strategies and inquiries that move beyond thematic areas of interest or a prescriptive list of competencies. Figure 2.6 represents the domains as intertwined, like threads of a rope, to emphasise that they are interdependent, and that the total strength of the framework is greater than the sum of its parts. The outer rings represent the different contextual influences on how the domains are understood and taught.

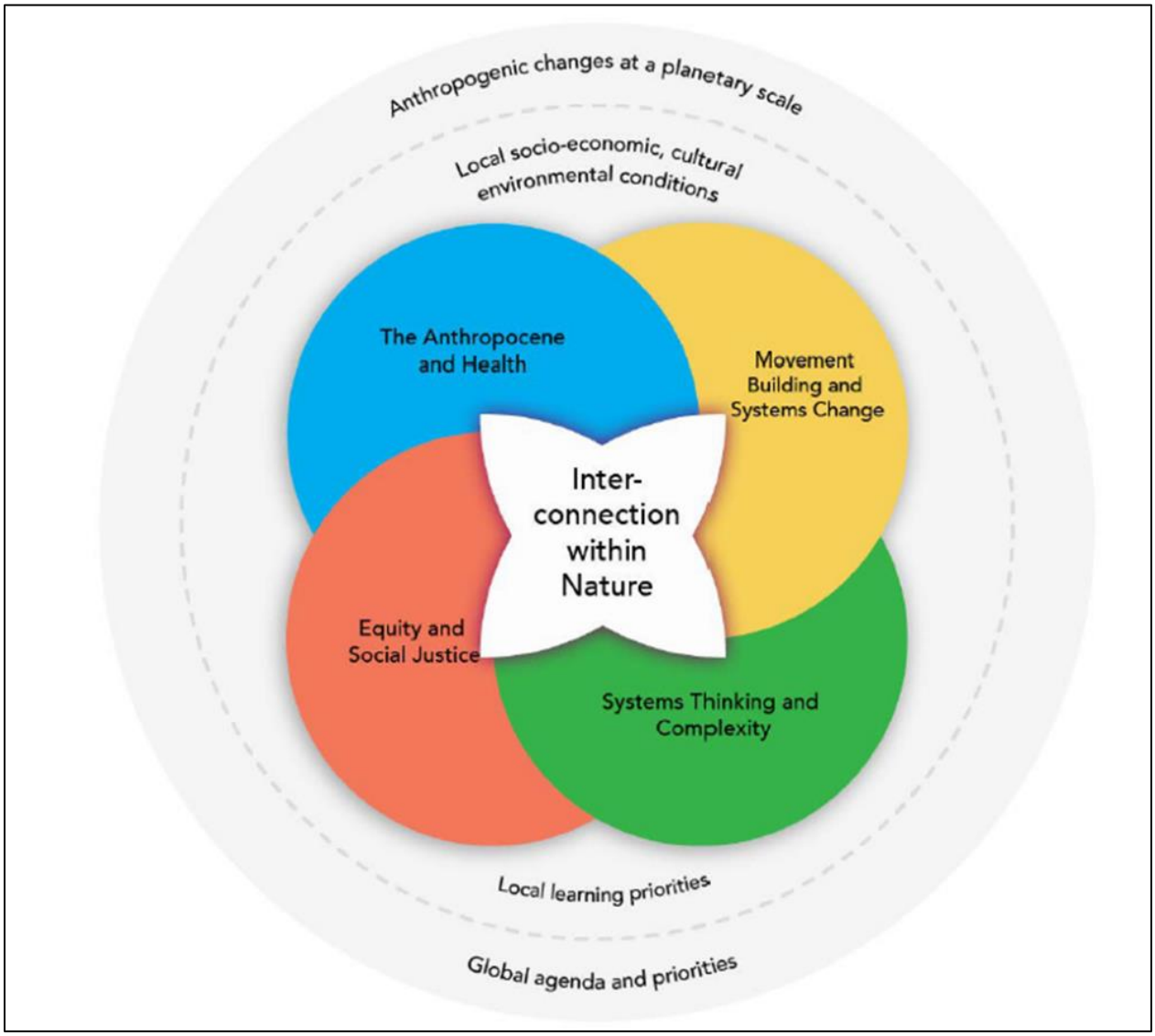

Figure 2.6: The Planetary Health Education Framework (115)

Education for Sustainable Healthcare in South Africa

South Africa is a highly climate-vulnerable country that is already burdened by huge inequalities, ill-health and a failing public health sector. It has also long been one of the leading emitters of GHGs, due to its heavy dependence on fossil fuels, primarily coal, for energy generation (16, 99). Yet SA also has the potential to be an international leader in climate change mitigation and adaptation, with its wealth of skilled human resources, highly promising renewable energy sources, and world-renowned climate research in the context of a developing country (100-102). SA's National Climate Change Adaptation Strategy recognises the need to build awareness and capacity for climate change responses, including the mainstreaming of climate change into tertiary curricula (103). The National Climate Change and Health Adaptation Plan for 2020-2024 recommends integrating climate, health, and environmental linkages into educational curricula, working with stakeholders such as the Health Professions Council of South Africa (HPCSA), the South African Nursing Council, and tertiary institutions (104). The HPCSA is responsible for undergraduate training of clinical associates, dentists, and medical doctors in SA, which includes accreditation of faculty training programmes in line with established training standards (105).

Health professionals in SA, like their international counterparts, can exercise considerable agency in national climate-health policy development, in decarbonising the healthcare sector, and in raising public awareness of climate change, given their relatively high social standing and levels of public trust and influence (33, 37, 106-108). The HPCSA has long recognised that being socially accountable means ensuring that HPE and training is aligned with the country's health needs (109). A series of strategic initiatives by the Undergraduate Education and Training subcommittee of the Medical and Dental Professions Board of the HPCSA, which followed the 2010 Lancet report, *Health Professionals for a New Century* (48), sought to ensure such alignment. The HPCSA also recognised that social accountability in HPE should be enabled by effective transformative learning principles and curricular practices (109). They therefore refined a social accountability evaluation framework, first developed by the Training for Health Equity Network (THENet) (110) and then adapted by the South African Collaboration for Health Equity through Education and Research (CHEER), to create an accessible tool for the SA context (111). As a result of advocacy by CHEER, criteria for measuring Social Accountability were included by the HPCSA in its national

standard *Questionnaire for Self-Assessment of Faculties/ Schools of Undergraduate Education and Training of Medical Doctors, Dentists and Clinical Associates*, within the Programme Governance section that addresses sustainability, and quality assurance and enhancement (112). Faculties are therefore required to describe the extent, with examples, to which they are socially accountable to the populations they serve, using the WHO definition adapted by the THEnet: "*Social accountability is the obligation to orient education, research and service activities towards priority health concerns of the local communities, the region and/or nation one has a mandate to serve*" (110).

A qualitative study from 2019 to 2022 across six national HPE institutions by the South African Responsive Curriculum Project examined how multidisciplinary health professions educators understood socially responsive curricula and how their teaching practices were shaped by it. It found a range of understandings and practices that are "*explicit, intentionally designed, take learning to the community, embrace a holistic approach, encourage safe dialogic encounters, and foster reflective practice"* (113). The authors argue that transformation towards responsive and contextually relevant curricula requires the collaboration of students, communities, patients, and of educators who are both clinically competent and critically conscious of the contexts and the health care systems where they practice.

The 2018 Consensus Report of the Academy of Science of South Africa (ASSAf), titled *Reconceptualising of Health Professionals in South Africa*, recommended that faculties of health sciences, monitored by the HPCSA, should embrace social accountability in order to strengthen HPE for practice in rural and underserved areas (114). Although the ASSAf report omitted mention of environmental accountability or climate change, it acknowledged threats to national health security from emerging infectious, environmental, and behavioural risks in a context of rapid demographic and epidemiological transitions. The need to educate staff about climate change and health is exemplified by a rapid appraisal of climate change and healthcare sustainability in a rural district in Mpumalanga province in north-eastern SA, which although highly vulnerable to climate-health impacts, had no relevant clinical care strategies in place (115). The authors recommended that environmental health practitioners should participate in community climate adaptation strategies, given their role as frontline workers addressing

environmental risks to health. Such strategies should include natural adaptations that benefit the health of all creatures, such as tree-planting, green parks, and ecosystem restoration. Shezi *et.al.* (2019) therefore argue that implementation of climate adaptation plans should be incorporated into their scope of practice, with support from all levels of governance (116).

The higher education sector has enormous potential in furthering debate and synergy between public health, sustainable development, and climate change by utilising a holistic approach consistent with the concept of the 'Healthy University' (117), which has been long promoted by the WHO and higher education networks (118). The experience of programmes seeking to educate change agents for sustainability has shown the importance of innovative partnerships among faculty, students, and the communities they serve to overcome the deep institutional inertia that has long characterised HPE (119, 120). Case studies in higher education institutions, such as the Faculty of Education Sciences at the North-West University in SA, have found that education for sustainable development has not been sufficiently integrated into the institutional concept of transformation (121). It recommended that collaborative approaches, and an appreciation of the epistemology and multicultural vision of sustainability, are needed to enhance sustainability in the curricula. Furthermore, academics should reflect on their personal values in order to effectively develop their students as agents of change for sustainability.

Environmental Sustainability at the UCT FHS

Then University of Cape Town has long committed itself to being a sustainable campus, as evidenced by it signing both the Sustainable Campus Charter (122) and the Talloires Declaration, which includes education for '*environmentally responsible citizenship*' (123). UCT adopted a Green Campus Policy Framework in 2008, an Action Plan in 2009, and has published annual Carbon Footprint reports foremost years since 2007 (124). In 2018 UCT created a Directorate of Environmental Sustainability in the Office of the Vice Chancellor and appointed its first Director in April 2019. The 2021 Environmental Sustainability Strategy for UCT includes a proposal for campus-wide online learning for environmental sustainability that includes related community service (125).

The FHS could be a leader in environmental sustainability at UCT in its teaching, research, and campus operations and services, due to the evident climate and health co-benefits. A 2019 survey of FHS students, however, revealed low priority given to environmental health in its curricula, inadequate waste recycling, and little provision for non-motorised transport on campus (126). The study called for more curriculum space to be allocated to planetary health, climate change, and environmental sustainability, in response to student perceptions that these are important themes and topics.

A lead theme of teaching in the UCT FHS since 1994 is the Primary Health Care (PHC) approach, based on a set of equity-based principles derived from the landmark Declaration of Alma Ata on Primary Health Care (127, 128). A 2018 case study of teaching the PHC approach to final-year health sciences students at three diverse community-based education sites found inconsistent engagement with PHC principles, however, and insufficient alignment between learning outcomes, activities, and formal assessments (129). Enablers of PHC at the FHS were good multidisciplinary teamwork, role-modelling by educators, and robust logistical support, whereas staff shortages and high workloads were the main barriers. The study concluded that strong faculty leadership, with a firm grounding in social accountability, is required, complemented by training and support for all educators in the PHC approach. Four of nine indicators of PHC in the FHS, developed by a national Delphi panel (130), were adapted from the Framework for Socially Accountable Health Workforce Education of the THEnet (110).

Conceptual Framework of the Thesis

The conceptual framework of this thesis is derived from the CPU model of Boelen *et al* (49). The framework's purpose is to help assess how HPE institutions in SA conceptualise environmental accountability and how well they educate their students to understand planetary health, to practise sustainable healthcare, and to effectively address the social and environmental determinants of health in the communities they serve. These stages are represented by the three inner ovals in Figure 2.7. The outer three ovals represent the context of healthcare systems, planetary ecosystems, and the global climate system, which interact significantly with human health and healthcare. There is an evident similarity between this framework and that of the Planetary Health Education (PHE) framework (Figure 2.6); they both depict the importance of

planetary and local contextual influences on the innermost domains of conceptualising and designing curricula that cover core planetary health knowledge, values, and practice. The PHE framework goes further in separating this core content into five foundational, albeit interconnected, domains.

The applicability of the conceptual framework in Figure 2.7 for evaluating institutional progress towards environmental accountability is discussed in Chapter 6 (*A Framework for Assessing Environmental Accountability in Health Professions Education Institutions*).

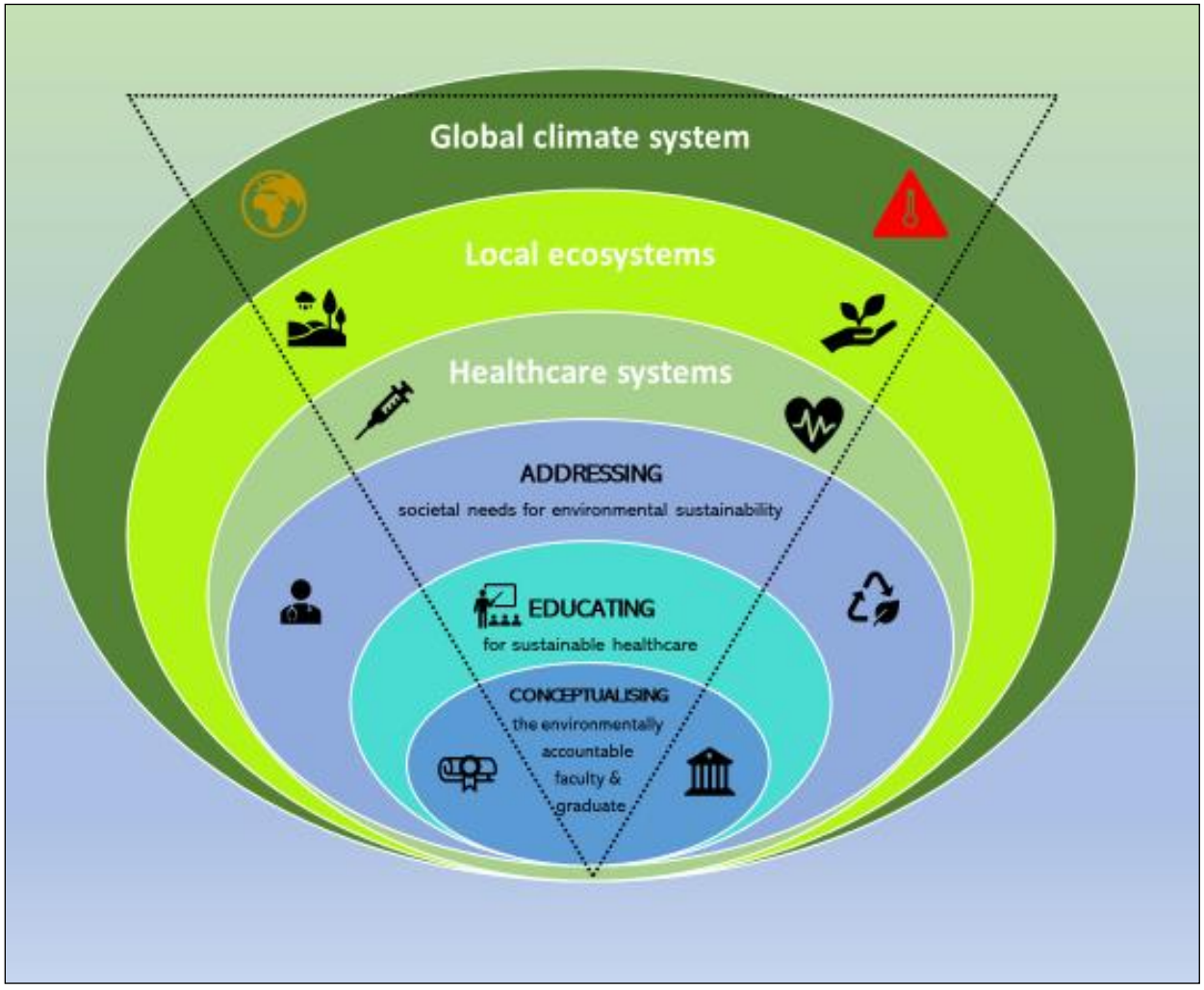

Figure 2.7: Conceptual framework for the institutional (CONCEPTUALISING and EDUCATING environmentally accountable graduates), societal (ADDRESSING environmental sustainability needs), and the local and global context (Healthcare systems; Local ecosystems; Global climate system) of Education for Sustainable Healthcare

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CHAPTER 3 A National Audit of ESH Curricula in South Africa

This chapter comprises the following publication, which describes a national survey of the status of ESH-related teaching and learning activities in all SA faculties of health sciences towards meeting the first study objective:

Irlam J, Dreyer A, Filies G, Govender L, Jacob N, Jayakumar J, Lokotola CL, Naidoo R, Reid SJ, Rother H-A. (2023). Education about Planetary Health and Sustainable Healthcare: a national audit of health professions education curricula in South Africa. African Journal of Health Professions Education 2023; 15(4). https://doi.org/10.7196/AJHPE.2023.v15i4.326

Role of Candidate

The candidate conceptualized the study, designed the survey, collected and analysed the data, and prepared all drafts of the article. Prof Hanna-Andrea Rother and Prof Steve Reid commented on and edited drafts of the article. The other co-authors contributed data, assisted with sharing the audit in their institutions, and provided comment on two drafts of the article.

Appendices related to this paper

Appendix 1: Ethics approval for HREC 358/2021

Appendix 2: Supplementary File 3.1. Survey questionnaire for National Audit 2021

Appendix 3: Supplementary Table 3.1. Survey Respondents by Faculty, Discipline and Academic Title

Appendix 4: Supplementary Table 3.2. Learning Activities Related to Planetary Health and Sustainable Healthcare by Faculty

Appendix 5: Supplementary Table 3.3. Assessments related to Planetary Health and Sustainable Healthcare by Faculty

Education about planetary health and sustainable healthcare: A national audit of health professions education curricula in South Africa

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Abstract

Background. Climate change and environmental degradation have severe public health impacts. Education about planetary health (PH) and sustainable healthcare (SH), or the interdependence of health and healthcare and planetary ecosystems, is developing globally to enable health professionals to protect public health from these threats, and to build sustainable healthcare systems.

Objective. To assess the status of PH and SH in health professions education in SA faculties of health sciences as a foundation for future work.

Methods. Educators at all 24 SA faculties of health sciences were surveyed regarding undergraduate and postgraduate faculty courses with PH- and SH-related learning objectives and outcomes, learning activities and assessments. Pivot tables were constructed to analyse their responses.

Results. Forty-one responses were received, representing 9 health professions from 15 of 24 faculties of health sciences in SA (62.5%). More than half (53.7%) were unaware of any courses with PH and SH content at their faculties. Nineteen respondents from 11 faculties reported 44 courses and provided data on 18 non-duplicate courses. Learning activities included advising patients about environmental and health co-benefits of their lifestyle choices (33.3%); written assignments (38.9%); oral presentations (55.6%); and community-based research (38.9%). Nine courses (50%) reported PH- and SH-related assessments, most commonly oral presentations (88.9%); reflective essays (77.8%); multiple-choice or short assessment questions (55.6%); and research outputs (55.6%).

Conclusion. Education about PH and SH is starting to develop in SA faculties, although with a limited variety of learning activities and assessments. This study provides a useful baseline for curriculum development and assessment of progress.

Introduction

Climate change has been widely recognised as a major and growing threat to global health in the 21st century, which is amplifying environmental risks to health (1,2). Educating current and future health professionals to protect health from climate change, to promote behaviour to mitigate and adapt to a changing climate, and to work for the environmental sustainability of health services, is therefore increasingly important (3). Advocacy on climate change is recognised as a duty of health professionals, especially given their proximity to those most vulnerable to climate-health impacts, their expertise and experience in treating such impacts, their influence in promoting more sustainable healthcare (SH), and the high levels of public trust placed in them (4).

Sustainable healthcare aims to provide high-quality healthcare, without compromising the ability of the healthcare system to meet future health needs (11). Promoting health and the timeous delivery of quality healthcare benefits patients and the ecosystems on which their health depends (5). Education for sustainable healthcare (ESH) has been defined as the organization of health professions education to develop knowledge, skills, and attitudes about the interdependence of health and healthcare and planetary ecosystems (6,7). This includes the effects of rapid climate and environmental changes on health, and conversely, the impacts of healthcare systems on the environment. There is growing international practice and research about integrating sustainability into various educational contexts and health professions education curricula that need to be adapted appropriately for local settings (8-12). The *Consensus Statement on Planetary Health and Education for Sustainable Healthcare* (13), developed by the Association for Medical Education in Europe (AMEE), is an important milestone in the field. It describes the knowledge, skills and values required to practise SH, and has proposed learning objectives, activities, and assessments to promote multidisciplinary learning. ESH mainstreams, as a cross-cutting curricular theme, the concept of planetary health (PH), which encompasses the health and wellbeing of human civilisation and the state of the natural systems on which it depends (14).

With the wide-ranging social and health impacts of global climate change and environmental degradation, the concept of environmental accountability has emerged as an aspect of the social

accountability of health educational institutions. It recognises that institutional policies and practices that reduce environmental impact, and educating graduates to promote PH and SH, are ways in which educational institutions can address public health needs in a rapidly changing environment (15-17). The World Health Organization (WHO) *COP26 Special Report on Climate Change and Health* (18) has urged that health workers be trained to help build low-carbon and climate-resilient healthcare systems. The WHO-Civil Society Working Group to Advance Action on Health and Climate Change has called on health education stakeholders to incorporate climate change into curricula for preparing health professionals '*to recognise and address the health risks and impacts of climate change and to ensure functioning healthcare systems in a climate-changed future*' (19). An ESH curriculum for the UK (20) was published by the UK Medical Schools Council in 2022 in support of the Outcomes for Graduates framework of the General Medical Council, or GMC (21), which requires application of the principles of population health and SH.

Common barriers to integrating ESH include perceptions that existing curricula are overloaded; poor integration, alignment, and assessment of current content on environmental sustainability; and faculty leaders, educators and students who doubt the relevance and worth of ESH, or fail to see what health professionals can do, especially in the face of more apparently urgent 'downstream' health challenges (5,6). Common enablers of integration include strong institutional leadership; increasing public awareness of climate and environmental crises, creating greater interest among educators and students; sharing of case studies and learning resources; and opportunities for change that arise from periodic curriculum reviews (5,6). Partnerships between educators and students, supported by international collaboration, have been critical for the successful integration of PH and SH into health professions curricula in other settings (22,23).

Southern Africa is highly vulnerable to environmental and climate risks to health, such as malnutrition and trauma arising from destructive extreme weather events (24-26). SA has therefore adopted climate change policies and plans to build capacity in climate change awareness and adaptation (27,28). Progress on including environmental accountability in health professions education in SA has been slow, despite calls to do so (29). It should therefore be a priority for enabling future health professionals to identify and appropriately treat climate-

sensitive conditions, to promote healthy behaviour and to advocate for sustainable healthcare systems.

However, the status of PH and SH in health professions education in SA faculties of health sciences is uncertain. The Education for Sustainable Healthcare Special Interest Group (ESH SIG) of the Southern African Association of Health Educationalists (SAAHE) was established in July 2021 to promote education regarding PH and SH in SA and southern Africa. This article describes a national audit in late 2021 of PH and SH in health professions education in faculties of health sciences in SA to provide a foundation for future work of the ESH SIG and others.

Methods

Design

The audit is a cross-sectional survey and the first of three phases of a mixed methods study design for the development of SA health professionals as advocates for PH and SH.

Study population and sampling

The study population comprised educators at all 24 SA faculties of health sciences. They were surveyed using a form based on the AMEE Consensus, which achieved broad consensus on a set of proposed learning objectives, activities, and assessments (13). The audit was endorsed by the national board of SAAHE and piloted on members of the ESH SIG executive, which helped to improve the clarity of the survey form. The invitation to participate in the audit was then shared widely with educators at all SA faculties of health sciences via SAAHE and several other networks (Box 3.1). The 2021 *COP26 Special Report on Climate Change and Health* (18) was referenced in communications to highlight the topicality of the study and to encourage timeous responses.

Box 3.1. Organizations and networks used to share the audit invitation

The Southern African Association of Health Educationalists (SAAHE) is an association of health sciences educators from SA universities, NGOs and government and private sectors for improving the quality of teaching and learning in health sciences education to enhance the delivery of high quality, affordable and sustainable health care to SA in both the public and private sector [saahe.org.za; accessed 17 January 2022].

The Network Towards Unity for Health (TUFH) is an international, intersectoral, intergenerational organization that fosters equitable community-oriented health services, education, and research with the goal of improving health locally and globally [thenetworktufh.org; accessed 17 January 2022]. It includes the following SA institutions: Central University of Technology; University of Witwatersrand Dept. of Family Medicine & Primary Care; Stellenbosch University; Nelson Mandela University School of Nursing, University of the Free State; Stellenbosch University; University of Cape Town; University of KwaZulu Natal; University of the Western Cape.
The Primary Care and Family Medicine Network for sub-Saharan Africa (PRIMAFAMED) is an international institutional network that aims to develop and strengthen family medicine higher education and training through capacity building, curricula enhancement and academic research development [primafamed.sun.ac.za; accessed 17 January 2022]. Its members number over 320 and include the following from SA: Universities of Cape Town, Stellenbosch, Free State, Witwatersrand, Pretoria, Sefako Makgatho, Limpopo, KwaZulu-Natal, and Walter Sisulu.
Climate-Migration-Health (CliMigHealth) is an international network focusing on climate change, migration and health(care) research, education and public awareness project. [twitter.com/climighealth, accessed 4 November 2021].
The Rural Doctors Association of Southern Africa (RuDASA) strives to inspire others towards rural healthcare in SA. Their aim is to support and empower those committed to making health care available to all ns. [rudasa.org.za/home; accessed 17 January 2022]
Wits Health Consortium; Africa Centre; Centres for Rural Health/PHC; Schools of Medicine; Departments of Allied Health Sciences in faculties of Health Sciences.
The Sub-Saharan Africa-FAIMER Regional Institute (SAFRI) is a two-year fellowship program for health professions faculty who have the potential to improve medical education at their schools. FAIMER (Foundation for Advancement of International Medical Education and Research) is designed to teach education methods, scholarship, and leadership skills, and to

develop an active, supportive professional network [safri.faimerfri.org/; accessed 17 January 2022]
The Forum of University Nursing Deans of South Africa (FUNDISA) is a registered NPO for SA's nursing and midwifery education programmes in higher education, which represents 21 member university nursing departments and 2 associate members. [https://fundisa.ac.za/ accessed 13 January 2022]
The Public Health Association of SA (PHASA) aims to provide leadership and a collective voice to improve health, through knowledge sharing, capacity building and partnership in SA [saahe.org.za; accessed 2 October 2021].

Data collection and analysis

The survey questions pertained to all undergraduate and postgraduate faculty courses that contained content regarding PH and SH, which were defined as the interdependence of health and healthcare and planetary ecosystems (13) (*Supplementary File: https://www.samedical.org/file/2089*). Respondents were asked to report on PH- and SH-related course learning objectives and outcomes, learning activities and formative or summative assessments, using checklists derived from the AMEE Consensus (13), with provision for any further responses. They were requested to separately email course learning outcomes (defined as the specific questions that the convener wants the course to raise) and course learning objectives (i.e. specific, measurable knowledge and skills that the student should gain) for thematic analysis. Survey data were captured via Google Forms and responses were viewed in Google Sheets Excel pivot tables, constructed by JHI, to analyse the frequency of key variables in the responses.

Ethical approval

Ethical approval was obtained in August 2021 from the Research Ethics Committee, Faculty of Health Sciences, University of Cape Town (UCT) (HREC 358/2021).

Results

Forty-one responses were received from educators, representing 9 of the 17 professions (Box 3.2) registered with the Health Professions Council of South Africa (HPCSA) and the South African Nursing Council (SANC). All were included in the analysis.

Box 3.2. HPCSA / SANC registered professions

Audiologist / Hearing Therapist; Clinical Associate; Clinical Technologist; Dental Practitioner; Dietician; Emergency Care Practitioner; Environmental Health Practitioner; Medical Practitioner; Medical Technologist; Nursing Professional; Nutritionist; Occupational Therapist; Optometrist; Physiotherapist; Psychologist; Radiographer; Speech & Language Therapist

The most common professions that responded were medical practitioners (n=13; 31.7% of sample) and environmental health practitioners (EHP) (n=5; 12.2%). Fifteen of the 24 faculties of health sciences in SA were represented in the sample (62.5%), 8 faculties more than once, but by different departments and courses. The faculties of UCT and the University of Pretoria had the most representatives, with 8 and 7 respondents, respectively. The respondents were nearly evenly split between the ranks of professor, associate professor, senior lecturer and lecturer. They most often described their occupations as undergraduate or postgraduate educators in environmental health or SH, and less often as researchers, health promoters or as engaging directly with communities (*Supplementary Table 3.1: https://www.samedical.org/file/2089*).

Their reporting of faculty courses with PH and SH content ranged from no courses (n=22; 53.7% of respondents) to ≥4 courses (n=4; 9.8%). Overall, 44 courses were reported by 19 respondents from 11 faculties. Data were provided for 21 of the courses, but as 3 of these courses were duplicate reports by 2 respondents at the same faculties, their responses were combined to provide data on 18 unique courses at 11 faculties.

Eight of these were undergraduate courses, 7 were postgraduate courses, and 3 were offered to both undergraduates and postgraduates in different disciplines. Three of the 8 undergraduate courses (29.4%) were offered exclusively within MB ChB programmes, 2 exclusively to EHPs (25%), 1 to physiotherapists only, and the remaining 2 (25%) to several disciplines. Of the 7

postgraduate courses reported, 5 were Master in Public Health (MPH) programmes, 1 an MMed (Community Health) programme and 1 a Postgraduate Diploma in Occupational Health. The existence of PH- and SH-related course learning outcomes was reported for 15 courses (83.3%) and learning objectives for 17 (94.4%) of the 18 courses (*Supplementary Table 3.2: https://www.samedical.org/file/2089*). The response to the request for emailed detail on the learning outcomes and objectives elicited only a few responses; therefore, no meaningful qualitative analysis was possible.

Learning activities

Over all 18 courses, the average reported frequency of the 11 learning activities proposed by the AMEE Consensus was 4 (22.2%) per course, ranging from 0 to 9 activities. The most frequent learning activities related to PH and SH were oral presentations on such topics (n=9; 50.0%); community-based research about key environmental determinants of health (n=7; 38.9%); written assignments (n=7; 38.9%); and advice to real or role-played patients about the environmental and health co-benefits of their lifestyle choices (n=5 courses; 27.8%). The following learning activities were each employed by 3 of the 18 courses (16.7%): designing a public health strategy to address environmental health impacts; concept mapping the relationships between the environment, disease, and healthcare; and debating issues of ecological justice, eco-ethics and eco-advocacy by health professionals (Table 3.1). The 10 courses that included a postgraduate offering had twice the average number of forms of learning activities than the 8 undergraduate courses (Supplementary Table 3.2: https://www.samedical.org/file/2089).

Table 3.1. Learning activities related to planetary health and sustainable healthcare (N=18 courses)

Learning activities	Courses, n	Frequency, %
Advice about eco-friendly and healthy lifestyles	5	27.8
Advice about eco-friendly treatments	1	5.6
Community-based research about environmental determinants of health	7	38.9
Concept mapping environment, disease and healthcare relationships	3	16.7
Debating ecological justice/eco-ethics/eco-advocacy	3	16.7
Designing a public health strategy to address environmental health impacts	3	16.7
Minimising tests and interventions with high environmental impact	0	0.0
Oral presentations	9	50.0
Reflections on personal and professional eco-ethical challenges	2	11.1
Taking an environmental history	5	27.8
Writing assignments	6	33.3
Other	1	5.6
Don’t know	4	22.2

Assessments

Nine of the 18 courses (50.0%) reported formative and/or summative assessments of PH and SH content (*Supplementary Table 3.3: https://www.samedical.org/file/2089*). The most common types of assessments were essays or individual reflections on learning (n=8; 88.9%); oral presentations with a rubric (n=8; 88.9%); written assignments (n=6; 66.7%); and multiple-choice or short assessment questions (MCQs/SAQs) (n=6; 66.7%). Environmental history taking and advice about sustainable and healthy lifestyles at observed structured clinical examination (OSCE) stations (n=1; 11.1%), and advice regarding sustainable and healthy lifestyles at OSCEs, were reported least often. Overall, more formative (n=36) than summative types of assessment (n=22) were reported (Table 3.2).

Table 3.2. Assessments related to planetary health and sustainable healthcare (N=9 courses)

Forms of assessment	Summative only	Formative only	Summative and formative	Courses with assessment, %
Assessments of concept mapping exercise	1	2	0	33.3
Assessments of debates with a rubric	2	0	1	33.3
Group discussion about eco-ethics in clinical care	1	2	1	44.4
Individual essay/reflections on learning	1	7	0	88.9
MCQs or SAQs on core topics	4	2	0	66.7
Oral presentations with a rubric	1	7	0	88.9
OSCE station: environmental history taking	1	0	0	11.1

OSCE station: SH advice to patients	0	0	0	0.0
Patient consults that include environmental history taking and SH advice	0	2	0	22.2
Peer feedback on oral presentations	3	2	0	55.6
Project supervisor assessment reports	2	2	0	44.4
Research report/presentation/journal article	3	2	0	55.6
Role-play	0	4	0	44.4
Written assignments with a rubric	2	3	1	66.7
Other	1	1	0	22.2
MCQ = multiple-choice questions; SAQ = short assessment questions; OSCE = observed structured clinical examination; SH = sustainable healthcare.				

Discussion

The responses received related to 18 undergraduate and postgraduate courses. Overall, the quantity and variety of course learning activities and assessments regarding PH and SH were limited compared with those proposed by the AMEE Consensus (13), especially at the undergraduate level. More traditional forms of learning and assessment predominated, such as oral presentations, writing assignments and MCQs/SAQs. More innovative forms suggested by the AMEE Consensus that were seldom reported include reflecting on and debating sustainability and eco-ethical challenges; investigating viable eco-friendly alternatives to tests and treatments

with high environmental impacts; and environmental history taking and advice about sustainable and healthy lifestyles in OSCEs and during real or role-played patient consultations. These appear to be significant missed opportunities to test the application of knowledge in the psychomotor and affective domains, given how important these skills and values are for health professionals in promoting sustainability in clinical care and patient self-care. More authentic approaches that allow for multiple assessments of progress and for individual creativity are needed to foster such skills and values (13).

Communicating sustainability values so that patients, their families, and clinical colleagues understand how care for the environment is essential for health and wellbeing, is recognised in the UK curriculum for ESH as an important competency of professionalism and leadership for change (20). Students should therefore learn how to take an environmental history from their patients and have conversations about their climate-health risks, as well as co-beneficial opportunities for personal and public health by means of eco-friendly lifestyle choices about energy, transport, food, and waste disposal. Such conversations could also promote available sustainable alternatives to excessive medicalisation, investigation, and treatment, while respecting the priorities and socioeconomic circumstances of the patient. Hence, general practitioners may have particularly good opportunities to empower patients and promote low-carbon alternatives, which are key principles of sustainable clinical practice (30,31). However, such 'social prescribing' of non-medical options can also be readily practised by other disciplines and may be especially effective in well-functioning health teams with a deep understanding of the determinants of health in their communities. The multidisciplinary student profile of many of the courses also provides a good opportunity for learning approaches to health and healthcare from a variety of health professionals.

Common examples of social prescribing include exercise and mindfulness classes; recreational and food gardening; active commuting on foot or by bicycle; and minimising, recycling, and composting waste (20). Involving students in such activities for communities that they serve can be a powerful learning experience. Students' learning should include the population-based community-orientated primary care (COPC) approach that can help to identify interventions to reduce climate vulnerabilities, to empower communities' responses to climate emergencies and

to address specific environmental determinants of health. It should also include learning about the prevailing public health challenges and potential interventions to develop greater resilience to environmental and climate risks to health and healthcare, such as flooding, high temperatures, poor waste management, displacement, migration, and the changing epidemiology of diseases (32). Interventions to mitigate the considerable climate and environmental impacts of health facilities, and their leadership implications for health professionals and facility managers, should also be examined, using guidelines and local case studies from projects such as the Global Green and Healthy Hospitals (GGHH) initiative (33).

Sustainability issues can be readily linked to existing topics in many specialties to build on students' prior knowledge of climate and environmental change. Discussions of current extreme weather events reported in the media, such as floods, droughts, heatwaves, and wildfires that heavily impact health and healthcare services, could include the vital role of health professionals in climate mitigation, healthcare adaptation, and disaster preparedness and response. Integrating such discussions with lectures, self-directed learning and hands-on learning about clinical skills and case management, both longitudinally throughout the years of study and collaboratively across the disciplines, could deepen learning in a well-constructed curriculum. A systems thinking approach is therefore important for broadening the focus from managing the patient within a healthcare setting, to addressing the social and environmental determinants of health and disease (20).

Similar barriers and enablers for integrating PH and SH as reported in the literature are likely in SA health professions education curricula; therefore, a strong case needs to be made. Determining the perceptions of national educators about the importance of PH and SH in the unique SA context, and what they think key learning objectives, activities and assessments should be, will help to build this case. A companion article describes the subsequent Delphi panel phase of the mixed methods study to assess the relevance and applicability to SA of the learning objectives, activities and assessments proposed by the AMEE Consensus (34).

Study limitations

Despite extensive efforts to disseminate the survey across multiple networks of educators, the 41 responses received from 15 faculties are a limited representation of health professions and academic ranks at faculties of health sciences in SA. Regular follow-up and reminders by the principal investigator helped to boost the survey response rate at a time when academic year-end pressures and COVID-19-related academic disruptions were a major barrier. Data collection of longer duration, and earlier in the year, may have yielded a larger and more representative response rate. The limited response may also reflect a disinclination to respond due to low awareness and understanding of the concepts of PH and SH, and perceptions of minimal relevance, as there are few courses with such content. The requested details on course learning outcomes and objectives are missing owing to a very low follow-up response rate, as explained above. Finally, further detail about learning activities and assessments was not requested to limit the burden of data collection on respondents and hence to achieve a higher overall response rate.

Conclusion

As far as we are aware, this is the first systematic attempt to survey education regarding PH and SH in health professions education in SA. We found that such education is starting to develop in SA health sciences faculties, albeit with a limited variety of learning activities and assessments of PH and SH content. Further research using deeper qualitative approaches would be helpful to address the study limitations.

Respondents recognised the growing importance and relevance of PH and SH to health professions education and practice, particularly in a country such as SA that is highly vulnerable to the health and social impacts of climate change and environmental degradation. Further work is therefore required in curriculum development in SA faculties of health sciences, enabled by strong institutional leadership, faculty staff and student involvement, sharing of ESH resources and continual monitoring and evaluation of progress. As such work is central to the mission of the ESH SIG of SAAHE, this audit provides a helpful baseline for the group's future activities, as well as informing the subsequent phases of the mixed methods study.

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CHAPTER 4 A National Delphi Panel Assessment of ESH in South Africa

This chapter comprises the following publication about a national Delphi panel assessment of the integration of ESH into HPE in SA, towards the second objective of assessing ESH learning objectives, activities, and assessments, and the third objective of assessing perceptions about the opportunities and barriers to ESH in SA:

Irlam J. Reid SJ, Rother H-A. (2024). Education about Planetary Health and Sustainable Healthcare: a national Delphi panel assessment of its integration into health professions education in South Africa. African Journal of Health Professions Education 2024;16(1). https://doi.org/10.7196/AJHPE.2024.v16i1.327

Role of Candidate

The candidate conceptualized and designed the study, collected and analysed the data, and prepared all drafts of the article. Prof Hanna-Andrea Rother and Prof Steve Reid provided conceptual inputs, and reviewed and edited the article.

Appendices related to this paper

Appendix 6: Supplementary File 4.1. Round ONE questionnaire for National Delphi Panel 2022

Appendix 7: Supplementary File 4.2. Round TWO questionnaire for National Delphi Panel 2022

Appendix 8: Supplementary Table 4.1. List of Delphi panelists

Appendix 9: Supplementary Table 4.2. Learning objectives by learning domains, sub-domains and AfriMEDS health professional roles

Appendix 10: Supplementary Tables 4.3.1 to 4.3.7 Core graduate competencies and roles related to ESH learning objectives (HEALTHCARE PRACTITIONER/ COMMUNICATOR/ COLLABORATOR/ LEADER & MANAGER/ HEALTH ADVOCATE/ SCHOLAR/ PROFESSIONAL)

Appendix 11: Supplementary Table 4.4. Barriers to curriculum integration of ESH

Education about planetary health and sustainable healthcare: A national Delphi panel assessment of its integration into health professions education in South Africa

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Abstract

Background. Education about planetary health (PH) and sustainable healthcare (SH), or education for sustainable healthcare (ESH), enables health professionals to help protect public health and healthcare from climate change and environmental degradation. The Association for Medical Education in Europe Consensus *Statement on Planetary Health and Education for Sustainable Healthcare* (AMEE Consensus) has proposed a set of ESH learning objectives, activities, and assessments for adaptation to different health professions education (HPE) contexts. The national audit phase of a mixed methods study in SA found that awareness of ESH and its curriculum development is emerging. The African Medical Education Directives for Specialists (AfriMEDS) is a competency framework for undergraduate medical students in SA that defines key competencies and enabling competencies related to seven roles of a health professional.

Objectives. To recruit a national Delphi panel of health professions educators to assess the applicability of the AMEE Consensus learning objectives, activities, and assessments to HPE in SA; to elicit panelists' perceptions of the main barriers and opportunities for ESH in faculties; and to compare learning objectives recommended by AMEE and the panel for key competencies and enabling competencies within the AfriMEDS framework.

Methods. Nine educators from three different disciplines and six national faculties of health sciences participated in two rounds of a Delphi process and in follow-up discussions. In round 1, they rated the AMEE Consensus learning objectives, activities, and assessments, and proposed additional ones. In round 2, they rated the score-ranked AMEE lists, as well as relevant additions from round 1. All panelists participated in further discussions regarding applicability and highlighted the potential barriers and opportunities for integrating ESH into their faculties. The lead author then matched the panel's learning objectives with enabling competencies related to all seven health professional roles described by AfriMEDS.

Results. All panelists recognised the importance of ESH in SA and the need for eco-ethical leadership by health professionals. All 13 AMEE Consensus learning objectives, as well as three additional objectives from the panel, were matched most frequently with AfriMEDS-enabling

competencies related to the roles of leader and manager (*n*=9), communicator (*n*=8) and healthcare practitioner (*n*=7). Panelists highly ranked learning activities and assessments that are authentic, multiprofessional and require systems thinking. They perceived the lack of capable educators and curriculum overload to be the main barriers to integration of ESH, as well as the need for strong leaders, disciplinary champions, and trained educators.

Conclusions. Situating the selected learning objectives within the AfriMEDS competency framework provides a good basis for developing aligned learning activities and assessments of ESH. Strong leadership, capable educators and multidisciplinary collaboration are important enablers of integrating ESH into HPE in SA.

Introduction

Planetary health (PH) is 'a solutions-oriented, transdisciplinary field and social movement focused on analysing and addressing the impacts of human disruptions to Earth's natural systems on human health and all life on Earth' (1). This definition encompasses the many ways, including climate change, pollution, biodiversity shifts, land use changes and resource scarcity, in which the environment can affect health, such as changing the epidemiology of vector-borne diseases, mental illness and heat and air pollution-related mortality (2).

Education regarding PH and sustainable healthcare (SH), or education for sustainable healthcare (ESH), has emerged internationally to develop the competencies of health professionals to help protect public health from planetary climate change and environmental degradation and to help build health systems that are more sustainable and resilient to climate disruption (3-5). The Declaration on Planetary Health of the Association of Faculties of Medicine of Canada (AFMC) recognises that faculties and academic health institutions have a social and environmental accountability mandate and therefore calls on them '*to take immediate action to both halt the negative impact of their activities on the planet's natural systems, and to institute adaptive and regenerative measures, including through advocacy*' (6).

The concept of eco-ethical leadership in health professions education (HPE) has emerged as an integrated values-based approach that prioritises social justice, collaboration, and advocacy towards environmental, organizational and community sustainability and regeneration (7). Systems thinking is a key feature of eco-ethical leadership that requires cognitive complexity to understand the world from a dynamic systems perspective (8). Eco-ethical leadership is urgently needed and highly relevant for health professionals and educators to respond to the growing climate crisis and its impact on health and healthcare systems (5).

The Association for Medical Education in Europe Consensus Statement (AMEE Consensus) on Planetary Health and Education for Sustainable Healthcare proposed learning objectives, activities, and assessments of ESH for adaptation to different educational contexts, although representation from LMICs was limited (9). Experience from many countries has shown that the

integration of PH and SH content is generally inhibited by curriculum overload, poor alignment and assessment, and lack of capacity among educators to teach and assess these topics (10).

In late 2021, the first phase of a three-phase mixed methods study of ESH in SA, including a national audit of health professions curricula, was undertaken via the Education for Sustainable Healthcare Special Interest Group (ESH SIG) of the Southern African Association of Health Educationalists (SAAHE). It found that ESH awareness and curriculum development are emerging, although with a limited variety of learning activities and forms of assessment. The authors recommended further work in national curriculum development of ESH, enabled by strong institutional leadership and staff and student involvement (11). The ESH SIG subsequently hosted a regional webinar on planetary health education in African primary healthcare curricula and issued a joint call for the integration of PH and SH into health professions curricula in Africa (12).

The lead author (JHI) led a team of medical students at the University of Cape Town (UCT) in 2022 to complete a baseline planetary health report card (PHRC) assessment of the integration of PH and SH into the curricula and campus operations and services of the Faculty of Health Sciences (FHS), UCT, as part of a global student-led initiative (13). The PHRC global summary report calls for curricular content on PH and SH to be formalised by developing testable learning objectives related to clinical knowledge and skills, and for such content to be integrated longitudinally as a cross-curricular theme (2). The graduate profiles for most of the FHS, UCT, health professional programmes have been adapted from a competency framework for undergraduate students in medical programmes in SA (14,15). This framework is known as the African Medical Education Directives for Specialists (AfriMEDS) and was adapted from the Canadian Medical Education Directives for Specialists (CanMEDS) Physician Competency Framework (16) by the predecessor to the Health Professions Council of South Africa (HPCSA), in collaboration with training institutions and faculty deans. CanMEDS was developed to enhance social accountability in medicine and has been widely used in the accreditation of medical education programmes (14). The core competencies in the AfriMEDS framework include 26 key competencies, which are further divided into 122 enabling competencies. The enabling competencies are related to seven roles of a health professional, i.e. healthcare practitioner, communicator, collaborator, leader and manager, health advocate, scholar, and professional (15).

The Delphi technique is a well-used method in HPE to achieve group consensus on developing curriculum components, assessment items, educational resources and defining competencies (17). The aim of this second phase of the mixed methods study was to identify ESH learning objectives and related curriculum content applicable to HPE curricula in SA. The objectives were to undertake an expert Delphi panel assessment of the applicability of the AMEE Consensus learning objectives, activities, and assessments to HPE in SA; elicit the panelists' perceptions of the main barriers and opportunities for integrating ESH into health sciences faculties; and compare learning objectives recommended by AMEE and the panel with key competencies and enabling competencies within the AfriMEDS framework.

Methods

Ten SA HP educators were invited to join two rounds of a Delphi panel through the ESH SIG in April 2022. Nine accepted, and one did not accept owing to personal time constraints. Eligible participants were identified by the national audit phase (11) who had some expertise in ESH curriculum development and had indicated interest in promoting ESH in SA. Representation was sought from different disciplines and faculties to enhance the national applicability of the findings. Participants were recruited by email and their informed consent was obtained.

In round 1, panelists rated lists of learning objectives, activities, and forms of assessment of PH and SH from the AMEE Consensus that they deemed applicable to HPE in SA. The panelists were invited to make additions to the lists. In round 2, they rated the score-ranked AMEE Consensus lists, as well as their additions from round 1. A 5-point scale was used for rating the learning objectives (1 = definitely exclude; 2 = exclude; 3 = neutral/not sure; 4 = include with reservations; 5 = definitely include) and a 3-point scale for the learning activities and assessments (1 = no; 2 = maybe; 3 = yes). The AMEE Consensus lists were ranked on their cumulative scores after both rounds, whereas round 1 additions were ranked on their round 2 scores only. Using a 3-point scale in round 1 only (1 = not at all; 2 = maybe; 3 = definitely), panelists also rated common barriers to integrating PH and SH into curricula, which were derived from the literature (10). The ranked results were tabulated in Excel (Microsoft Corp., USA) by JHI and shared with the panelists via email before and via screen-sharing during online Teams (Microsoft Corp., USA) meetings in May 2022. The agenda of the meetings was to review and discuss round 1 and 2 results, and to

explore panelists' perceptions of the main barriers and opportunities for integrating ESH into their respective faculties and national curricula.

The AMEE Consensus learning objectives, as well as all additions from the panel, were coded, categorised, and tabulated in Excel by JHI, according to the three learning domains from the AMEE Consensus, i.e. knowledge (K); knowledge and skills (KS); and knowledge, values, attitudes, and agency (KVA). They were further coded and categorised by six sub-domains created by JHI from his assessment of the purpose of each objective: understanding the environmental determinants of health (K1); understanding the environmental sustainability of healthcare (K2); enhancing the environmental sustainability of healthcare (KS1); critiquing environmental sustainability policy (KS2); advocating for planetary health and sustainable development (KS3); and eco-ethical leadership in healthcare (KVA1). A final column in the Excel table displayed one of the seven health professional roles in the AfriMEDS framework that appeared to JHI to be most closely related to each learning objective.

JHI then removed learning objectives added by the panel that looked as though they were essentially similar to those of the AMEE Consensus, compared the remaining learning objectives with all of the key competencies and enabling competencies for each health professional role within the AfriMEDS framework, and performed a best match, using Excel to tabulate the results. A narrative feedback report with accompanying tables (included in and supplementary to this article), as well as a narrated PowerPoint (Microsoft Corp., USA) presentation of the key findings and conclusions, was shared with all nine panelists for review and comment within a month of the follow-up discussions.

Ethical approval

Ethical approval was obtained in August 2021 from the Human Research Ethics Committee, FHS, UCT (HREC 358/2021).

Results

All 9 panelists participated in both Delphi rounds and in one of three follow-up meetings, as it proved impossible to schedule one meeting with all in attendance. They represented three different professions, i.e. family medicine (n=4), environmental health (n=3) and nursing (n=2);

and six different faculties of health sciences: Stellenbosch University (SU; n=3), University of KwaZulu-Natal (UKZN; n=2), and one panelist each from Durban University of Technology (DUT), University of Cape Town (UCT), University of the Western Cape (UWC) and University of the Witwatersrand (Wits) (*Supplementary Table 4.1. List of Delphi panelists: https://www.samedical.org/file/2122*). Comment on the feedback report was received from only one of the panelists, who did not challenge the validity of the analysis.

Importance of ESH

All panelists highly rated the importance of educating health professional students about PH and SH. Their reasons included the dependence of human health and wellbeing on a healthy planet; that climate change poses the greatest risk to health and healthcare globally; and that many SA undergraduates lack knowledge and interest regarding planetary health and environmental sustainability. They recognised that health professionals, as trusted members of society, can exercise considerable agency in patient care and policy development based on a sound understanding of the concepts and principles of PH and SH.

One panelist observed that more awareness is needed of how consumption patterns and healthcare practices degrade the health of the planet and humankind:

"I think that all humans require greater awareness of the risks of how our consumption patterns threaten the survival of our planet. Health professional students are no exception. There are also certain 'professional' practices that negatively impact human health. Our apartheid-era health facilities require massive overhaul together with other health infrastructure to become more environmentally friendly. In their professional roles, students will need to grapple with this and ultimately provide leadership" (W01).

Learning objectives

Thirty-three learning objectives (13 from the AMEE Consensus and 20 additions by the Delphi panel) were coded and categorised by the three AMEE learning domains (K/KS/KVA), six sub-domains (K1/K2/KS1/KS2/KS3/ KVA1) and the related AfriMEDS health professional roles (*Supplementary Table 4.2. Learning objectives by learning domains, sub-domains and related AfriMEDS health professional roles: https://www.samedical.org/file/2123*). Seventeen learning

objectives added by the panel that JHI considered similar to the AMEE Consensus objectives were removed. The following three were retained on the grounds of their applicability to the SA context: K2.3 (*Understand how the health system contributes to the problem of planetary degradation*); KS2.2 (*Critique current environmental protections in the SA constitution and other legislation in terms of how they affect other health rights of your patients, families and communities*); and KVA1.2 (*Understand what is expected of health professionals in their personal and professional behaviour*). Hence, 16 objectives, 13 from the AMEE Consensus and three added by the panel, were compared and matched with key competencies and enabling competencies for each health professional role within the AfriMEDS framework.

The results of this comparative exercise ranged from one match for enabling competencies for objectives K1.2, K2.3, KS1.3, KS2.1, KS2.2 and KS3.3 to six matches for objectives K1.1 and KS3.1 (Table 4.1). The AMEE Consensus learning objective KVA1.1 (*Discuss examples of eco-ethical leadership*) was matched with two enabling competencies in AfriMEDS, while the additional objective from the panel (KVA1.2 *Understand what is expected of health professionals in their personal and professional behaviour*) was matched with three enabling competencies. Overall, the learning objectives were matched most often with enabling competencies related to the AfriMEDS health professional roles of leader and manager (n=9), communicator (n=8) and healthcare practitioner (n=7), and least often with competencies related to the roles of scholar (n=3) and professional (n=3) (*Supplementary Table 4.3. Core graduate competencies and roles related to ESH learning objectives: https://www.samedical.org/file/2124*).

In follow-up discussions, one panelist proposed that educators should agree on core principles to guide future education and training before setting ESH-related learning objectives because of the diversity of HPE in SA. The panelist believed that such principles would help to motivate the relevance of PH and SH in overloaded curricula, especially for those who have not 'bought in' to its importance. Another panelist thought that some of the objectives were quite conceptual and hence difficult to assess, and that the key teaching topics to assess are the following: environmental impacts on health; building more resilient facilities and health services; and reducing the environmental harm caused by the health sector. A third panelist emphasised that

"*learning objectives are the key to unpacking the content, learning opportunities, and assessment within a given program*"" (S01).

Table 4.1. Learning objectives matched to enabling competencies in the AfriMEDS framework

Source	Learning objectives, *n*=16	Enabling competencies matched, *n*
AMEE Consensus 2021	K1.1 Discuss how local and global ecological crises impact on individual patients and communities	6
	K1.2 Describe the interaction between local and global ecological crises and the social determinants of health	1
	K2.1 Discuss how the promotion of environmental sustainability generally and in healthcare can support progress on social determinants of health, health equity and respect for cultural diversity, including indigenous traditional knowledge	3
	KS1.1 Evaluate the environmental impacts of a patient pathway to care and identify ways to enhance environmental sustainability	2
	KS1.2 Describe how changes in disease burden due to environmental change may be identified, characterised and quantified and how such information can inform planning and practice to address health needs	2
	KS1.3 Apply critical thinking, problem solving and systems thinking to sustainable healthcare challenges	1
	KS2.1 Apply key policies and frameworks related to sustainable development including the sustainable	1

	development goals to evaluate a population health challenge	
	KS3.1 Communicate clearly with health professional colleagues when responding to an ecological challenge or opportunity in healthcare	6
	KS3.2 Demonstrate how to motivate behaviour change to promote environmental sustainability at an individual, professional and community level	4
	KS3.3 Demonstrate the ability to advocate for planetary health and sustainable development goals	1
	KS3.4 Identify how indigenous traditional knowledge and voice can inform healthcare practice and promotion of planetary health and sustainable development in your local context	4
	KVA1.1 Discuss examples of eco-ethical leadership	2
	KVA1.3 Discuss the role of health professionals in mitigation, adaptation, advocacy and activism in terms of sustainable development, planetary health and environmental stewardship	2
Delphi panel	K2.3 Understand how the health system contributes to the problem of planetary degradation	1
	KS2.2 Critique current environmental protections in the SA Constitution and other legislation in terms of how they affect other health rights of your patients, families and communities (e.g. equity in housing, clean water, food safety, property ownership)	1

	KVA1.2 Understand what is expected of health professionals in their personal and professional behaviour	3
AfriMEDS = African Medical Education Directives for Specialists; AMEE = Association for Medical Education in Europe; K = knowledge; KS = knowledge and skills; KVA = knowledge, values, attitudes and agency; SA = South African.		

Learning activities

Eleven learning activities from the AMEE Consensus were scored in both Delphi rounds, and seven round 1 additions by the panel were scored in round 2 only (Table 4.2). The top-ranked AMEE Consensus learning activity was role-plays or real-life advice to a patient about environmental and health co-benefits of lifestyle choices (52 out of a maximum score of 54; 96%). Reflections on personal and/or professional eco-ethical challenges were ranked with a score of 80%. Of the round 1 addition made by the panel, learning from industrial technicians/environmental health officers about assessing an area was ranked highest (21 out of a maximum score of 27; 78%). This ranking was closely followed by suggestions for campus workshops on environmentally responsible behaviour, webinars on the interaction of the environment and health, site visits, and interactions with students from other faculties or programmes (score of 20 (74%) for all).

Table 4.2. Learning activities ranked by the Delphi panel score

Learning activities, *n*=18	Round 2 scores (maximum= 27), *n* (%)	Round 1 plus round 2 scores (maximum= 54), *n* (%)
AMEE Consensus		
Role-plays or real life: advise a patient about environmental and health co-benefits of lifestyle choices	25 (93)	52 (96)
Oral presentations about a sustainable healthcare or planetary health topic	21 (78)	47 (87)
Role-plays or real life: take a patient's history of exposure to common environmental risk factors	20 (74)	46 (85)
Participatory research with communities regarding their priority environmental determinants of health	20 (74)	45 (83)
Designing a public health strategy to address priority environmental health impacts on individuals or communities	19 (70)	44 (81)
Debates on issues of ecological justice/eco-ethics/eco-advocacy by health professionals	19 (70)	44 (81)
Application of principles of sustainable healthcare to tests and interventions during a patient's referral pathway	20 (74)	43 (80)
Reflections on personal and/or professional eco-ethical challenges	19 (70)	43 (80)
Concept mapping the inter-relationships between environment, disease burden and healthcare	19 (70)	41 (76)

Writing assignments about a sustainable healthcare or planetary health topic	18 (67)	40 (74)
Role-plays or real life: advise a patient about eco-friendly medical treatment options	15 (56)	36 (67)
Additions by panel in round 1		
Learning from industrial technicians/environmental health officers about assessing an area: air pollution (e.g. particulate matter), soil samples (e.g. arsenic, lead), water contamination (e.g. microbial content)	21 (78)	
Workshops on campus to explore environmentally responsible behaviour as students and future professionals	20 (74)	
Webinars that enable multidisciplinary inputs on the interaction of environment and health	20 (74)	
Site visits to e.g. water treatment/sewerage plants, landfills in the areas where patients live	20 (74)	
Joint discussions and participation with students from other faculties/programmes (e.g. geography/environmental sciences/mining)	20 (74)	
Linking the topic to teaching on community orientated primary care and leadership/clinical governance	19 (70)	
COPC/community mapping based on site visits	16 (59)	
AMEE = Association for Medical Education in Europe; COPC = community-orientated primary care.		

Assessments

Fourteen types of assessment from the AMEE Consensus were scored by panelists in both rounds and one addition only by the panel (multiprofessional problem-solving case) was scored in round 2 (Table 4.3). The top-ranked assessments were group discussions regarding eco-ethical issues in clinical care (51 out of a maximum score of 54; 94%); oral presentations with a rubric (n=50; 93%); and patient consultations that include environmental history taking and advice on sustainable healthcare (n=48; 89%).

Table 4.3. Assessments ranked by the Delphi panel score

Types of assessments, N=14	Round 2 scores (maximum= 27), *n* (%)	Round 1 plus round 2 scores (maximum= 54), *n* (%)
AMEE Consensus		
Group discussion about eco-ethical issues in clinical care	25 (46)	51 (94)
Oral presentations with a rubric	26 (48)	50 (93)
Patient consultations that include environmental history taking and advice on sustainable healthcare	25 (46)	48 (89)
MCQs or SAQs on core topics	25 (46)	46 (85)
Peer feedback on oral presentations	22 (41)	46 (85)
OSCE station on sustainable healthcare communication	23 (43)	45 (83)
Research project report/presentation/journal articles	23 (43)	45 (83)
OSCE station on environmental history taking	22 (41)	45 (83)
Role-plays	22 (41)	44 (81)
Individual essay/short reflections on learning	21 (39)	44 (81)

Written assignments with a rubric	23 (43)	43 (80)
Assessing debates with a rubric	22 (41)	42 (78)
Project supervisor assessment reports	21 (39)	42 (78)
Assessments of concept mapping exercises	21 (39)	38 (70)
Additions by panel in round 1		
Multiprofessional problem-solving case	26 (48)	26 (48)
AMEE = Association for Medical Education in Europe; MCQs = multiple-choice questions; SAQs = short assessment questions; OSCE = objective structured clinical examination.		

Barriers to curriculum integration

Eight barriers to integrating PH and SH into curricula were scored in round 1 only. The top-ranked barriers were: lack of educators who are knowledgeable about sustainable healthcare (26 out of a maximum score of 27; 96%); lack of understanding about the relevance of sustainability teaching to healthcare (n=25; 93%); too many competing educational interests (n=24; 89%); lack of faculty leadership on sustainability (n=23; 85%); and lack of time/space in the teaching curricula (n=23; 85%) (*Supplementary Table 4.4. Barriers to curriculum integration of ESH: https://www.samedical.org/file/2125*).

A panelist and specialist in environmental health practice reported few problems in integrating environmental health into their faculty programmes, but acknowledged challenges in 'scaffolding' it longitudinally:

"The curriculum mapping exercise is critical, but it has to go hand in hand with face-to-face discussion about how to integrate it" (D01).

Another panelist proposed layering ESH learning objectives over the course of the spiral undergraduate curriculum and into postgraduate studies. A lecturer in PH described a 'conflict of interest' with colleagues who teach environmental health, who saw no need for climate change and PH to be taught as separate modules. A panelist from the nursing sciences reported that

environmental and climate change issues had been included in their teaching on advocacy and health services management in recent years, despite the absence of these issues from the core nursing curriculum. She reported that the AMEE Consensus had been a helpful guide and described their challenges in attempting interactive teaching of large classes of students. Another nursing professional reported that monitoring in their faculty had shown that their curriculum had not been implemented correctly at times, which was exacerbated by a high turnover of staff and by 'threads' of SH often being insufficiently explicit and inconsistently championed. The lack of educator interest and expertise in teaching and assessing PH and SH was a prevalent theme of the discussions. Higher-degree pathways in ESH in SA faculties were therefore proposed to develop a cohort of capable educators in the field.

Several panelists noted that many students have prior awareness and knowledge of climate change from their schooling, yet deficient understanding of the connections between climate and health, and how individual lifestyle choices impact the environment. One panelist observed that:

"It's almost as if there's kind of this immunity, I think, with climate change and these other issues, gender-based violence or addiction or a whole range of issues. It's almost as if you learn about this in a detached way, as if it doesn't impact you and your family. And you know that's what professionalism means, is that you sort of begin to distance yourself in a way from your own roots and your own trauma and your own pain and your own reality" (W01).

This panelist therefore proposed educating students about using their positionality as future health professionals effectively to leverage political will for meaningful change within their campuses, health institutions and communities, and to hold their leaders accountable.

Discussion

Eco-ethical leadership

Eco-ethical leadership is given high priority in the results section of this study. This is apparent in the frequent matching of related learning objectives with enabling competencies in the AfriMEDS framework, and the high scoring by the panel for eco-ethical learning activities and assessments suited to the SA context. The panel's recognition of the potential agency of health professionals

as trusted members of society, is consistent with growing international consensus in the face of increasing climate and environmental risks to health (9). The need for eco-ethical leadership has been recognised by the AMEE Consensus (9), while others have explored the implications for health professional leaders at the health systems and organizational levels (7) and the ethics of sustainability for responsible professionals (18). The PHRC global report, e.g. the AMEE Consensus, strongly recommends that curricula should acknowledge indigenous knowledge and value systems as an essential part of the response to the planetary crisis (2,9). Hence, eco-ethical leaders should '*demonstrate socio-cultural and ecological values that embody inclusivity and social and ecological justice*' (7). The national audit of ESH in SA found minimal coverage of this topic (11), and the PHRC at UCT FHS found few examples of such leadership (2).

Learning objectives, activities, and assessments

The AMEE Consensus calls for the constructive alignment of ESH learning outcomes, objectives, activities, and assessments, and for their adaptation to local settings, using a range of approaches that are relevant and authentic and incorporate interprofessional learning, where possible (9). The PHRC global summary report recommends the development of testable learning objectives with students, as well as educating and incentivising faculty members to integrate PH and SH themes and topics into existing teaching and learning activities across curricula (2).

Comparing and matching the ESH learning objectives to key competencies and enabling competencies of AfriMEDS have demonstrated their potential applicability within a widely adopted competency framework in HPE curricula in SA. The exercise helped to identify which learning objectives from the panel were sufficiently locally relevant to add to the AMEE Consensus objectives. It was found that the ESH learning objectives appear to be most relevant to the AfriMEDS health professional roles of leadership and management and communication. The complex and interconnected causal pathways associated with the planetary determinants of health and sustainability in healthcare systems, and hence their potential solutions, emphasise that future curricula should address the AMEE learning objective KS1.3 (*Apply critical thinking, problem solving and systems thinking to sustainable healthcare challenges*). The need for systems thinking has also been identified as a central characteristic of eco-ethical leadership (7) and is implicit in the recommendation of the PHRC summary report to situate teaching in a global

interconnected context of human health (2). Curricula should therefore also include related learning activities and assessments, such as skills in identifying the inter-relationships between environment, disease, and healthcare. The panel's high scoring of concept-mapping activities and assessments supports this assertion.

The panel's support for authentic learning activities and assessments that are consistent with the AMEE Consensus (9) was apparent in their high scoring of role-played or real-patient history taking of environmental exposures, as well as advice regarding the environmental and health co-benefits of lifestyle choices, such as home food gardening and active commuting as pedestrians or cyclists (19). The panel also added interprofessional and multiprofessional activities such as community health assessments and site visits that extend authentic learning beyond the clinical encounter to communities. Cross-disciplinary webinars, campus workshops, and multiprofessional problem solving were also suggested, which align with global efforts to integrate PH and SH topics into clinical disciplines to demonstrate their relevance to diagnostic history taking, health promotion and therapeutic interventions (19-21). This is especially important for developing student and graduate agency, as students have reported often feeling unprepared to answer patients' questions about climate change and environmental sustainability (13,22).

Three learning objectives from the panel (K2.3, KS2.2 and KVA1.2) were added to those of the AMEE Consensus owing to their contextual relevance in SA. Although these additional objectives were not specifically reflected in the ranked learning activities and assessments, they could guide topics for student assignments, debates, workshops, and site visits. The PHRC provides many helpful global examples of faculties that have introduced environmental justice opportunities into their curricula, research, student leadership and community engagement (2). One panelist noted that health professional leadership is needed in transforming SA health facilities and infrastructure to become more environmentally friendly. The work of the Global Green and Healthy Hospitals (GGHH) network in SA is relevant, as it follows a global action agenda for mitigating the considerable carbon footprint of the health system, which includes local champions, skills development, and helpful case studies (23,24). Hence, there are growing

opportunities for authentic, relevant and interprofessional learning activities and assessments that require collaborative eco-ethical leadership.

Barriers and opportunities for ESH

Most panelists strongly agreed with almost all of the barriers that were summarised from the literature. In common with faculties worldwide, HPE curricula are perceived to be overloaded, yet they are often characterised by disciplinary 'silos'; thus, opportunities for cross-disciplinary integration are missed (10,21). Strong leaders, capable educators and champions for integrated approaches were seen as necessary by many panelists, especially to challenge 'hidden' curricula, or the unofficial norms, values and beliefs that are transferred by an institution's culture (25,26). Such a culture may devalue content not deemed relevant to what is considered to be 'core clinical' competencies of a health professional, yet such values and opinions can be altered (10,27).

The suggestions made by the panel to overcome these barriers are generally consistent with recommendations from the PHRC and others for cross-curricular/multi- and interdisciplinary integration of ESH across the years, which require educational leaders to consult with key stakeholders in disciplines other than their own (13,18). The Declaration on Planetary Health (6) and the PHRC initiative (13) are excellent opportunities for institutional reflection and global collaboration for achieving greater social and environmental accountability. For academic health institutions that strive to lead planetary health research, policy and advocacy for real-world solutions, key stakeholders could include those in engineering, agriculture, architecture, urban planning, communications, and the behavioural sciences (6).

Study limitations

Although the Delphi panel was small, it was reasonably representative of the limited community of ESH practice in SA, founded by the prior national audit. Panelists were from three health professions at six faculties, whereas nine types of health professions from 15 faculties submitted audit responses, and most professions in both phases were medical or environmental health practitioners (11). Despite the inability to schedule only one follow-up meeting with all panelists, the smaller groups facilitated greater participation in the limited time available. Furthermore,

the lead author alone selected learning objectives from the panel to add to those of the AMEE Consensus, and also compared them with the AfriMEDS framework of health professional roles and enabling competencies. Although a feedback report with the detailed tables, as well as a narrated PowerPoint (Microsoft Corp., USA) presentation of the key results, was shared with the panel soon after the follow-up meetings, no panelists interrogated the outcomes of this process. Further engagement with the study results, preferably face-to-face to facilitate deeper discussion, is therefore warranted to improve their validity and applicability to other settings.

Conclusions

The Delphi process was a useful and efficient means of assessing national expert perceptions of the applicability of the learning objectives, activities and assessments suggested by the AMEE Consensus, an international milestone for ESH development, and of the main barriers and opportunities for ESH in SA. The situation of ESH learning objectives with enabling competencies within the national AfriMEDS framework has provided a good basis for further refinement as a prerequisite for aligned learning activities and assessments. Key barriers to ESH in health sciences faculties that are consistent with global experience are the lack of capable educators and overloaded curricula. The study recommends integrating ESH as a cross-curricular theme in interprofessional curricula, empowering leaders and champions of ESH within faculties and health professional programmes, and training a national cohort of capable educators. Further work is required in developing national ESH accreditation standards and indicators of progress that are generally consistent with global standards. These recommendations may also apply to other settings where ESH development is still in its infancy, or which have adopted the AfriMEDS competency framework.

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CHAPTER 5 A Planetary Health Report Card Assessment of UCT FHS

This chapter comprises the following publication about a Planetary Health Report Card (PHRC) assessment of the UCT FHS to fulfil the fourth objective of the study, assessing the perceptions of educators about the opportunities and barriers to ESH in the UCT FHS:

Irlam JH, Reid S, Rother HA. Education about planetary health and sustainable health care in low- and middle-income countries: A planetary health report card assessment of perceptions at the University of Cape Town Faculty of Health Sciences. Education for Health (January-March 2024) 37(1).

Role of Candidate

The candidate conceptualized and designed the study, collected and analysed the data, and prepared all drafts of the article. Prof Hanna-Andrea Rother and Prof Steve Reid provided conceptual inputs, and reviewed and edited the article.

Appendices related to this paper

Appendix 12: Informed consent for PHRC participants, UCT FHS

Appendix 13: Supplementary Table 5.1. Characteristics of PHRC interviewees, UCT FHS

Appendix 14: Supplementary Table 5.2. Planetary health grades for the UCT FHS

Education about Planetary Health and Sustainable Health Care in Low- and Middle-income Countries: A Planetary Health Report Card Assessment of Perceptions at the University of Cape Town Faculty of Health Sciences

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Abstract

Background: The Planetary Health Report Card (PHRC) was developed by medical students in the USA as a metric-based scorecard and institutional advocacy tool for planetary health (PH), with respect to five categories: curriculum, community engagement, student leadership, research, and campus sustainability. The PHRC has expanded into a global initiative, although its use by faculties in low- and middle-income countries (LMICs) has been very limited.

Objectives: To assess perceptions at the Faculty of Health Sciences (FHS) of the University of Cape Town (UCT) about PH and sustainable health care (SH) and perceptions of the barriers and opportunities for integrating PH and SH into curricula in the UCT FHS.

Methods: A PHRC was completed for the UCT FHS by means of interviews with key educators. Interview summaries and scored report cards (where applicable), were shared for validity checking before compilation of the UCT FHS summary report.

Results: Thirty-nine interviews were conducted, 31 of them with key educators representing nine academic departments. Twenty-three graded report cards were completed with those engaged in PH and SH activities. The PHRC category scores ranged from a grade of D minus (20%) for student leadership to a C grade for curriculum (54%), with an overall grade of C minus (42%). Education about PH and SH in the UCT FHS is seen as increasingly important yet insufficient. Curriculum overload, "siloed" learning, and poor understanding among educators were perceived as key barriers. PH and SH were proposed as cross-cutting curricular themes for all health sciences disciplines in the UCT FHS. More community engagement, student leadership development, collaborative research, and campus sustainability interventions were recommended in the other PHRC categories.

Conclusions: The PHRC provides a baseline assessment of PH and SH in a faculty of health sciences in a LMIC contributing towards greater environmental accountability. It should be repeated regularly at the UCT FHS to measure and evaluate progress in integrating PH and SH into transformed curricula, engagement with the communities it serves, development of student leadership, interdisciplinary research, and campus sustainability.

Introduction

Planetary health (PH) is a transdisciplinary field and social movement for understanding and addressing the impacts on human health and all life from human disruptions to the planet's natural systems (1). This definition encompasses the many ways, in which the environment can affect health, such as the impact of climate change, pollution, biodiversity shifts, and land use changes, on the epidemiology of vector-borne diseases, mental illness, and heat and air pollution-related mortality, among others (2).

To address PH, several calls have been made to build capacity on climate change and health for health workers, to help address growing health impacts and strengthen the resilience of health systems (3-7). The 2021 consensus statement on PH and education for sustainable health care (SH) of the Association for Medical Education in Europe (AMEE) recognizes the agency of health professionals to protect PH and urges collective action in health professions education (HPE) linked to the Sustainable Development Goal targets by the year 2030 (8). Education about PH and SH, or Education for SH (ESH), is the development of knowledge, skills, and attitudes in HPE regarding the interdependence of human health and planetary systems, including the impacts of health systems on the environment (8).

Some low- and middle-income countries (LMICs) are responding to these calls for action. The Global Green and Healthy Hospitals (GGHH) Agenda, for example, has been adopted by many LMICs for mitigating the considerable carbon footprint made by the health system, estimated at 4%–5% of global greenhouse emissions (9). Over 70 countries, about half of them LMICs, have formally committed under the World Health Organization Alliance for Transformative Action on Climate and Health (ATACH), to build climate resilient and sustainable health systems (4). This includes developing the capacity of the health workforce to respond to climate change by updating health curricula and providing ongoing training and support (6).

In late 2021, the first of three phases of a mixed-method study on evaluating ESH readiness in SA was conducted through a national audit of HPE curricula (10), via the Education for Sustainable Healthcare Special Interest Group (ESH SIG) of the Southern African Association of Health Educationalists (SAAHE) (11). It found that ESH awareness and curriculum development are

emerging, although with a limited variety of learning activities and forms of assessment. Further, ESH curriculum development was recommended in SA, enabled by strong institutional leadership and by staff and student involvement. In the second phase of the study, a Delphi panel favourably assessed the applicability of the AMEE consensus learning objectives, activities, and assessments to HPE in SA (12).

One potential tool for supporting SA (and other LMICs) to update their health professions curricula is the *Planetary Health Report Card* (PHRC), which was developed by medical students in the USA in 2019 as an institutional advocacy tool (13). It uses a metric-based scorecard to assess PH with respect to the five categories of curriculum, community engagement, student leadership, research, and campus sustainability (see Box 5.1) (2).

Box 5.1: Categories of the Planetary Health Report Card (PHRC) (144)

- **Curriculum**: the integration of relevant planetary health topics into curricula.
- **Community Engagement**: extent of faculty engagement in community outreach and advocacy efforts associated with planetary health.
- **Student Leadership**: institutional support for student-led planetary health initiatives.
- **Research**: the quality and quantity of interdisciplinary planetary health research.
- **Campus Sustainability**: institutional support and engagement in environmental sustainability initiatives on campus.

The PHRC has expanded into a global initiative, although participation by LMICs has been very limited; only three of the 105 reports in the 2022–23 PHRC were from LMICs i.e., India, SA, and Malaysia (2). The potential applicability of the PHRC in a SA HPE institution was indicated by a 2019 survey of the knowledge and perceptions of UCT FHS students about climate change and environmental sustainability. It found perceptions of high importance, yet low levels of teaching and assessment in current UCT FHS curricula and few sustainable campus interventions (14). Exploratory curriculum mapping of the UCT FHS undergraduate medical program (MBChB) confirmed the survey's findings about insufficient curriculum content and assessment of ESH.

Developments at UCT and the UCT FHS over the past few years provide a window of opportunity for integrating PH and SH into the domains represented by the PHRC categories. In 2022, for example, the UCT FHS began an extensive process of curriculum transformation that will establish multidisciplinary work streams led by trained educational leaders, including one related to ESH. This work may be informed by the Planetary Health Education framework (15) from the Planetary Health Alliance (16). The framework consists of five foundational domains that contain the essence of PH knowledge, values, and practice: *Interconnection within nature; The Anthropocene and health; Equity and social justice; Movement building and systems change*; and *Systems thinking and complexity*.

In preparation for curriculum transformation at the UCT FHS, this final phase of the mixed methods study of ESH in SA sought to assess perceptions of key educators at the UCT FHS about PH and SH using the PHRC. Further objectives were to assess their perceptions about the barriers and opportunities for integrating PH and SH into curricula in the UCT FHS.

Methods

Design

A qualitative approach was followed using individual interviews with key informants in the UCT FHS and university.

Study Population and Sampling

Key educators were identified in the undergraduate medical program and the health and rehabilitation sciences (HRS) programs as the heads of departments and departmental divisions, and conveners of academic years and of individual courses, using contact lists provided by the UCT FHS undergraduate administration. A study information letter and an informed consent form were attached to the invitation e-mails.

Data Collection and Analysis

Student co-interviewers were recruited through personal contacts of the authors and a volunteer appeal by the UCT FHS health sciences students' council. Despite initial interest from some HRS students, they withdrew before the commencement of interviews, leaving seven MBChB

students in the team. The team was oriented to the global PHRC in an introductory online meeting with the lead author and two international student coordinators of the PHRC. Several follow-up meetings with the student team were held to plan and fully explain the method of data collection at the UCT FHS.

UCT FHS staff who consented were interviewed by the lead author alone, or with a student co-interviewer, online through MS Teams™, using a screen-share of the PHRC questions for one or two of the five sections that were most closely related to their role in the UCT FHS or university. The interviewer read aloud each question and the scoring options and recorded their response, as illustrated for one question in Box 5.2. The scores for each question were tallied for a total category score for each respondent. Descriptive statistics were employed by calculating aggregate grades for each PHRC category from the dataset of completed report cards. The focus of this paper is the PHRC Curriculum category only.

Box 5.2: Example of a scoring metric in the Curriculum category of the PHRC (144)

Curriculum: Health Effects of Climate Change

2. Does your medical school curriculum address the relationship between extreme heat, health risks, and climate change?	
3	This topic was explored **in depth** by the **core** curriculum.
2	This topic was **briefly** covered in the **core** curriculum.
1	This topic was covered in **elective** coursework.
0	This topic was **not** covered.
Extreme heat is briefly covered as one of several climate impacts on health in introductory lectures on Climate Change and Health in MBChB year 3 (Critical Health Humanities (CHH) course in semester 5), and MBChB year 4 (Health in Context (HiC) course).	

Open-ended questions were added at the end of the PHRC metric questions to assess the perceptions of all interviewees about the extent and quality of undergraduate teaching and assessment of PH and SH in the UCT FHS and the barriers and opportunities for improvement in all PHRC categories. Educators who reported that they taught no PH and SH topics skipped the scoring metric questions and responded to the open-ended questions only.

In the interviews, the lead author led the introductions and questioning with a student observing. Two of the students subsequently volunteered to conduct two interviews each with the lead author observing and assisting when necessary, so that they could gain some experience for future iterations of the PHRC. Interviews were conducted by the lead author alone if no student co-interviewers were available due to their academic commitments. All interviews were recorded and auto-transcribed through MS-Teams™ and summarized by the lead author using deductive thematic analysis of the transcripts. The cumulative scores from all completed scorecards were tabulated and aggregated for the entire sample by the lead author using MS-Excel™. The summaries, and their completed scorecards (where applicable), were shared with each of the interviewees for validity checking after the interview and any corrections received were made to the final summaries. If no responses were received from the interviewee after two follow-up attempts within a month following, the summary was accepted as a valid record of the interview. Interviews and transcripts were assigned codes to maintain confidentiality, and all interviewees signed an informed consent form before the interview.

Ethical approval was obtained in August 2021 from the Research Ethics Committee, Faculty of Health Sciences, University of Cape Town (HREC 358/2021).

Results

Thirty-nine online interviews, each between 30 and 60 min in duration, were conducted from August to December 2022. Thirty-one were educators who represented nine academic departments within the UCT FHS. Three additional educators did not respond to the invitations despite two follow-up e-mails. A further eight non-educators were interviewed with respect to the non-curriculum aspects of the PHRC (*Supplementary Table 5.1: Characteristics of PHRC interviewees, UCT FHS*).

Planetary Health Report Card Grades

Twenty-three report cards were completed with interviewees who reported current engagement with PH and SH. The calculation of the individual section grades [Box 5.1] and overall institutional grade for the UCT FHS are presented in a supplementary table (*Supplementary Table 5.2: Planetary health grades for the UCT FHS*). The aggregate grades (with % of maximum score per

category) and key findings for each category are presented in the PHRC Summary for the UCT FHS (Table 5.1). The category scores ranged from a D minus grade (20%) for *Student Leadership* to a C grade for *Research* (53%) and *Curricula* (54%), with an overall grade of C minus (42%). The full report for the UCT FHS can be accessed via the PHRC website (2).

Table 5.1. PHRC Summary for UCT FHS, 2022-23

PHRC CATEGORY	Grade (%)
Curricula	C (54%)
Planetary health (PH) and sustainable healthcare (SH) topics are included in the FHS medical (MBChB) and health and rehabilitation sciences (HRS) programmes. Chronic curriculum overload; "siloed" learning and timetabling; and low consciousness among educators are key barriers to integration. There is growing awareness of the need for SH, despite insufficient leadership; few 'best-practice' examples; and the general priority given to cost-cutting over an ethic of sustainability. Recommendations: Adopt transdisciplinary and interfaculty approaches towards integration of PH and SH. Incorporate indigenous ecological knowledge and values into curriculum design and delivery. Integrate PH and SH into foundational year lectures and problem-based learning (PBL) cases. Teach clinical educators about SH for more sustainable practice in clinical teaching environments.	
Community Engagement	D+ (36%)

There is little awareness-raising and advocacy by the FHS to protect local communities' health from environmental and climate threats, and to promote more sustainable healthcare. Recommendations: Develop more active community partnerships that address environmental health threats. Produce educational materials about how to mitigate climate-health impacts.	
Student Leadership	D- (20%)
The FHS provides little support and no funding for PH and SH-related student projects. Recommendations: Offer opportunities for quality improvement (QI) and community-based sustainability projects. Collaborate with student leaders for sustainability in curricula development and campus operations.	
Research	C (53%)
The UCT *Khusela Ikamva* (*Secure the Future*) Sustainable Campus project is developing a diverse community of practice that is informed by leading research. Recommendations: *Khusela Ikamva* should include more FHS researchers. The FHS should seek local and international partners in PH research.	
Campus Sustainability	C- (41%)

UCT's Environmental Sustainability Strategy has a goal of a net zero carbon, water and waste-to-landfill campus by 2050 or sooner, led by a Director of Sustainability. Waste recycling is promoted; and sustainable water management is practised, but without effective monitoring and evaluation. Renewable energy use is low and green building standards are not prevalent. A pilot orientation course is being transformed into a 'sustainability literacy' course for all faculties. Recommendations: Increase energy efficiency and solar power on new green building projects. Increase training and promotion of waste recycling. Evaluate the pilot orientation course on sustainability.	
OVERALL	C- (42%)

Perceptions of Education for Sustainable Health Care Curricula

There was near-unanimous agreement that PH and SH principles and topics are increasingly important content for all UCT FHS disciplines, yet almost an equal acknowledgement that these principles are not taught and assessed enough, and are seldom demonstrated in practice.

"I think it's critical for students to be made aware because they need to know what the risk factors are, they need to know what we are facing every day and how that impacts healthcare… it's really important that students are educated about sustainable healthcare, that we're not living in a bubble, that there are other external variables, factors that influence our health" (PH01).

There is a growing awareness of sustainable practice in some UCT FHS clinical disciplines (e.g., nephrology, surgery, and medicine) that is being spurred on by global developments toward more sustainable clinical practice and decarbonized health care:

"*I have been quite involved in infectious diseases in nephrology globally and there has been quite a lot of interest in how infectious diseases are changing with climate change and how they affect kidney disease. Definitely there is a lot more we can do about understanding the effects of climate change on disease and trying to educate both our undergraduates and postgraduates*" (MED02).

Barriers to Education for Sustainable Healthcare Curricula

Curriculum overload was cited most often as a barrier to curriculum integration of ESH. Insufficient awareness and understanding of sustainability and its clinical applicability among faculty educators, "siloed" learning and timetabling, and a lack of "best practice" examples were also frequently cited.

"The nature of the curriculum, the different timetables for different years across different disciplines means that what should be a priority across years and across health sciences, different disciplines and beyond them is almost impossible to find a shared teaching space where this work could be done in a way that provided a core for all health sciences disciplines and then allowed specialization in people's particular callings" (PHC02).

A senior faculty leader noted the lack of systems thinking necessary to effectively address complex and interrelated environmental and health system and health-care challenges:

"Sustainable healthcare links to what I have a passion for, which is really understanding that everything operates in big systems. So even healthcare is just a portion of a broader health system that incorporates energy, water, sanitation, infrastructure, etc. I think that there's a big gap in a systems approach in understanding key aspects of environmental health and planetary health that needs to be addressed" (FHS01).

A clinician spoke of how the ethic of sustainability and the fair distribution of limited resources often conflicts with his duty of care to individual patients:

"Public health kind of clashes with surgical principles in a sense that you're very familiar with the principles of public health and the attempt for distributive justice, but obviously as a surgeon who encounters a sick patient, your duty of care is really to that individual to almost the exclusion of all other concerns" (GS04).

He also expressed concern about the vast amount of health-care waste of single-use devices and his view that there are powerful vested corporate interests opposed to reprocessing, which has prompted him and others to advocate for changing national policy on the reuse of such devices.

His colleague believes that their staff are aware of the non-sustainable practices that need to be changed, such as single-use items:

"But I think primarily when people look at reuse of items, it's to save money for things that they feel don't need to be single-use items because the companies don't really have any incentive to make them reusable items. And so many of our staff are looking at changing policies from a date-based expiry to event-based expiry. But that kind of approach needs to have some sort of evidence base behind it" (PH04).

Others spoke of how the need to cut costs and to deal with urgent challenges in the health system tends to marginalize environmental sustainability. A recently appointed academic head of division and experienced surgeon reflected on the effectiveness of the GGHH at Groote Schuur, the main academic teaching hospital of the UCT FHS and one of several provincial hospitals in SA to have adopted their global agenda (9).

"As an on-the-ground clinician, no idea. As a manager, I haven't been in the post for long, but I haven't heard much about it, so I'm not sure how much momentum there really is. My sense is that you see, we're firefighting every day, and because of that, people are not looking forward" (GS01).

Suggestions for Education for Sustainable Health Care Curricula

Several interviewees suggested the need for transdisciplinary and interfaculty approaches toward making sustainability a cross-cutting theme across all years of the study:

"I think it should be a much more visible part of our curriculum and it should start from 1st year and it should filter right across…and perhaps the assessment could somehow be linked to making changes on our campus" (HRS08).

More specific suggestions were to integrate ESH themes and topics into teaching and assessment of the Primary Health Care approach, which is a lead theme of the UCT FHS (17) and of the

International Classification of Functioning Disability and Health (ICF) framework (18), which is widely applied in the health and rehabilitation science disciplines. Opportunities for ESH were also noted in clinical training in surgery, medicine, family medicine, as well as continuing medical education courses:

"I guess it's just being intentional and making it a priority. I think everyone should be teaching a bit of planetary health basically across the disciplines" (GS02).

The need for a decolonial perspective was a common theme. This was evident in suggestions to include indigenous knowledge practitioners in curriculum design; to involve local environmental health activists in community-based teaching; to introduce small student-led environmental sustainability projects; and to include reflective assessments on personal agency for sustainability in local contexts. Recent initiatives toward decolonization of the HRS curricula were seen as opportunities for embedding environmental sustainability into teaching and practice:

"We've had a seminar and several workshops where we were thinking about what it means to decolonize the curriculum. And I think that we can't do that without talking about environmental sustainability as part of that. So, I think there are opportunities. To start thinking about how we embed this into our practices, rather than making it an add-on" (HRS06).

Environmental history-taking as a clinical diagnostic tool is included as a learning objective and learning activity in two undergraduate medical courses, yet they are not using the same conceptual framework. An educator in family medicine, therefore, suggested that these frameworks become standardized. A public health course convener believed there is insufficient depth in undergraduate teaching of PH and SH, due to limited curriculum time and space and possibly insufficient educator understanding of its relevance. She suggested more advocacy about the public health and clinical relevance of climate change, and the need for its integration into teaching:

"We need to advocate that planetary health concerns all of us, and there is growing awareness of climate change from media coverage that facilitates its integration. For example, in internal medicine, we can highlight the link to more pathology associated with climate change and

integrate it, rather than seeing it as something that needs to be taught separately. That's the key to teaching it better" (PH03).

Discussion

Development of Education for Sustainable Health Care Curricula

ESH is generally perceived by educators in the UCT FHS as important and relevant to public health and clinical practice, yet insufficiently taught and assessed. Examples of PH and SH topics from the MBChB and HRS programs were shared, which are generally taught and assessed through lectures, problem-based learning cases, assignments, and written examinations. These findings are consistent with a 2019 study in the UCT FHS of student knowledge and perceptions of climate change and environmental sustainability (14), as well as the findings from the national audit (10) and Delphi panel (12) phases of this mixed-method study.

The addition of open-ended questions to the PHRC to assess educators' perceptions of the barriers and opportunities for improvement enhanced its usefulness for informing curriculum developments in the UCT FHS. Chronic curriculum overload, "siloed" learning and timetabling, and low awareness among educators were perceived as key barriers to the integration of ESH in the UCT FHS, which are consistent with barriers in the international literature (8,19-21). The priority of cost-saving over an ethic of sustainability, as noted by some participants, supports the need for teaching responsible professionalism in an environmentally accountable medical curriculum, which includes resolving ethical tensions between one's duty of care to individual patients and advocacy for mitigating the impact of health care on the environment (21).

The necessity of transdisciplinary and interfaculty approaches is implied by the definition of planetary health (1) and the benefits are endorsed by international experience (2,22-24). The support for such approaches among UCT FHS educators is consistent with the preceding Delphi phase (12), which recognized strong leadership, capable educators, and multidisciplinary collaboration as enablers of ESH integration into HPE in SA. This requires the capacity development of leaders and educators in health-care institutions and faculties of health sciences, as called for by the AMEE consensus (8) and the 2023 Association of Faculties of Medicine of Canada (AFMC) Declaration on Planetary Health (3). Teaching clinical educators about SH practice

in clinical contexts was recommended by several participants, to build on the growing interdisciplinary awareness and global availability of educational and curriculum resources for ESH (8,25,26).

It was also recommended that UCT FHS educators should include community leaders and environmental health activists to assist in integrating indigenous ecological knowledge and values into curriculum design and delivery (8, 27), which is consistent with intentions in the UCT FHS to decolonize its curricula by including diverse voices, perspectives, and knowledge traditions. Curricular decolonization and education for sustainable development share the goal of global well-being and the common good, leading educational researchers in SA to posit that both "*are equally necessary for institutional and broader societal reform and well-being, and that both imperatives may potentially be achieved by focusing on the principles of epistemically diverse curricula*" (28). They have therefore called for academic staff development to prioritize curriculum knowledge and design, and for decolonization, social accountability, and global sustainability to be promoted as similar cross-cutting curriculum imperatives.

Curricular change can be difficult to achieve (21,29), but success is associated in the literature with a consistent set of institutional characteristics (30). These characteristics relate to context (e.g., compatibility with an institution's mission, goals, and educational philosophy; internal networking, resource allocation, and its relationship with the external environment; and its organizational structure); curriculum (e.g., agreement on the need for change; balance in the scope; and complexity of the innovation); and process (e.g., a cooperative climate; good participation and ownership; clear communication; capacity development; valid and formative evaluation; and stable, participative, and visionary leadership). Many of these characteristics were addressed by the other aspects of the PHRC at the UCT FHS, which recommended more community engagement, student leadership development, collaborative research, and campus sustainability interventions related to PH and SH.

Limitations of the Study

Potential sources of bias include the selection of interviewees by the lead author alone, as well as the aggregation of the PHRC scores and summaries of the interviews, and the summary of the

key findings for the PHRC report, due to the co-authors' time constraints. All UCT FHS interviewees, however, were offered the opportunity to review their interview summaries, and the summary report was shared with the local PHRC student team and with the global editors for checking before publication. The findings of the PHRC have also been shared through multiple presentations in the UCT FHS and with the ESH SIG of SAAHE. These have been opportunities to clarify certain aspects and to communicate the key findings to stakeholders in curriculum development, community engagement, and campus sustainability.

Conclusions

This study has provided a first baseline assessment of PH and SH in the curricula, community engagement, student leadership, research, and campus sustainability of the UCT FHS by means of a metric-based scorecard from the global PHRC initiative. Almost all interviewees recognized the growing importance of ESH, but that current teaching and assessment in the UCT FHS are insufficient and impeded by several barriers. Curriculum overload, "siloed" learning, poor understanding among educators, health system challenges, and insufficient leadership were most often mentioned. It was proposed that PH and SH be integrated as a longitudinal theme across all curricula and disciplines, in collaboration with educators and students.

The PHRC has proved useful for this study and for facilitating subsequent discussion with audiences of key stakeholders in the UCT FHS. The PHRC should be repeated in the UCT FHS every 2 years at least to measure and evaluate progress across all categories. Additional indicators of progress in curriculum integration of SH and PH could be the insertion of related learning objectives and outcomes; multiprofessional and collaborative learning activities; and the quantity and diversity of student-centred and community-engaged assessments.

Integration of PH and SH into undergraduate health sciences curricula in LMICs could develop the agency of health professionals to protect health from climate change and planetary degradation and to contribute to low-carbon and climate-resilient health systems. The crises of climate change and environmental degradation demand new ways of collaboration across the whole gamut of society, and the health sector and faculties of health sciences have leading roles to play.

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Addendum to Chapter 5: Other Aspects of the PHRC

The following paragraphs discuss the non-curriculum findings of the PHRC, which are referred to in the discussion of the proposed conceptual framework in Chapter 6. They relate to the conceptualisation of environmental accountability and the role of faculty leaders in creating a holistic environmentally sustainable institution. They were omitted from the journal publication on the recommendation of the reviewer due to restrictions on the word count.

Community Engagement for Planetary Health

An explicit goal of the draft UCT FHS Strategy 2023 - 2025 and Beyond ('FHS Strategy') is Social Accountability, Alliances and Partnerships, for enhancing service delivery and other forms of social accountability to address health and its structural and social determinants (1). It is suggested that this goal also encompasses environmental accountability, which is consistent with a broader understanding of social accountability for HPE institutions (2-5). More active community partnerships that address environmental health threats are aligned with this goal, including accessible health promotional materials about climate-health impacts. Existing student health promotion projects in the FHS could therefore address climate- health impacts too, and community-based mitigation with simultaneous co-benefits for individual and environmental health.

Student Leadership for Planetary Health

The poor support for student-led initiatives on planetary health is certainly not unique to the UCT FHS (6). Another goal of the FHS Strategy (Curriculum, Mentorship and Student Support) includes '*broadening academic perspectives, stimulating social consciousness, and cultivating critical citizens of staff and students*', which seeks to build the capacity of students as critical citizens, as postgraduate researchers, and global public health practitioners, with dedicated funding support (1). The team of student interviewers reported increased understanding of sustainability in the curriculum, and developing skills in teamwork, interviewing, and report-writing from their participation in the PHRC (7). Further recruitment and mentorship of students as advocates for ESH within the FHS and the global PHRC movement is being undertaken to produce student leaders for future iterations of the PHRC in the UCT FHS and other SA faculties.

Research for Planetary Health

Providing funded research opportunities in planetary health, in partnership with local and international partners, would help to improve the score for the PHRC Research category, and to realise the FHS Strategy goal of capable graduates within global public health (1). Active involvement of FHS researchers is therefore recommended within UCT's existing *Khusela Ikamva Sustainable Campus* project (8) and its African Climate and Development Initiative (ACDI) (9) for promoting collaborative research and training in climate change and development across campus.

Campus Sustainability

Campus sustainability initiatives are guided by UCT's Environmental Sustainability Strategy, in keeping with the university's 2030 Vision for social, financial, and environmental sustainability (10). Interviewees associated with the UCT Office of Environmental Sustainability expressed willingness to collaborate with the FHS on its sustainability initiatives, which although underway for several years, have, in the opinion of many interviewees, had variable success. Waste recycling and water saving were the most common examples cited, which were seen to require university-wide systemic interventions along with ongoing awareness and promotion. The international and locally adopted GGHH Agenda (11) could be a helpful tool for application to clinical educational settings, and to include in assessment of experiential learning on campus.

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CHAPTER 6 Discussion

This chapter analyses the overall findings of the mixed methods study and evaluates its achievement of the aim and objectives of the thesis. The applicability of the conceptual framework for assessing environmental accountability in HPE institutions is discussed. An extended framework for guiding ESH curricular development is presented, which integrates recommendations for faculty leaders and educators within six focus areas, adapted from the AMEE Consensus Statement, and within the three domains of the CPU model. The key barriers and enablers of ESH identified by this study are also included, along with examples from the UCT FHS case study of opportunities that may have wider applicability. The chapter concludes with a discussion of the study limitations.

Analysis of Findings

The aim of this thesis was to increase the understanding of the opportunities and barriers to ESH in undergraduate HPE in SA and specifically at the UCT FHS. A mixed methods study design of three sequential phases was employed to address four study objectives.

The first phase of the study, a questionnaire survey of ESH-related teaching and learning activities in all SA HPE faculties (Chapter 3), addressed the first objective of the thesis, to assess the status of ESH-related teaching and learning activities in all SA faculties of health sciences (1). It found that ESH awareness and curriculum development are emerging, although with a limited variety of learning activities and forms of assessment. The survey method was appropriate and feasible for this phase, despite some challenges in achieving a good response rate. It facilitated access to an emergent community of ESH practice in SA via extensive networks of HPE educators, and it helped to identify expert health professional educators for the subsequent Delphi panel. The author's role as national convener of the ESH SIG within SAAHE facilitated the process of recruitment, follow-up, data collection, and prompt feedback to survey participants.

In the second phase (Chapter 4), a national Delphi panel of health professions educators addressed the second thesis objective, to assess the applicability to HPE in SA of ESH learning objectives, activities, and assessments suggested by the AMEE Consensus (2). The panelists were in favour of the Consensus suggestions, and they proposed three additional learning objectives

to help contextualize ESH in SA. They agreed that learning activities and assessments should be authentic, multiprofessional, and should require systems thinking. Each of the 16 learning objectives, suggested by AMEE and the panel, was matched against enabling competencies of the AfriMEDS framework for medical, clinical associate, and dentistry undergraduates in SA (3). The matching related the objectives mostly to competencies of the AfriMEDS-defined roles of Leader and Manager, Communicator, and Healthcare Practitioner. This highlights the need for skills in leadership, management, and communications among graduates entrusted to protect individual and public health from climate and environmental degradation (4). Integrating ESH learning objectives within the AfriMEDS framework may facilitate their adoption and alignment with appropriate learning activities and assessments, especially where AfriMEDS has been used as a basis for core graduate competencies. Furthermore, including environmental accountability in a CanMEDS-based instrument that has successfully evaluated medical student perceptions of key social accountability competencies at UCT FHS (5), may also facilitate national ESH curriculum development with student participation. Student feedback has been shown to be essential to helping faculties produce socially and environmentally accountable graduates who are well prepared to serve the needs of their communities (6).

The Delphi panel also achieved the third objective of the thesis, to assess the perceptions of national health professions educators about the opportunities and barriers to ESH in SA. Strong faculty leadership and ESH advocates, capable and passionate educators, and multidisciplinary collaboration in curriculum development, were all considered necessary to overcome perceived barriers of curriculum overload, “siloed” disciplinary learning, and a lack of capable educators. The Delphi process was appropriate and effective due to good co-operation from the panelists, adherence to the timeframes, and timeous feedback on outcomes of both rounds and the final discussions.

The fourth thesis objective, to assess perceptions of UCT FHS educators about the opportunities and barriers to ESH in the FHS, was achieved by the third and final phase of the study (Chapter 5). A standardised global instrument, the Planetary Health Report Card (PHRC), was used to conduct a baseline assessment (7). The PHRC included five categories, namely curricula (the primary focus of this thesis), community engagement, student leadership, research, and campus

sustainability. Interviewees recognized the growing international importance of ESH, and perceived that teaching and assessment are impeded by insufficient leadership, low ESH capacity among educators, curriculum overload, few opportunities for multidisciplinary learning, and challenges in the health system. Longitudinal integration of ESH across all disciplinary curricula was recommended, in collaboration with multidisciplinary educators and students. ESH-related learning outcomes and objectives, diverse multidisciplinary learning activities, and student-centred and community-engaged assessments, were identified as key indicators of ESH curricular development.

The PHRC instrument successfully and efficiently assessed FHS curricula, as well as the other four categories. Data collection was facilitated by good support from the deputy dean for education in the FHS, and good co-operation from PHRC participants. The author's institutional knowledge and participation since 2003 in FHS curriculum development and teaching (albeit mostly within the medical curriculum), and a core of voluntary student co-interviewers, enabled timeous completion of the PHRC. Furthermore, the author's participation during 2022 in the FHS Educational Leadership Fellowship programme for building educators' capacity for curriculum transformation (8), facilitated recruitment of educator peers for the PHRC.

The participation of the UCT FHS in the PHRC confers membership of an active and international community of ESH practice (9). This could assist in setting priorities for follow-up action and for the ambitions of repeat PHRC assessments, with active student involvement for successful curriculum change (6, 10, 11). UCT is the first institution from Africa to participate in the PHRC. Two of the PHRC student team subsequently joined the African PHRC leadership to support baseline PHRC assessments in 2024 by three other SA faculties. The PHRC could be extended to other LMICs by capitalizing, for example, on significant LMIC involvement in the WHO's Alliance for Transformative Action on Climate and Health (ATACH), which is developing health workforce capacity for climate-resilient and sustainable health systems (12). Advocating for SA to join ATACH too may help to advance the agenda of ESH nationally and elsewhere, with the benefit of WHO's extensive experience in the climate and health capacity development of health workers (13, 14). Furthermore, supporting other African countries to participate in the PHRC can ultimately help to integrate ESH into African HPE curricula (15).

In conclusion, the mixed methods study design, methods, and study participants described above were appropriate to meet the aim and objectives of the thesis, and active student involvement in the UCT PHRC has helped to extend the African PHRC movement. The experience of this study could inform ESH curriculum development in the UCT FHS, and in SA and other LMICs.

A Framework for Assessing Environmental Accountability in Health Professions Education Institutions

The conceptual framework of this thesis was derived from the Conceptualisation, Production and Usability (CPU) model for socially accountable medical schools (16) to assess how HPE institutions could also conceptualise environmental accountability, educate about PH and SH, and prepare their graduates to be socially and environmentally accountable to the communities they serve (Figure 2.7). The CPU model was selected because it is derived from the foundational definition of Social Accountability by Boelen and Heck that was adopted by the World Health Organisation in 1995 (35). The model was also the subject of a Global Consensus on Social Accountability of Medical Schools held in South Africa in Dec 2010 (36) and a UCT FHS workshop with Charles Boelen shortly before. Boelen has also published the Social Obligation Scale (Fig. 2.4), which has been used in the FHS to distinguish social accountability from the related concepts of social responsibility and social responsiveness (37).

Furthermore, Pearson et al (2015) used the WHO definition above to argue that professionalism and social accountability should encompass responses to increasing environmental and social challenges, and that the emerging concept of environmental accountability should therefore be integral to the social accountability of health professions education (38). They also cited as two recent examples, the social accountability framework of the Training for Health Equity Network, or THENet (39), and the ASPIRE initiative of the International Association for Health Professions Education (40). The Health Professions Council of South Africa derived the social accountability criteria for their *Self-Assessment of Faculties* questionnaire (41) from a South African adaptation of THENet framework (42). The ASPIRE criteria for social accountability specifically include environmental accountability; therefore, an ASPIRE Award does recognise international leadership in social and environmental accountability (40).

The CPU model was a rational and relevant basis for the conceptual framework of the thesis; in addition, two other widely used social accountability frameworks (THEnet, and ASPIRE) have informed the recommendations below. A recent review by Wood et al (2022), provides a comparison of other theories, models, and frameworks of social accountability in health professions education, which could inform future conceptualisation and understanding of social and environmental accountability in the UCT FHS (43).

Some key related questions, adapted from Boelen and Woollard (2009), for assessing progress towards environmental accountability (16), perhaps by means of an institutional review, are shown in Table 6.1. Within the domain of Conceptualisation, an assessment could be made of how well the principles of PH and SH are reflected in the faculty's vision and mission, in its health professional graduate profiles, in its engagements with key partners in the health service and in the communities served, and in its governance structures, processes, and allocation of resources. Within the Production domain, the integration of PH and SH themes and topics into the institution's graduate competencies, learning outcomes and objectives, learning activities, and assessments would be important. For assessing the Usability of its graduates, a review should assess how the faculty promotes understanding among its strategic health service and community partners of linkages between health and healthcare and the environment, and how well the competencies of its graduates as leaders, managers, communicators, and practitioners of SH are recognised and valued in the health system. Such recognition would empower graduates as effective change agents in mitigating climate-health impacts and adapting health systems in line with climate-health policies and plans. Including some of these key questions about environmental accountability in the HPCSA assessments of social accountability in South African faculties may be worthwhile and feasible.

Table 6.1. Questions for evaluating faculty progress towards environmental accountability (adapted from Boelen & Woollard, 2009)

Domains of CPU model	Key questions for evaluating progress towards environmental accountability
Conceptualising the environmentally accountable faculty and graduate	How well does the faculty reflect environmental accountability in its vision, mission, core graduate competencies, community engagements, health service partnerships, governance structures and processes, and in its allocation of resources?
Producing graduates as change agents for sustainable healthcare	How well does the faculty integrate the principles of planetary health and sustainable healthcare into learning outcomes and objectives, learning activities, and assessment practices that are well aligned in all its educational programmes?
Ensuring the **Usability** of graduates for practising environmentally sustainable healthcare, and protecting public health from environmental degradation and climate change	What is the faculty is doing to ensure that the health services and communities it serves recognise the value of their graduates in promoting understanding of how health and healthcare and the environment are interlinked, of how to mitigate climate and public health impacts, and of how to help the health system adapt according to local and national climate-health policies and plans?

However, although the CPU model may be helpful for understanding and guiding the assessment of environmental accountability at an institutional level, it is not specific enough for the development of ESH curricula to produce graduates as competent change agents for sustainable healthcare. A framework is therefore proposed below to better guide faculty leaders, educators, and developers of integrated ESH curricula.

An Integrated Framework for ESH Curricular Development

A framework for the development of ESH curricula is presented in Table 6.2 below and is concept mapped in Supplementary Figures 6.1.1 to 6.1.3 (Appendix 15) and in Supplementary Figure 6.1.4 (Appendix 16). It integrates suggestions for implementing ESH, adapted from the AMEE Consensus (18), into the CPU model (16). Nested within the three CPU domains are six focus areas and related enabling actions by faculty leaders and educator. The framework also includes key barriers and enablers of ESH integration, and examples of current opportunities in the UCT FHS, that were findings of this study (2, 7). These are all discussed within each focus area (and domain) below, as well as potential applications to HPE in other LMICs.

Eco-ethical leadership (CONCEPTUALISATION)

Strong, capable, and accountable leadership was identified by the Delphi panelists and UCT FHS educators as a key element of ESH curricular development, due to common barriers of HPE institutional leadership with little understanding of ESH, and of few advocates and role models of ESH (2, 7). Eco-ethical leadership, characterised by values-based and systems thinking approaches to ecological impacts on health and healthcare systems (19), is therefore an appropriate first focus area of recommended actions, falling within the CPU domain of Conceptualising the environmentally accountable faculty and graduate.

A priority recommendation from both the AMEE Consensus (18) and international Academic Health Institutions' Declaration on Planetary Health (20) is that institutional leaders should publicly commit to advance planetary health and environmentally sustainable healthcare. For this commitment to have true integrity, PH and SH principles should be reflected, at least, in the faculty's mission, strategies, core graduate competencies, and in its governance of social and environmental accountability. Senior faculty leaders should ensure that there are well-aligned plans for promoting environmental sustainability within all aspects of the faculty.

Educators and advocates for ESH could undertake a baseline assessment of PH and SH with key role players in their faculties, using a standard instrument such as the PHRC (9). Importantly, these assessments should be widely shared with their peers to jointly identify multidisciplinary opportunities and develop plans for ESH curricular integration. Global communities of ESH

practice, such as the PHA and GCCHE, could assist with course examples and educational resources for ESH (21, 22).

There are several significant and promising opportunities for eco-ethical leadership within the FHS, despite institutional budget austerity constraints. Firstly, a major ongoing curriculum transformation process led to the launch in late 2023 of multidisciplinary workstreams, including one to review FHS graduate competencies and curricular integration, which could include an ESH task team. Secondly, the recent establishment of a faculty-wide Social Accountability Working Group is an opportunity to integrate environmental accountability into all aspects of the FHS. Thirdly, a newly formed Environmental Sustainability Working Group of FHS educators, students, and institution-wide managers will be following up the campus sustainability recommendations of the FHS PHRC.

The recommendations for the FHS with respect to all four non-curriculum aspects of its PHRC assessment are presented in the Addendum to Chapter 5. These support the development of a comprehensive understanding and practice of environmental responsibility, responsiveness, and accountability, analogous to the gradients of the Social Obligation Scale of HPE institutions (23). Furthermore, the AMEE Consensus recommended that faculty partnerships should meaningfully include indigenous peoples and those disproportionately impacted by climate and environmental breakdown (18). Specific suggestions from FHS PHRC interviewees included hosting educator workshops on decolonizing curricula, involving indigenous knowledge practitioners in curriculum design, and having environmental health activists participate in community-based teaching (7). These and the other opportunities described above for the FHS may be instructive for HPE institutions elsewhere. Particularly where institutions face resource constraints on their social and environmental accountability initiatives, this study supports a greater need for visionary and committed leadership to advocate for the significant long-term benefits of investments in environmental sustainability.

Educator capacity development (CONCEPTUALISATION)

This study found that educational capacity in ESH is urgently needed to address the lack of capable educators, who often face competing demands for time and curricular space (2, 7). A

cohort of capable trainers of ESH educators, supported by HPE leadership within an active community of ESH practice, was perceived as an important enabler of ESH by the Delphi panel (2). Faculty leaders should therefore adequately resource the training of ESH educators in their institutions and identify opportunities with health service managers for continuing professional development in sustainable healthcare.

Faculty educators should initiate discussions with their peers about the opportunities and enablers of ESH within and across disciplines, and how to plan for curricular integration. They could offer to co-host departmental workshops, for example, to develop understanding of what ESH is, why it is important, how it may be integrated, and of ESH resources that could be readily adapted to their contexts.

Within the UCT FHS, the Educational Leadership Fellowship programme, with active support from its senior leadership, has developed the capacity of a cohort of educators to enable curriculum transformation (8). This programme has created opportunities for various curricular projects such as the PHRC (7), which has been widely shared in the FHS. It has also been shared via provincial, national, and regional webinars to support the call for the integration of ESH into HPE curricula in Africa (15). The call also supports the development of ESH educator capacity, and it further recommends that ESH innovation be incentivised by national education and accreditation bodies, and by health professional associations.

Identifying opportunities for ESH integration (PRODUCTION)

Identifying opportunities for ESH integration is a first step in educating and producing environmentally responsive and accountable graduates. Barriers of overloaded curricula, “siloed" learning, and biomedical biases against sustainability and systems thinking were often cited by study participants (2, 7). Committed and capable ESH educators, and feasible plans for curricular development with good participation by multidisciplinary educators and students, were seen as key enabling factors of ESH. These findings are consistent with international literature (4, 24, 25).

Faculty leaders should therefore support and resource the development of a collaborative strategy and plans for integrated ESH curricular development. Educators should develop curriculum maps of ESH learning outcomes, objectives, activities, and assessments to identify

current and potential opportunities for integration, supported by expert advice and educational resources from communities of ESH practice.

Within the UCT FHS, a map of its medical curriculum has been drafted to identify potential opportunities for ESH integration and to assist a recently established ESH task team with setting priorities. HPE institutions elsewhere could also capitalize on the opportunities presented by periodic curriculum reviews and capacity development initiatives to update their curriculum maps and to identify opportunities for ESH integration across their programmes.

Testing new ESH learning activities and assessments (PRODUCTION)

Once opportunities for ESH integration have been identified, the focus turns to testing and evaluating new ESH learning activities and assessments. Overloaded curricula, with few opportunities for multidisciplinary learning, have been identified by this study and others as major barriers to ESH (4, 7, 24). Another barrier found by this study was little capacity and experience in creating valid and innovative ESH learning activities and assessments, which requires capable multidisciplinary and student teams to design and test. Faculty leaders should therefore support innovation and excellence in curriculum development, both multidisciplinary and transdisciplinary collaboration, and curriculum responsiveness to new educational developments. Educational task teams should design and test and timeously evaluate new ESH learning activities and assessments, informed by any existing baseline assessments and curriculum maps.

Selective or elective curricular components may be feasible places to start testing, since it is likely that wider choices and fewer students per component can facilitate quicker innovation, genuine multidisciplinary involvement, and more specific evaluations. At the UCT FHS, for example, mid-level medical students select four-week Special Study Modules from a diverse range of topics and methodologies, such as literature reviews, and quantitative and qualitative research projects. Senior medical students undertake electives in clinical medicine or public health or research, which are mostly self-initiated, or offered by the faculty or by its health service or community partners. An innovative Special Study Module about *Planetary Health Education and Indigenous Knowledge Systems (IKS)* for five third-year medical students in July 2024, was developed as an

example of integrating ESH into the UCT MBChB curriculum. It included visits to significant heritage sites of the indigenous San people of the Western Cape province, guided by expert indigenous educators. It also required the students to co-design planetary health curricular components, using educational resources from the Planetary Health Alliance (PHA). These proposals included one for spiral integration of Planetary Health and IKS in the MBChB, and another for an elective in sustainable healthcare in private, public, and traditional healthcare facilities. These and other proposals are being developed further by an ESH task team to start implementation in 2025, with capacity development grant funding from the faculty. Similar options could be tested and evaluated at relatively low cost in HPE institutions elsewhere.

Longitudinal integration of ESH themes and topics (PRODUCTION)

Perceived barriers from this study to the longitudinal integration of ESH themes and topics included minimal space for new curricular content, few multidisciplinary opportunities, and lack of capacity in developing spiral curricula (2, 7). Conversely, core graduate competencies that include PH and SH, and multidisciplinary teams to oversee the integration and alignment of appropriate ESH learning outcomes, objectives, activities, and assessments, were perceived as key enablers.

Faculty leaders should therefore support multidisciplinary curriculum development teams, and join the faculty to communities of ESH practice. Faculty educators should direct the integration of ESH themes across all curricula within the curriculum development teams, by adapting and constructively aligning ESH learning outcomes, objectives, and activities with diverse assessment approaches. The Planetary Health Education (PHE) framework could provide the basis of longitudinal ESH themes and topics, and lessons from its international application could inform a more compassionate, knowledgeable, and reflective educational praxis (9, 26, 27). The PHE framework could also promote ESH capacity development within faculties by establishing a common understanding of the importance, relevance, and integration of planetary health into HPE curricula.

Successful curriculum change is enabled by its compatibility with the mission and educational philosophy of institutions, and by the extent of good stakeholder participation and

communication, capacity development, and by visionary and inclusive leadership (28). A distinguishing philosophy of the UCT FHS is the equity based PHC approach, which has been continually developed and evaluated over the past three decades (29, 30). Therefore, integrating ESH into PHC teaching and assessment in the FHS, as suggested by several PHRC participants, would be consistent with two of nine faculty indicators of PHC that include social accountability ("*The teaching philosophy and practice embodies core values of social accountability e.g. respect for dignity and rights of learners and patients, social justice"*; and "*The education programme, including curriculum content, reflects priority health and social needs of the communities served"*) (30). Integrating environmental accountability into social accountability governance in the FHS, and ESH into its curricula, could therefore strengthen the PHC approach. Environmental accountability and ESH could in turn be strengthened by PHC-promoting measures in the FHS, such as PHC principles that inform the strategic plan of the FHS, its educator training, and engaged partnerships with health services and communities (29). The International Classification of Functioning, Disability and Health framework, or ICF (31), was also suggested by some participants for integrating ESH within health and rehabilitation sciences in the FHS, where it has long been part of their curricula. The ICF includes natural and anthropogenic changes to the environment among the contextual factors that affect individual functioning and disability, and therefore offers opportunities to examine the role of rehabilitation professionals in addressing the impacts of climate change and environmental degradation on their practice (32). In conclusion, the recommendations above for integrating ESH within the PHC approach and ICF teaching framework in the FHS have global applicability in a world of growing inequities, especially in LMICs that are usually most affected by climate and environmental impacts on health (10, 33).

Ongoing collaboration, development, and evaluation of ESH (PRODUCTION and USABILITY)

The continual development and evaluation of ESH is necessary for both the production of eco-ethical and environmentally accountable graduates and future leaders, and for their optimal utilisation within the health services and communities they serve. The sixth and final focus area therefore spans the Production and Usability domains of the CPU model. This study found that there are few valid and locally applicable indicators for evaluating ESH outcomes, and that time

and resource constraints create tensions between health professionals' duty of care to the individual patient versus an ecological ethic to utilise resources equitably and sustainably (2, 7). The inclusive development of valid and feasible indicators, evidence-based curriculum reviews at regular intervals, and working with strategic health service and community partners, are therefore important enablers of collaboration, development, and evaluation of ESH.

Faculty and health service leaders should therefore jointly promote common understanding of linkages between health and healthcare and the environment. They should also work to enhance recognition within the health service of graduate competencies and skills as leaders, managers, communicators, and practitioners of SH. Faculty leaders should foster a culture of evaluation and accountability, and should commit to continual curriculum development and transformation. They should encourage movement-building and policy advocacy in the educational, health, and related sectors, demonstrated by a commitment to support planetary health action by health professionals and their organizations. Faculty and health service leaders should also support the integration of environmental sustainability knowledge, skills, and values into health professional standards, and into the supervision, assessment, and progression of health professional trainees. This could be evaluated using indicators of longitudinal integration of ESH, and of environmental accountability across all domains of the CPU model, as suggested by Figure 2.3 (The CPU framework: Domains, Sections, and Items), for example. Applying for an institutional ASPIRE to Excellence Social Accountability Award, for example, would demonstrate leadership in social and environmental accountability and could help to raise the aspirations of other faculties (34). Faculty educators, for their part, could evaluate progress and help develop indicators of ESH integration within their faculties and health service partners. Sharing these evaluations within communities of ESH practice would enable mutual learning and continuous quality improvement.

There are currently few examples within this focus area from the UCT FHS, however. The ongoing curriculum transformation process should therefore seek to align core graduate competencies in PH and SH with its desired profiles of health professionals, with priority environmental and social needs of communities served, and with environmental sustainability in healthcare. Faculties everywhere should work for a healthcare system that values and prioritises environmental sustainability, and for partnerships characterised by mutual learning, respect, and social and

environmental accountability. The potential to influence the planning, production, and deployment of graduates able to respond to priority health needs and health system challenges should be a benchmark of excellence in HPE (23).

Table 6.2. A Framework for Guiding ESH Curricular Development

CPU Domain	ESH Focus area	Barriers to ESH integration	Enabling factors for ESH integration	Recommendations for faculty leaders	Recommendations for HPE educators	Opportunities within UCT FHS, 2024-2030
1. CONCEPTUALISING the environmentally accountable faculty and graduate	**1. Eco-ethical leadership**	Leadership with little understanding or appreciation of ESH; few ESH advocates or role models	Environmental Sustainability: Publicly commit faculty to advance planetary health and environmentally sustainable healthcare (e.g. in its mission and vision; governance; graduate pledges). Provide leadership on a strategy for integrated ESH curricular development, and for emotional resilience to address 'eco-anxiety' about ecological impacts. Lead on sustainability in faculty research, and in campus operations and services. Join the faculty to a community of ESH practice and support an intra- faculty ESH community.	Environmental Sustainability: Publicly commit faculty to advance planetary health and environmentally sustainable healthcare (e.g. in its mission and vision; governance; graduate pledges). Provide leadership on a strategy for integrated ESH curricular development, and for emotional resilience to address 'eco-anxiety' about ecological impacts. Lead on sustainability in faculty research, and in campus operations and services. Join the faculty to a community of ESH practice and support an intra- faculty ESH community. Partnerships: Develop environmental accountability to health service and community partners, including indigenous peoples and those most vulnerable to ecological impacts.	Environmental Sustainability: Conduct a baseline assessment, using a standardised instrument (e.g. PHRC) with key faculty role players. Recruit a team to develop and implement plans and indicators. Repeat assessments to evaluate progress at appropriate intervals. ESH: Present the ESH assessment to faculty leaders and key educators. Identify key barriers, enablers, and opportunities. Plan for curricular integration within all disciplines. Participate in communities of ESH practice (e.g. PHRC; PHA; GCCHE; SAAHE).	Establish an ESH task team within the Curriculum Transformation workstreams. Include environmental accountability in the Terms of Reference of the FHS Social Accountability Working Group. Recruit students and educators for the FHS Environmental Sustainability Working Group of Operations, Properties & Services managers across UCT.

1. CONCEPTUALISING the environmentally accountable faculty and graduate	**2. Educator capacity development**	Lack of capable and interested educators in ESH; staff shortages; competing curricular demands	Capable and passionate trainers of ESH educators, supported by faculty, and a community of ESH practice;	Support capacity development in the faculty by recognizing ESH advocates and resourcing training courses for ESH educators. Identify opportunities for continuing professional development in sustainable healthcare with health service managers and clinician educators	Share a baseline assessment of ESH with key educators to identify the barriers, enablers, and opportunities for ESH within their disciplines, and plan for curriculum integration. Use opportunities at departmental and divisional levels (workshops, journal clubs) to explain what ESH is, why it is important, and how it may be integrated into education and training and continuing professional development. Join a community of practice to share examples of ESH competency frameworks, multi-disciplinary curricula and courses, and ESH training opportunities.	The Educational Leadership Fellowship created a cohort of curriculum developers. The PHRC has been shared with the FHS and beyond. An intended ESH task team will engage with educators about ESH within their practice, offer to co-host ESH workshops or journal clubs, and share ESH resources and opportunities.

2. PRODUCING competent graduates for sustainable healthcare	**3. Identifying opportunities for ESH integration**	Overloaded curricula; siloed learning; and a biomedical bias against sustainability and systems thinking.	Experienced, committed, and capable educators; multidisciplinary collaboration; active student participation; comprehensive and up-to-date curriculum maps; ambitious yet feasible strategies and plans with good 'buy-in'.	Support and resource the development of a strategy and plans for integrated ESH curricular development with multidisciplinary educators and students, based on continually updated curriculum maps.	Implement collaborative plans for integrated ESH curricular development. Develop curriculum maps of current ESH learning outcomes, objectives, activities, and assessments; and identify opportunities for ESH integration. Seek support as needed from a broader community of ESH practice.	Create a multi-disciplinary ESH task team to identify ESH integration opportunities and develop plans; recruit student participants via the PHRC interest group. Update outdated curriculum maps or develop new ones for all curricula.
2. PRODUCING competent graduates for sustainable healthcare	**4. Testing new ESH learning activities and assessments**	Overloaded curricula; few opportunities for inter-disciplinary learning; lack of capacity and experience in creating valid and innovative activities and assessments.	Experienced, committed and capable educators; multi-disciplinary collaboration; active student participation; comprehensive and up-to-date curriculum maps; valid evaluations and timeous feedback on innovations	Actively encourage and recognise innovation and excellence in ESH curriculum development, multi- and transdisciplinary collaboration, and curriculum responsiveness to new developments.	Identify opportunities with multidisciplinary educator and student advocates to design and test and timeously evaluate new ESH learning activities and assessments, informed by any baseline assessments and curriculum maps of ESH.	An ESH task team will oversee ESH innovations, evaluation & feedback for future ESH development. The Special Study Modules (MBChB year 3) and Electives (MBChB years 5&6) will offer PH and SH options. Evaluations will be shared with FHS to inform a

						repeat PHRC assessment in 2025/26.
2. PRODUCING competent graduates for sustainable healthcare	**5. Longitudinal integration of ESH themes and topics**	Overloaded curricula; few multi-disciplinary opportunities for longitudinal integration; lack of capacity in creating spiral curricula; non-existent, incomplete, or outdated curriculum maps.	PH and SH are included in core graduate competencies; multidisciplinary teams oversee longitudinal integration of ESH themes and the alignment of learning outcomes, objectives, activities, and assessments. A community of ESH practice advises on resources and examples of best practice.	Establish and support multidisciplinary curriculum development teams to direct longitudinal integration of curricular themes and to ensure constructive alignment. Support development of curriculum design capacity and the sharing of experiences within a community of ESH practice.	Work with multidisciplinary curriculum development teams to direct the integration of ESH themes across all curricula. Constructively align ESH learning outcomes and objectives and activities with diverse assessment approaches. Review applications of the Planetary Health Education (PHE) framework and others.	An ESH task team leads longitudinal ESH integration and ensures that it is sustained in FHS curriculum governance. The PHC Approach and ICF frameworks provide opportunities for ESH linked to well- established principles of equitable, holistic, contextualised, interdisciplinary

						and intersectoral care, and health promotion.
2. PRODUCING competent graduates for sustainable healthcare	**6. Ongoing collaboration, development, and evaluation of ESH**	Few valid and locally applicable indicators of ESH integration; time and budgetary and staff constraints in faculties and health services	Collaborative development of valid and feasible indicators; a commitment to evidence-based curriculum revision and development	Foster a culture of evaluation and accountability within the faculty. Demonstrate a commitment to the foundational principles of curriculum development and transformation. Encourage and incentivize faculty to contribute to movement-building and policy advocacy in the educational sphere and beyond. Evaluate progress against targets agreed with FHS partners and key stakeholders, and share lessons learnt with communities of ESH practice.	Review and evaluate progress bi-annually towards integration of ESH, including the perceptions of educators and students. Help to develop and test indicators of longitudinal integration of ESH within the faculty. Share examples and evaluations for mutual learning within communities of ESH practice.	Ensure that core graduate competencies in sustainable healthcare that are aligned with the expected roles of the health professional, the needs of the communities served by the faculty, and the needs and values of the healthcare system.

3. Ensuring USABILITY of graduate skills within society	**6. Ongoing collaboration, development and evaluation of ESH**	Few valid and locally applicable indicators of ESH integration; lack of 'buy-in' from health service partners; time and budgetary and staff constraints in health system. Tensions between professionals' duty of care to the individual versus their eco-ethical duty to equitable and sustainable resource use; and budget austerity versus environmentally sustainable choices.	Faculties working with strategic health service and community partners to promote linkages between health and healthcare and the environment; and to enhance the value and recognition given in the health system to graduate competencies and skills as sustainable healthcare leaders, managers, communicators, and clinicians.	Publish a faculty commitment to support planetary health action by health professionals and health professional organizations. Recognize environmental sustainability as a core competency of health professional graduates. Call for environmental sustainability knowledge, skills and values to be integrated into all health professional standards, and for ESH to be included within the supervision, assessment, and progression of health professionals in training. Support the development of indicators of longitudinal integration of ESH by educational institutions and training providers within health services. Apply for an ASPIRE to Excellence Social Accountability Award of AMEE, to demonstrate leadership in social and environmental accountability, and a commitment to improvement.	Support the development and testing of indicators of longitudinal integration of ESH within the faculty and its health service partners.	Work collaboratively for a healthcare system that values and prioritises environmental sustainability; faculty partnerships that are committed to mutual learning, good communication, and accountability to the healthcare system and communities served.

Limitations and Reflexivity

The limitations of each research phase of the study have been discussed in Chapters 3 to 5 and the key ones are summarised here. The survey response to the Phase 1 audit of national faculties was limited, which may have been due to the timing of data collection, and to low awareness and understanding of ESH and perceptions of minimal relevance. The Delphi panel in phase 2 was reasonably representative of the SA community of ESH practice identified by Phase 1, and overall participation was good, although the online medium and time constraints may have limited more extensive and in-depth participation. Although participants had the opportunity soon afterwards to review a summary written report and narrated presentation of the results, their non-response to invitations to correct any subjective biases may have limited the validity of the results. The comparison of the Delphi panel's set of learning objectives with the health professional roles and enabling competencies of AfriMEDS was performed solely by the author (JHI) and therefore requires further validation by others with expertise in evaluating graduate competencies and aligned curricula. The same should apply to the review of competency frameworks in other health professions.

For the PHRC assessment of the UCT FHS, JHI was responsible alone for selecting the interviewees, aggregating the report card scores, summarising the interviews, and compiling the key findings for the PHRC summary report. To mitigate subjectivity bias, participants were able to review their interview summaries and report cards and several did make corrections, albeit minor ones. Moreover, the summary graded FHS report was reviewed by the local PHRC student team and international PHRC editors before publication in the global PHRC report. The author's positionality and investment in the study that facilitated the timeous completion of a comprehensive baseline PHRC at the FHS may not apply, however, in other faculties. Where there is the potential for bias arising from such positionality, it could be mitigated by data validity checking by participants, and by having an institutional study reference group.

Appendices related to this chapter

Appendix 15: Supplementary Figures 6.1.1 to 6.1.3 Summary Framework for ESH Curricular Development (CONCEPTUALISATION / PRODUCTION / USABILITY Domains – Focus Areas 1 to 6 – Actions for Faculty Leaders / Educators)

Appendix 16: Supplementary Figure 6.1.4 Summary Process for ESH Curricular Development

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CHAPTER 7 Conclusion

This chapter presents the contribution of the study to new knowledge about ESH and the implications for future research.

Contribution to New Knowledge

This thesis employed a mixed methods study in three phases for understanding the opportunities and barriers to ESH in undergraduate HPE in SA, and specifically at the UCT FHS. It is the first study to do so, and each phase has been published as a separate paper in a national or international HPE journal.

In the first phase, a national survey found growing interest in ESH in SA faculties, with existing courses employing a limited variety of ESH learning activities and assessments (1). A national Delphi panel in phase two favourably assessed the applicability of the learning objectives, activities, and assessments for ESH from the international AMEE Consensus and recommended some additional ESH learning objectives for the SA context. The combined AMEE and Delphi learning objectives were each matched with enabling competencies in the AfriMEDS core competency framework to facilitate future ESH curriculum development. The Delphi panel also identified key national barriers, enablers, and opportunities for integration of ESH in SA (2). In the third phase, a baseline PHRC assessment of the UCT FHS assessed the perceptions of FHS educators about the barriers and opportunities for ESH in the faculty (3). It is the first PHRC from an African country and from a LMIC in the global South (4).

The thesis proposes a novel framework for guiding ESH curricular development at HPE institutions that integrates enabling actions adapted from the international AMEE Consensus (5) into the CPU model of social accountability at HPE institutions (6). The framework includes key barriers and enabling factors identified by the study, and consistent with much of the international literature, with recommendations for faculty leaders and HPE educators, as well as examples of promising opportunities for ESH in the UCT FHS. This study has applicability beyond UCT and other HPE institutions in SA, and it therefore adds to evidence for ESH development in Africa and in LMICs.

Implications for Research

Further research is required to build the low base of current evidence for ESH in LMICs. At the UCT FHS, this should include a repeat PHRC assessment in the next two years to evaluate progress since its 2022-23 PHRC, using a larger and more representative sample of multidisciplinary educators, researchers, faculty and student leaders, and community and health service partners. Other HPE institutions in SA could utilise recent global versions of the PHRC for Nursing and Physiotherapy (7), and versions could be developed too for postgraduate programmes. In order to sustain the commitment to iterative assessments at regular intervals, teams of faculty educators and students should be recruited and trained timeously with oversight by institutional reference groups. Team members should independently apply participant inclusion criteria and analyse data to reduce bias and enhance study validity.

The integrated framework proposed by this thesis is intended to guide ongoing ESH curricular development at UCT FHS, and elsewhere. Its implementation should therefore be evaluated and shared timeously within the FHS and with broader ESH communities of practice. Beyond curricular integration of ESH, which has been the primary focus of this study, research and evaluation is also needed of environmental sustainability in FHS campus operations, research programmes, student leadership, and partnerships with communities and health services. The mixed methodology used in this study is recommended for future research into ESH in SA and other LMICs.

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APPENDICES

Appendix 1:

Ethics approval for HREC 358/2021

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room G50- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-enquiries@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

17 August 2021

HREC REF: 358/2021

Prof A Rother
Division of Environmental Health
SPHFM
Email: Andrea.rother@uct.ac.za
Student: James.irlam@uct.ac.za

Dear Prof Rother

PROJECT TITLE: OPPORTUNITIES AND BARRIERS TO IMPLEMENTING EDUCATION FOR SUSTAINABLE HEALTHCARE IN AFRICA: A SOUTH AFRICAN CASE STUDY-PHD CANDIDATE-MR JAMES IRLAM

Thank you for your response letter, addressing the issues raised by the Faculty of Health Sciences Human Research Ethics Committee (HREC).

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19, dated 17 March 2020; 06 July 2020 & 01 July 2021.

Approval is granted for one year until the 30 August 2022.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Mr James Irlam will also be involved in this study.

Please quote the HREC REF 358/2021 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938
NHREC-registration number: REC-210208-007

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

HREC/REF 358/2021sa

Appendix 2:

Supplementary File 3.1. Survey questionnaire for National Audit 2021

Dear Participant

Thank you for your interest in this national curriculum audit of Education for Sustainable Healthcare (ESH).

Your participation will contribute to a better understanding of the status of ESH in all faculties of health sciences in South Africa, so as to better prepare health professional graduates as leaders of change for sustainable healthcare.

The 2020 AMEE Consensus Statement has defined ESH as educating health science students and health workers about the interdependence of human health, climate change, and planetary ecosystems; and how to mitigate environmental impacts of healthcare by making health systems more environmentally sustainable [Shaw, Walpole et al. 2020]

The following LEARNING OUTCOMES for ESH have been adopted in the Consensus Statement and apply to this audit:

1. Describe how the environment and human health interact at different levels.
2. Demonstrate the knowledge and capabilities needed to improve the *environmental sustainability of health systems*, using systems thinking
3. Discuss how the *duty of health professionals to protect and promote health* is impacted by the interdependence of health and ecosystems, and the implications for their personal and professional lives

This audit therefore seeks data on courses offered by your faculty that are designed to achieve these broad Learning Outcomes.

The questionnaire is divided into the following Sections:

- SECTION 1 & 2: Personal Information about yourself
- SECTION 3: Characteristics of the course with content about Sustainable Healthcare
- SECTION 4: Information about Assessments of Sustainable Healthcare content in the course
- SECTION 5: Information for follow-up on your interest in ESH

<u>NOTES:</u>

Sections 3 & 4 require a *separate response for each eligible course*. However you may opt out in Q 5.1 from submitting responses for multiple eligible courses if you are unwilling or unable to.

Q5.2 requests that you email me the 2021 Faculty course prospectus / yearbook, or document/s describing the relevant course characteristics to facilitate any further data extraction and validation. Your agreement would be much appreciated.

The questionnaire may therefore take between 5 and 15 minutes to complete, depending on the data "density" of your response or multiple responses. To make data entry quicker, most questions are multiple choice/ checklists, and sections may be easily skipped if not applicable.

INFORMED CONSENT:

- Your participation is entirely voluntary, and you may withdraw at any time without any consequences.
- There are no anticipated risks, and no remuneration nor direct benefits, from participating.
- Your identity will not be disclosed to others, except to any fellow participants at your faculty.
- Personal identifying information is collected for analysis of course data by pre-defined demographic sub-groups. These data will be de-identified in the analyses in accordance with the POPIA Industry Code of Conduct for Research at Public Universities (https://www.usaf.ac.za/wp-content/uploads/2020/09/USAf-POPIA-Guideline_Final-version_1-September-2020.pdf)
- All participants are offered co-authorship on a journal paper about this audit, and membership of the ESH Special Interest Group of SAAHE . Please indicate acceptance in your survey response to Q5.3 & Q5.5

This study has been approved by the University of Cape Town Faculty of Health Sciences Human Research Ethics Committee (HREC 358_2021). Please contact Professor Marc Blockman, Chair of the HREC (marc.blockman@uct.ac.za) with any queries about your rights as a research participant.

Thank you

JAMES IRLAM
James.Irlam@uct.ac.za
PhD researcher & Senior Lecturer: UCT Division of Environmental Health & PHC Directorate
Convener: Education for Sustainable Healthcare (ESH), Southern African Association of Health Educationalists (SAAHE) (saahe.org.za/education-for-sustainable-healthcare/)
TWITTER @ESH_SouthAfrica

[Ref: Shaw, E., Walpole, S., McLean, M., Alvarez-Nieto, C., Barna, S., Bazin, K., . . . El Omrani, O. (2020). AMEE Consensus Statement: Planetary health and education for sustainable healthcare. Medical teacher, 43(3), 272-286]

Email _____

INFORMED CONSENT: I hereby acknowledge and understand the conditions for participating in the research study. I have had the opportunity to ask questions and have had these questions answered. I understand that my participation is voluntary and that I am free to withdraw at any stage without consequence. I agree to have my response data used anonymously for purposes of the study.

- ☐ **I consent to participate**

1.1 What is your name?

_____

Section 2 of 5

2. Personal Information

These data will be de-identified in the analyses in accordance with the POPIA Industry Code of Conduct for Research at Public Universities

2.1 At which health sciences faculty are you employed?

- ☐ Cape Peninsula University of Technology
- ☐ Central University of Technology
- ☐ Durban University of Technology
- ☐ Mangosuthu University of Technology
- ☐ Nelson Mandela University
- ☐ North West University
- ☐ Rhodes University
- ☐ Sefako Makgatho University
- ☐ Stellenbosch University
- ☐ Tshwane University of Technology
- ☐ University of Cape Town
- ☐ University of Fort Hare
- ☐ University of Free State
- ☐ University of Johannesburg
- ☐ University of KwaZulu Natal
- ☐ University of Limpopo
- ☐ University of Pretoria
- ☐ University of South Africa
- ☐ University of the Western Cape
- ☐ University of the Witwatersrand
- ☐ University of Venda
- ☐ University of Zululand
- ☐ Vaal University of Technology
- ☐ Walter Sisulu University

2.2 What is your disciplinary background (as registered with the HPCSA or SANC)?

- ☐ Audiologist / Hearing Therapist
- ☐ Clinical Associate
- ☐ Clinical Technologist
- ☐ Dental Practitioner
- ☐ Dietician
- ☐ Emergency Care Practitioner
- ☐ Environmental Health Practitioner
- ☐ Medical Practitioner
- ☐ Medical Technologist

- ☐ Nutritionist
- ☐ Occupational Therapist
- ☐ Optometrist
- ☐ Physiotherapist
- ☐ Psychologist
- ☐ Radiographer
- ☐ Speech & Language Therapist
- ☐ Other

2.2.1 Please specify any OTHER personal Disciplinary Background

_____

2.3 What is your job title?

- ☐ Professor
- ☐ Assoc. Professor
- ☐ Senior Lecturer
- ☐ Lecturer
- ☐ Assistant Lecturer
- ☐ Research scientist
- ☐ Other

2.3.1 Please specify any OTHER Job Title

_____

2.4 How does your job relate to environmental health or sustainable healthcare?

_____

2.5 How many courses are you aware of that contain content about sustainable healthcare? (i.e. the interdependence of human health, climate change, and planetary ecosystems; and making health systems more environmentally sustainable)

- ☐ None - skip to Section 5
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ More than 5

Section 3 of 5

3. Characteristics of each course with Sustainable Healthcare content

Please complete this section for each course that contains content about Sustainable Healthcare (i.e. the interdependence of human health, climate change, and planetary ecosystems; and making health systems more environmentally sustainable). If you are uncertain whether a particular course is eligible, please rather include it.

3.1 Name of Department offering course

_____

3.2 Name of Course

_____

3.3 Course Code (enter XX if you don't know)

_____

3.4 Name of Content Topic or Theme (enter XX if you don't know, or NA if not applicable)

_____

3.5 Which Programmes (as registered with HPCSA) offer the course? [*Select all that apply*]

- ☐ Audiology / Hearing Therapy
- ☐ Clinical Associate
- ☐ Clinical Technologist
- ☐ Dental Practitioner
- ☐ Dietetics and Nutrition
- ☐ Emergency Care
- ☐ Environmental Health Practitioner
- ☐ Medical Practitioner
- ☐ Medical Technologist
- ☐ Occupational Therapy
- ☐ Optometry
- ☐ Physiotherapy
- ☐ Psychology
- ☐ Radiography
- ☐ Speech & Language Therapy
- ☐ Other

3.6 In which year/s of study is the course offered? [*Select all that apply*]

- ☐ Year 1
- ☐ Year 2
- ☐ Year 3
- ☐ Year 4
- ☐ Year 5
- ☐ Year 6
- ☐ POST- GRADUATE
- ☐ Don’t Know

Please consult the available course prospectus / course outline, or similar document, for the course learning outcomes, learning objectives, learning activities, and details of formative & summative assessments as requested below.

Please email these document/s to me if possible (James.Irlam@uct.ac.za)

3.7 Are the course learning OUTCOMES described? (i.e. the specific questions that the *convener* wants the course to raise)

- ☐ Yes
- ☐ No
- ☐ Don't know

3.8 Are the course learning OBJECTIVES described? (i.e. the specific, measurable knowledge & skills that the *student will gain*)

- ☐ Yes
- ☐ No
- ☐ Don't know

Course LEARNING ACTIVITIES related to SUSTAINABLE HEALTHCARE (SH) content.

Please consult the available course prospectus / course outline, or similar document

3.9 Does the course have any of the following LEARNING ACTIVITIES related to SUSTAINABLE HEALTHCARE (SH)? [*Select all activities that apply*]

- ☐ 3.9.1. Role-plays /real patients: take a history of environmental risk exposure
- ☐ 3.9.2. Role-plays /real patients: advise about environmental & health co-benefits of lifestyle choices
- ☐ 3.9.3. Role-plays /real patients: advise about "eco-friendly" treatment options
- ☐ 3.9.4. Writing assignments on sustainable healthcare topics
- ☐ 3.9.5. Oral presentations on sustainable healthcare topics
- ☐ 3.9.6. Community-based research about key environmental determinants of health
- ☐ 3.9.7. Minimising unnecessary and high environmental impact diagnostic tests & interventions
- ☐ 3.9.8. Designing a public health strategy to address environmental health impacts
- ☐ 3.9.9. Concept mapping the relationships between the environment, disease, & healthcare
- ☐ 3.9.10. Debating ecological justice / eco-ethics / eco-advocacy by health professionals
- ☐ 3.9.11. Reflections on personal / professional eco-ethical challenges
- ☐ 3.9.12. OTHER - please specify below
- ☐ 3.9.13 DON'T KNOW
- ☐ 3.9.14 NONE

3.9.12.1 Please specify any OTHER Learning Activities related to the SUSTAINABLE HEALTHCARE (SH) content of the course

_____

3.10 Does the course include any Formative or Summative assessment of the SUSTAINABLE HEALTHCARE (SH) content only?

- ☐ Yes - continue below
- ☐ No - skip to Section 5
- ☐ Don't know - skip to Section 5

Section 4 of 5

4. Assessments of Sustainable Healthcare content in each course

Please complete this section for each course that contains content about Sustainable Healthcare (i.e. the interdependence of human health, climate change, and planetary ecosystems; and making health systems more environmentally sustainable), and in which that content is assessed.

4.1 Select ALL forms of Formative and/ or Summative assessment of the Sustainable Healthcare (SH) content ONLY [*Select at least one response per row*]

	FORMATIVE	SUMMATIVE	Don't know	None
4.1.1. Assessments of debates with a rubric				
4.1.2. Assessments of concept mapping exercise				
4.1.3. Group discussion about eco-ethics in clinical care				
4.1.4. Individual essay / reflections on learning				
4.1.5. MCQs or SAQs on core topics				
4.1.6. Oral presentations with a rubric				
4.1.7. OSCE station: environmental history taking				
4.1.8. OSCE station: SH advice to patients				
4.1.9. Patient consults that include enviro. history taking & SH advice				
4.1.10. Peer feedback on oral presentations				
4.1.11. Project supervisor assessment reports				
4.1.12. Research report / presentation / journal article				
4.1.13. Role plays				
4.1.14. Written assignments with a rubric				
4.1.15. OTHER - please specify below				

4.1.15.1 Please specify any OTHER Assessments of the SUSTAINABLE HEALTHCARE (SH) content of the course

_____

Section 5 of 5

5. Information for follow-up

This information will be used for follow up if you wish to be involved in further work on ESH in South African health science faculties

5.1 If there are additional eligible courses with content about Sustainable Healthcare, are you willing to submit another response about it?

- ☐ There are NO additional eligible courses
- ☐ There are additional eligible courses but I do NOT want to submit another response
- ☐ Yes, there are additional eligible courses & I will submit another response

5.2 Can you email me the 2021 Faculty course prospectus / yearbook, or document/s describing the relevant course characteristics ? (James.Irlam@uct.ac.za)

- ☐ Yes
- ☐ No
- ☐ Other

5.3 Would you like to be a contributing author on an academic paper about this audit?

- ☐ Yes
- ☐ No
- ☐ Maybe

5.4 Can you suggest any other participants in this audit? If YES, please list their names, job titles, and email addresses.

_____

5.5 Would you like to be added to the membership list of the ESH Special Interest Group of SAAHE (saahe.org.za/education-for-sustainable-healthcare/)?

- ☐ Yes
- ☐ No
- ☐ Maybe

5.5 THANK YOU FOR YOUR RESPONSE. Do you have any further comments or queries?

_____

Appendix 3:

Supplementary Table 3.1. Survey respondents by Faculty, Discipline and Academic Title (N=41)

Faculty of Health Sciences	Disciplinary background	Title
Cape Peninsula University of Technology	Environmental Health Practitioner	Assoc. Professor
Durban University of Technology	Environmental Health Practitioner	Professor
Durban University of Technology	Nursing Professional	Lecturer
Durban University of Technology	Radiographer	Lecturer
Nelson Mandela University	Emergency Care Practitioner	Lecturer
Nelson Mandela University	Environmental Health Practitioner	Senior Lecturer
North West University	Nursing Professional	Senior Lecturer
Stellenbosch University	Medical Practitioner (MBChB)	Professor
Stellenbosch University	Medical Practitioner (MBChB)	Professor
Stellenbosch University	Nursing Professional	Lecturer
Stellenbosch University	Physiotherapist	Senior Lecturer
Stellenbosch University	Psychologist	Professor
Stellenbosch University	Public Health	Lecturer
Tshwane University of Technology	Environmental Health Practitioner	Senior Lecturer
University of Cape Town	Clinical Sciences & Immunology	Lecturer
University of Cape Town	Dentistry	Lecturer
University of Cape Town	Epidemiologist	Senior Lecturer
University of Cape Town	Medical Practitioner (MBChB)	Assoc. Professor
University of Cape Town	Medical Practitioner (MBChB)	Lecturer
University of Cape Town	Medical Practitioner (MBChB)	Senior Lecturer
University of Cape Town	Medical Practitioner (MBChB)	Senior Lecturer
University of Cape Town	Nursing Professional	Lecturer
University of Free State	Medical Practitioner (MBChB)	Professor
University of KwaZulu Natal	Medical Practitioner (MBChB)	Assoc. Professor
University of KwaZulu Natal	Medical Practitioner (MBChB)	Assoc. Professor
University of KwaZulu Natal	Medical Practitioner (MBChB)	Lecturer
University of KwaZulu Natal	Medical Practitioner (MBChB)	Professor
University of Limpopo	Nursing Professional	Senior Lecturer
University of Pretoria	Dentistry	Assoc. Professor
University of Pretoria	Environmental Health Practitioner	Senior Lecturer
University of Pretoria	Epidemiologist	Assoc. Professor
University of Pretoria	Medical Practitioner (MBChB)	Professor
University of Pretoria	Medical Practitioner (MBChB)	Senior Lecturer
University of Pretoria	Occupational Therapist	Lecturer
University of Pretoria	Physiotherapist	Assoc. Professor

University of South Africa	Nursing Professional	Professor
University of the Western Cape	Pharmacy	Senior Lecturer
University of the Western Cape	Physiotherapist	Assoc. Professor
University of the Witwatersrand	Dentistry	Senior Lecturer
University of the Witwatersrand	Rural Health	Lecturer
University of Zululand	Nursing Professional	Assoc. Professor

Appendix 4:

Supplementary Table 3.2. Learning Activities Related to Planetary Health and Sustainable Healthcare by Faculty (N=18 courses)

Faculty	Department / Division/ School	Course	Topics or Themes	Programmes offering the course	Years of study	Learning OUTCOMES	Learning OBJECTIVES	Learning Activities	Graduate level
Durban University of Technology	**Community Health Studies**	**Bachelor of Health Science: Environmental Health**	Don't know	Environmental Health Practitioner	Year 1, Year 2, Year 3, Year 4	Yes	Yes	Writing assignments on SH topics. Oral presentations on SH topics.	UG
Nelson Mandela University	**Environmental Health**	**Sustainable development**	Don't know	Environmental Health Practitioner	Year 1	No	Yes	Writing assignments on SH topics. Oral presentations on SH topics.	UG
Stellenbosch University	**Physiotherapy and Global Health**	**Becoming a Healthcare Professional**	Action for Health, Global health	Dietetics & Nutrition, Physiotherapy Nursing	Year 1, Year 2, Year 3, Year 4, POST-GRADUATE	Yes	Yes	Role-plays /real patients: take a history of environmental risk exposure; advise about environmental & health co-benefits of lifestyle choices. Oral presentations on SH topics.	UG/ PG

Stellenbosch University	**Family Medicine and Primary Care**	**Planetary Health**	Environmental stewardship	Medical Practitioner (MBChB), COPC	Year 1, Year 2, Year 3, POST-GRADUATE	Yes	Yes	Role-plays /real patients: take a history of environmental risk exposure; advise about environmental & health co-benefits of lifestyle choices. Writing assignments on SH topics. Community-based research about key environmental determinants of health. Concept mapping the relationships between the environment, disease, & healthcare. Debating ecological justice / eco-ethics / eco-advocacy by health professionals. Reflections on personal / professional	UG/ PG

								eco-ethical challenges.	
Tshwane University of Technology	**Nursing Department**	**Nursing Science**	Don't know	Dental Practitioner, Environmental Health Practitioner, Medical Technologist, Radiography	Year 1, Year 2, POST-GRADUATE	Yes	Yes	Don't know	UG/ PG
University of Cape Town	**Pathology**	**Integrated Health Systems**	Climate Change and Health	Medical Practitioner (MBChB)	Year 3	Yes	Yes	Don't know	UG
University of Cape Town	**School of Public Health & Family Medicine**	**Health in Context**	Climate change, Environmental Health	Medical Practitioner (MBChB)	Year 4	Yes	Yes	Role-plays /real patients: take a history of environmental risk exposure; advise about environmental & health co-benefits of lifestyle choices. Community-based research about key environmenta	UG

								l determinants of health. Designing a public health strategy to address environmental health impacts.	
University of Cape Town	**School of Public Health & Family Medicine**	**Masters in Public Health**	Climate change, Pollution, and Health	Multidisciplinary programme	POST-GRADUATE	Yes	Yes	Writing assignments on SH topics. Interviews with environmental health stakeholders. Class presentations of topical climate and health media stories.	PG
University of Free State	**Community Health**	**M.Med. (Community Health)**	Don't know	Medical Practitioner (MBChB)	POST-GRADUATE	Yes	Yes	Role-plays /real patients: take a history of environmental risk exposure; advise about environmental & health co-benefits of lifestyle choices. Writing assignments on SH topics. Oral presentations on SH topics.	PG

								Community-based research about key environmental determinants of health. Designing a public health strategy to address environmental health impacts. Concept mapping the relationships between the environment, disease, & healthcare.	
University of KwaZulu Natal	**Public Health Medicine**	**Masters in Public Health**	Climate Change and Public Health	Multidisciplinary programme	POST-GRADUATE	Don't know	Yes	Oral presentations on SH topics.	PG
University of KwaZulu Natal	**Occupational and Environmental Health**	**Postgraduate Diploma in Occupational Health**	Environmental Health	Multidisciplinary programme	POST-GRADUATE	Yes	Yes	Oral presentations on SH topics. Debating ecological justice / eco-ethics / eco-advocacy by health professionals.	PG
University of KwaZulu Natal	**Occupational and Environmental Health**	**Becoming a Professional**	Climate Change and Public Health	Medical Practitioner (MBChB)	Year 1	Yes	Yes	Oral presentations on SH topics. Community-based research about key	UG

								environmental determinants of health.	
University of Pretoria	**Physiotherapy**	**Integrated Health Leadership**	Environmental Sustainability in Health Care	Physiotherapy	Year 4	Don't know	Don't know	Don't know	UG
University of Pretoria	**School of Health Systems and Public Health**	**Social Determinants of Health**	Environmental Determinants of Health	Masters of Public Health	POST-GRADUATE	Yes	Yes	Community-based research about key environmental determinants of health.	PG
University of Pretoria	**School of Health Systems and Public Health**	**Basis of Environmental Health**	Don't know	Masters of Public Health	POST-GRADUATE	Yes	Yes	Writing assignments on SH topics. Oral presentations on SH topics.	PG
University of South Africa	**Health Studies**	**Health and the Environment**	Health and the environment	Health studies, Environmental sciences and open to other disciplines	Year 1	Yes	Yes	Don't know	UG
University of the Western Cape	**Interprofessional Education Unit**	**Health, Development and Primary Health care, Interdisciplinary Health promotion**	Determinants of Health, Development, Engaging Communities/Community Profile	Dentistry, Oral Health, Dietetics and Nutrition, Occupational Therapy, Physiotherapy, Nursing, Social Work, Sport Recreation and Exercise Science, Natural Medicine	Year 1, Year 2,	Yes	Yes	Community Profile assignment which includes environmental determinants of health. . Eight of these were undergraduate courses, seven were postgraduate	UG

								courses, and three were offered to both undergraduates and postgraduates in different disciplines. Project implementation in primary schools including environmental determinants of health.	
University of the Witwatersrand	**Family Medicine and Primary Care**	**Masters in Rural Health**	Rural Health Context, Quality improvement, Community Orientated PHC, Burden of Disease, Developing appropriate services	Masters in Public Health	POST-GRADUATE Year 1, Year 2, Year 3	Yes	Yes	Role-plays /real patients: take a history of environmental risk exposure; advise about environmental & health co-benefits of lifestyle choices; advise about 'eco-friendly' treatment options. Oral presentations on SH topics. Community-based research about key environmental	PG

	determinants of health. Designing a public health strategy to address environmental health impacts. Concept mapping the relationships between the environment, disease, & healthcare. Debating ecological justice / eco-ethics / eco-advocacy by health professionals. Reflections on personal / professional eco-ethical challenges. Quality improvement projects. Research projects

Appendix 5:

Supplementary Table 3.3. Assessments related to Planetary Health and Sustainable Healthcare by Faculty (N=9 courses)

Faculty	Department / Division/ School	Course	Grad level	Debates with a rubric	Concept mapping	Discussion about eco-ethical care	Individual essay / reflections	MCQs or SAQs on core topics	Oral presentations with a rubric	OSCE: environmental history taking	OSCE: SH advice to patients	Enviro. history taking & SH advice	Peer feedback on oral presentation	Project supervisor assessment reports	Research report /presentation	Role plays	Written assignments with a rubric
Stellenbosch University	Family Medicine and Primary Care	Planetary Health	UG/ PG	S	F	S	F	F	F	DK	DK	F	S	DK	S	F	N
Tshwane University of Technology	Nursing Department	Nursing Science	UG/ PG	F, S	DK	F, S	F	DK	F	S	DK	DK	F	S	S	F	S
University of Cape Town	School of Public Health & Family Medicine	Health in Context	UG	N	N	F	F	S	F	N	N	F	N	Maybe	N	F	N
University of Cape Town	School of Public Health & Family Medicine	Masters in Public Health	PG	N	N	N	N	N	N	N	N	N	N	N	N	N	S
University of Free State	Department of Community Health	MMED (Community Health)	PG	S	S	N	F	F	F	N	N	N	S	F	F	N	F
University of KwaZulu Natal	Public Health Medicine	Becoming a Professional	UG	N	N	N	S	S	S	N	N	N	N	N	N	N	N

University of Pretoria	**School of Health Systems and Public Health**	**Basis of Environmental Health**	**PG**	N	N	N	F	S	F	N	N	N	N	N	N	N	F
University of the Western Cape	**Interprofessional Education Unit**	**Health, Development and Primary Health care, Interdisciplinary Health promotion**	**UG**	N	F	F	F	N	F	N	N	N	F	F	F	F	F
University of Witwatersrand	**School of Public Health & Family Medicine**	**Health in Context**	**UG**	N	N	N	F	S	F	N	N	N	S	S	S	N	F, S

Appendix 6:

Supplementary File 4.1. Round ONE questionnaire for National Delphi Panel 2022

Dear Delphi panelist

Thank you for agreeing to participate in this Delphi panel
Please would you respond as best you can to the following 34 questions about environmental sustainability and education about planetary health and sustainable healthcare at your faculty.
Some questions are required and some are optional.
The following definitions apply:
* PLANETARY HEALTH: the health of human civilization and the state of the natural systems on which it depends (Whitmee, Haines et al. 2015 In: Shaw 2020)
* EDUCATION FOR SUSTAINABLE HEALTHCARE (ESH): The process of equipping current and future health professionals with the knowledge, attitudes, confidence and capacity to provide environmentally sustainable services through health professional education (Tun 2019).

Many thanks,
James Irlam
PhD researcher (UCT HREC 358_2021)
Division of Environmental Health & PHC Directorate
UCT Faculty of Health Sciences
James.Irlam@uct.ac.za
W/app 076 180 9972

Primary reference:
Shaw, E., Walpole, S., McLean, M. *et.al* (2020). AMEE Consensus Statement: Planetary health and education for sustainable healthcare. Medical teacher, 1-15.

Section 1 of 4 Characteristics of participants

This section asks for some information that will be used for sub-group analysis and for further follow-up

1. What is your name? _____
2. What is your job title? _____
3. How does your job relate to education about planetary health or sustainable healthcare?

   _____
4. What is your disciplinary background (as registered with HPCSA)?
   - ☐ Clinical Associate
   - ☐ Clinical Technologist
   - ☐ Dental Practitioner
   - ☐ Dietician
   - ☐ Emergency Care Practitioner
   - ☐ Environmental Health Practitioner
   - ☐ Medical Practitioner
   - ☐ Medical Technologist
   - ☐ Nutritionist
   - ☐ Occupational Therapist
   - ☐ Optometrist
   - ☐ Physiotherapist
   - ☐ Psychologist
   - ☐ Radiographer
   - ☐ Speech & Language Therapist
   - ☐ Audiologist / Hearing Therapist
   - ☐ Other
5. At which university are you employed?
   - ☐ Cape Peninsula University of Technology
   - ☐ Central University of Technology
   - ☐ Durban University of Technology
   - ☐ Mangosuthu University of Technology
   - ☐ Nelson Mandela University
   - ☐ North West University
   - ☐ Rhodes University
   - ☐ Sefako Makgatho University
   - ☐ Stellenbosch University
   - ☐ Tshwane University of Technology
   - ☐ University of Cape Town
   - ☐ University of Fort Hare
   - ☐ University of Free State
   - ☐ University of Johannesburg
   - ☐ University of KwaZulu Natal
   - ☐ University of Limpopo
   - ☐ University of Pretoria
   - ☐ University of South Africa
   - ☐ University of the Western Cape

- University of the Witwatersrand
- University of Venda
- University of Zululand
- Vaal University of Technology
- Walter Sisulu University

Section 2 of 4

Environmental sustainability at your faculty or institution

Please share your perceptions of the extent to which your faculty and/ or tertiary educational institution is committed to principles of environmental sustainability by responding to the following questions, with the relevant detail where applicable (or NA =not available/ applicable).:

6. Is there a **vision or mission statement** for your faculty or institution that includes environmental sustainability?

Yes / No / Don't Know

6.1 If YES, please state the vision or mission statement (or share weblink) related to environmental sustainability - OR else state NA (=not available/ applicable)

_____

7. Is there a **strategy for environmental sustainability** at your faculty or institution?

Yes / No / Don't Know

7.1 If YES, please share a copy of the strategy (weblink or emailed copy) - OR else state NA (=not available/ applicable) _____

8. Are there **appropriate governance structures** to support the strategy for environmental sustainability across all aspects of the faculty or institution (e.g., health service delivery, facilities, human resources, student life, procurement, finance).

Yes / No / Don't Know

8.1 If YES, please name some examples of governance structures - OR else state NA (=not available/ applicable)

_____

9. Are there any **environmental mitigation policies** to reduce the impact of operations of the faculty or institution (e.g., carbon emissions, transport, energy use, renewable energy, water consumption, waste-to-landfill, sustainable procurement, fossil fuel divestment)?

Yes / No / Don't Know

9.1 If YES, please share some examples of operational environmental mitigation policies - OR else state NA (=not available/ applicable)

_____

10. Does the faculty or institution actively promote the **involvement and engagement of staff, student, and external stakeholders/ communities** in its environmental sustainability programs and activities?

Yes / No / Don't Know

10.1 If YES, please describe some examples of staff, student & external stakeholder engagements in environmental sustainability programs - OR else state NA (=not available/ applicable)

_____

11. Does the faculty or institution actively promote **research** related to environmental sustainability?

Yes / No / Don't Know

11.1 If YES, please cite some examples of research programs or themes - OR else state NA (=not available/ applicable)

_____

12. Does the faculty or institution include environmental sustainability in its **graduate profile or core competencies?**

Yes / No / Don't Know

12.1 If YES, please share the related graduate competencies - OR else state NA (=not available/ applicable)

_____

13. Does the faculty or institution include undergraduate courses to enable students and graduates to understand and actively promote environmental sustainability?

Yes / No / Don't Know

13.1 If YES, please name some examples of undergraduate courses - OR else state NA (=not available/ applicable)

_____

Section 3 of 4

Rating of Course Learning Objectives

The following example Course Learning Objectives (LOs) are from the AMEE Consensus Statement (Shaw et. al, 2020) and are categorised wrt :

* KNOWLEDGE (3 LOs)
* KNOWLEDGE & SKILLS (5 LOs)
* KNOWLEDGE, VALUES, ATTITUDES & AGENCY (5 LOs)

Please rate each Learning Objective below on a scale of 1 to 5 w.r.t. their inclusion in a proposed national set of LOs for health professional education about Planetary Health and Sustainable Healthcare in South Africa.
Please provide any optional comments on your ratings or the phrasing of the given LO examples.
Please feel free to propose any alterations, or additional LOs that you think should be included.
Your responses will be used to create a ranked shortlist of LOs for further rating in Round 2 of the Delphi, and discussion at the concluding workshop.

14. LOs_KNOWLEDGE : Rate these LOs to develop *__Knowledge__* about how the environment and human health interact at different levels [1 = definitely EXCLUDE; 2 = EXCLUDE; 3 = neutral/ not sure; 4 = INCLUDE with reservations; 5 = definitely INCLUDE]

	definitely EXCLUDE	EXCLUDE	neutral/ not sure	INCLUDE with reservations	definitely INCLUDE
14.1 Discuss how local and global ecological crises impact on individual patients and communities					
14.2 Describe the interaction between local and global ecological crises and the social determinants of health.					
14.3 Discuss how the promotion of environmental sustainability generally and in healthcare can support progress on social determinants of health, health equity and respect for cultural diversity, including Indigenous traditional knowledge.					

15. Please provide any comments on your ratings or phrasing of the LOs above

_____

16. Please propose any **additional LOs** to develop KNOWLEDGE about how the environment and human health interact at different levels

_____

17. LOs_KNOWLEDGE & SKILLS : Rate these LOs to develop ***Knowledge & Skills*** in improving the environmental sustainability of health systems [1 = definitely EXCLUDE; 2 = EXCLUDE; 3 = neutral/ not sure; 4 = INCLUDE with reservations; 5 = definitely INCLUDE]

	definitely EXCLUDE	EXCLUDE	neutral/ not sure	INCLUDE with reservations	definitely INCLUDE
17.1 Evaluate the environmental impacts of a patient pathway to care and identify ways to enhance environmental sustainability.					
17.2 Describe how changes in disease burden due to environmental change may be identified, characterised and quantified and how such information can inform planning and practice to address health needs.					
17.3 Apply key policies and frameworks related to sustainable development including the SDGs to evaluate a population health challenge.					
17.4 Apply critical thinking, problem-solving and systems thinking to sustainable healthcare challenges.					
17.5 Communicate clearly with health professional colleagues when responding to an ecological challenge or opportunity in healthcare.					

18. Please provide any comments on your ratings or phrasing of the LOs above

_____

19. Please propose any **additional LOs** to develop KNOWLEDGE & SKILLS in improving the environmental sustainability of health systems

_____

20. LOs_KNOWLEDGE, VALUES, ATTITUDES & AGENCY : Rate these LOs to develop ***Knowledge, Values, Attitudes & Agency*** to :- Protect health from environmental and climate change ; Promote sustainable healthcare ; Understand why health professionals have a duty towards sustainable healthcare ; Understand the personal and professional implications of this duty [1 = definitely EXCLUDE; 2 = EXCLUDE; 3 = neutral/ not sure; 4 = INCLUDE with reservations; 5 = definitely INCLUDE]

	definitely EXCLUDE	EXCLUDE	neutral/ not sure	INCLUDE with reservations	definitely INCLUDE
20.1 Discuss the role of health professionals in mitigation, adaptation, advocacy and activism in terms of sustainable development, planetary health and environmental stewardship.					
20.2 Demonstrate the ability to advocate for planetary health and the SDGs.					
20.3 Demonstrate how to motivate behaviour change to promote environmental sustainability at an individual, professional and community level					
20.4 Discuss examples of eco-ethical leadership.					
20.5 Identify how Indigenous traditional knowledge and voice can inform healthcare practice and promotion of planetary health and sustainable development in your local context.					

21. Please provide any comments on your ratings or phrasing of the LOs above

_____

22. Please propose any ***additional LOs*** to develop KNOWLEDGE, VALUES, ATTITUDES & AGENCY

_____

Section 4 of 4

Education about Planetary Health and Sustainable Healthcare at your faculty

This section asks you about the opportunities and barriers to education about planetary health and sustainable healthcare in your faculty specifically.

23. How important do you think it is to educate health professional students about planetary health and sustainable healthcare?

Definitely NOT important				Extremely important
1	2	3	4	5

24. Please motivate your answer above about the importance of educating health professional students about planetary health and sustainable healthcare

_____

25. OPPORTUNITIES FOR LEARNING: Select the Learning Activities below that you think should be integrated into health professional curricula in your Faculty [*Select all that apply*]:

	Yes	Maybe	No
25.1 Role-plays or real-life: take a patient's history of exposure to common environmental risk factors			
25.2 Role-plays or real-life: advise a patient about environmental & health co-benefits of lifestyle choices			
25.3 Role-plays or real-life: advise a patient about "eco-friendly" medical treatment options			
25.4 Writing assignments about a sustainable healthcare or planetary health topic			
25.5 Oral presentations about a sustainable healthcare or planetary health topic			
25.6 Participatory research with communities about their priority environmental determinants of health			
25.7 Application of principles of sustainable healthcare to tests & interventions during a patient's referral pathway			
25.8 Designing a public health strategy to address priority environmental health impacts on individuals or communities			
25.9 Concept mapping the inter-relationships between environment, disease burden, and healthcare			
25.10 Debates on issues of ecological justice / eco-ethics / eco-advocacy by health professionals			
25.11 Reflections on personal and/or professional eco-ethical challenges			
25.12 Other			

26. Please specify any *OTHER Learning Activities related to planetary health and sustainable health care content of the course

_____

27. Please provide any further comments on your responses above about Learning Activities

_____

28. OPPORTUNITIES FOR ASSESSMENT: Select the types of Formative/ Summative assessment of Sustainable Healthcare (SH) content below that you think *should* be integrated into the Health Professional Programmes in your Faculty. *Select all that apply*Select as many of the types of Formative/ Summative assessment below that you think *could* be applied in undergraduate health professional curricula in your Faculty

	Yes	Maybe	No
28.1 Assessing debates with a rubric			
28.2 Assessments of concept mapping exercises			
28.3 Group discussion about eco-ethical issues in clinical care			
28.4 Individual essay / short reflections on learning			
28.5 Multiple choice (MCQ) or Short Assessment questions (SAQ) on core topics			
28.6 Oral presentations with a rubric			
28.7 OSCE exam station on environmental history taking			
28.8 OSCE exam station on sustainable healthcare communication			
28.9 Patient consultations that include environmental history taking and advice on sustainable healthcare			
28.10 Peer feedback on oral presentations			
28.11 Project supervisor assessment reports			
28.12 Research project report / presentation / journal articles			
28.13 Role plays			
28.14 Written assignments with a rubric			
28.15 Other			

29. Please specify any *OTHER opportunities there may be for assessing education about planetary health and sustainable healthcare in your faculty

_____

30. Please provide any further comments on your responses above about Assessment opportunities.

_____

31. BARRIERS TO ESH: Select what you think are the barriers or obstacles to integrating teaching and learning about sustainable healthcare ***in your faculty***

	Not at all	Maybe	Defin-itely
31.1 Lack of faculty leadership on sustainability			
31.2 Lack of educators who are knowledgeable about sustainable health care			
31.3 Lack of understanding about the relevance of sustainability teaching to healthcare			
31.4 Lack of time / space in the teaching curricula			
31.5 Lack of certainty about where to locate sustainability teaching in the curricula			
31.6 Lack of teaching & learning resources for sustainable health care			
31.7 Too many competing educational interests			
31.8 Difficulty in assessing learning about sustainable health care.			
31.9 Other			

33. Please provide any further comments on your responses above about Barriers to education about planetary health and sustainable healthcare in your faculty

_____

34. Do you have any final comments or queries?

_____

THANKS - YOU WILL BE INVITED TO PARTICIPATE IN ROUND 2 BEFORE THE END OF APRIL

Appendix 7:

Supplementary File 4.2. Round TWO questionnaire for National Delphi Panel 2022

Dear Delphi panelist

Welcome to Delphi Round 2
Thank you again for your responses in Round 1.

The response options derived from the AMEE Consensus Statement have been *scored and ranked* from your collective Round 1 (R1) responses for the following:

1. Course Learning Objectives (LOs)
2. Learning Activities
3. Assessment Opportunities

In this round you are requested to apply the same response scales as R1 w.r.t. each of the above, as well as for each *additional response* that were proposed during Round 1.
The data analysis of both rounds will be shared before the final consultative workshop.

THANK YOU

James Irlam
(James.Irlam@uct.ac.za)

Section 1 of 3

1. What is your name? _____

Section 2 of 3
Rating of Course Learning Objectives

The Course Learning Objectives (LOs) have been scored and ranked from your Round 1 (R1) responses.
Each option is displayed with its numeric identifier from R1, and its R1 score out of 50.
Please rate each again wrt their inclusion in a national set of LOs for health professional education about Planetary Health and Sustainable Healthcare at faculties of health sciences in South Africa.
[1 = definitely EXCLUDE; 2 = EXCLUDE; 3 = neutral/ not sure; 4 = INCLUDE with reservations; 5 = definitely INCLUDE]

2. LO_KNOWLEDGE: Rate these LOs to develop *__Knowledge__* about how the environment and human health interact at different levels

	1 = def. EXCLUDE	2 = EXCLUDE	3 = neutral	4 = INCLUDE	5 = def. INCLUDE
2.1 Discuss how local and global ecological crises impact on individual patients and communities [R1 score= 45]					
2.3 Discuss how the promotion of environmental sustainability generally and in healthcare can support progress on social determinants of health, health equity and respect for cultural diversity, including Indigenous traditional knowledge. [R1_score=42]					
2.2 Describe the interaction between local and global ecological crises and the social determinants of health. [R1 score= 41]					

3. LO_KNOWLEDGE & SKILLS: Rate these LOs to develop ***Knowledge & Skills*** in improving the environmental sustainability of health systems

	1 = def. EXCLUDE	2 = EXCLUDE	3 = neutral	4 = INCLUDE	5 = def. INCLUDE
3.2 Describe how changes in disease burden due to environmental change may be identified, characterised and quantified and how such information can inform planning and practice to address health needs. [R1 score= 41]					
3.4 Apply critical thinking, problem-solving and systems thinking to sustainable healthcare challenges. [R1 score= 40]					
3.5 Communicate clearly with health professional colleagues when responding to an ecological challenge or opportunity in healthcare. [R1 score= 39]					
3.1 Evaluate the environmental impacts of a patient pathway to care and identify ways to enhance environmental sustainability. [R1 score= 38]					
3.3 Apply key policies and frameworks related to sustainable development including the SDGs to evaluate a population health challenge. [R1 score= 38]					

4. LO_KNOWLEDGE, VALUES, ATTITUDES & AGENCY: Rate these LOs to develop ***Knowledge, Values, Attitudes & Agency*** to:- Protect health from environmental and climate change ; Promote sustainable healthcare ; Understand why health professionals have a duty towards sustainable healthcare ; Understand the personal and professional implications of this duty

	1 = def. EXCLUDE	2 = EXCLUDE	3 = neutral	4 = INCLUDE	5 = def. INCLUDE
4.1 Discuss the role of health professionals in mitigation, adaptation, advocacy and activism in terms of sustainable development, planetary health and environmental stewardship. [R1 score= 43]					
4.3 Demonstrate how to motivate behaviour change to promote environmental sustainability at an individual, professional and community level [R1 score= 42]					
4.2 Demonstrate the ability to advocate for planetary health and the SDGs. [R1 score= 38]					

4.4 Discuss examples of eco-ethical leadership. [R1 score= 36]					
4.5 Identify how Indigenous traditional knowledge and voice can inform healthcare practice and promotion of planetary health and sustainable development in your local context. [R1 score= 36]					

5. These are ***additional*** LOs that you proposed in Round 1, with no ranking applied. Please rate each one too and comment below (Q6) if you wish.

	1 = def. EXCLUDE	2 = EXCLUDE	3 = neutral	4 = INCLUDE	5 = def. INCLUDE
5.1 Know how to integrate principles within their own healthcare practice					
5.2 Understand the drivers influencing environment & health relationships - political and economic (mostly), social and behavioral etc.					
5.3 Know the global environmental determinants of health					
5.4 Understand the interaction of environmental exposures					
5.5 Know the various environmental issues that make up the 'ecological crisis					
5.6 Know what planetary environmental systems support human health					
5.7 Understand how dysfunction in planetary systems leads to health consequences					
5.8 Understand how the health system contributes to the problem					
5.9 Know how the health system can mitigate its environmental footprint					
5.10 Understand how the health system can prepare to be more resilient in the face of the ecological crisis					
5.11 Understand what is expected of health professionals in their personal and professional behaviour					
5.12 Critique current environmental protections in the SA Constitution and other legislation i.t.o. how they affect other health rights of your patients, families and communities (eg: equity in housing, clean water, food safety, property ownership, etc.)					
5.13 Understand the application to nursing practice					
5.14 Understand the environmental determinants of health in Africa					

5.15 Evaluate the environmental determinants of health in a community.					
5.16 Evaluate the preparedness of health services to be resilient					
5.17 Evaluate the environmental footprint of health services					
5.18 Plan responses and interventions to these issues					
5.19 Be able to speak out and advocate for change as health professionals					
5.20 Be able to articulate concerns and advocate to a wider audience for changes to 'save our planet'					
5.21 Identify and map local indigenous and other efforts that are happening in your specific context that are relevant to these themes, and with whom you can build coalitions to support the achievement of SDGs.					

6. Please provide any comments on the additional LOs above

_____

Section 3 of 3
Rating of opportunities for Learning and Assessment

The opportunities for LEARNING and for ASSESSMENT of education about planetary health and sustainable healthcare have been scored and ranked from your Round 1 (R1) responses.
Each option is displayed with its numeric identifier from R1, and its R1 score out of 30.

7. OPPORTUNITIES FOR LEARNING: Select all the Learning Activities below that you think should be integrated into health professional curricula in your Faculty

	Yes	Maybe	No
7.2 Role-plays or real-life: advise a patient about environmental & health co-benefits of lifestyle choices [R1 score= 30]			
7.1 Role-plays or real-life: take a patient's history of exposure to common environmental risk factors [R1 score= 28]			
7.5 Oral presentations about a sustainable healthcare or planetary health topic [R1 score= 28]			
7.6 Participatory research with communities about their priority environmental determinants of health [R1 score= 28]			
7.8 Designing a public health strategy to address priority environmental health impacts on individuals or communities [R1 score= 28]			
7.10 Debates on issues of ecological justice / eco-ethics / eco-advocacy by health professionals [R1 score= 28]			
7.11 Reflections on personal and/or professional eco-ethical challenges [R1 score= 27]			
7.4 Writing assignments about a sustainable healthcare or planetary health topic [R1 score= 25]			
7.7 Application of principles of sustainable healthcare to tests & interventions during a patient's referral pathway [R1 score= 25]			
7.9 Concept mapping the inter-relationships between environment, disease burden, and healthcare [R1 score= 25]			
7.3 Role-plays or real-life: advise a patient about "eco-friendly" medical treatment options [R1 score= 24]			

8. These are additional OPPORTUNITIES FOR LEARNING that you proposed in Round 1. Please select each one too and comment below (Q9) if you wish.

	Yes	Maybe	No
8.1 Workshops on campus to explore environmentally responsible behaviour as students and future professionals.			
8.2 Webinars that enable multidisciplinary inputs on the interaction of environment and health.			
8.3 Linking the topic to teaching on community orientated primary care and leadership/clinical governance			
8.4 Site visits to water treatment/sewerage plants, landfills, etc. in the drainage areas where patients live.			
8.5 COPC/community mapping based on site visits			
8.6 Joint discussions and participation with students from other faculties/programmes (e.g. Geography/Environmental Sciences/Mining)			
8.7 Learning from Industrial Technicians/Environmental Health Officers about assessing an area: air pollution (particulate matter), soil samples (e.g. arsenic, lead), water contamination (e.g. microbial content)			

9. Please provide any comments on the additional OPPORTUNITIES FOR LEARNING above

_____

10. OPPORTUNITIES FOR ASSESSMENT: Select all the types of Formative/ Summative assessment of Sustainable Healthcare (SH) content below that you think *should* be integrated into the Health Professional Programmes in your Faculty.

	Yes	Maybe	No
10.3 Group discussion about eco-ethical issues in clinical care [R1 score= 28]			
10.4 Individual essay / short reflections on learning [R1 score= 26]			
10.6 Oral presentations with a rubric [R1 score= 26]			
10.7 OSCE exam station on environmental history taking [R1 score= 26]			
10.9 Patient consultations that include environmental history taking and advice on sustainable healthcare [R1 score= 26]			
10.10 Peer feedback on oral presentations [R1 score= 26]			
10.8 OSCE exam station on sustainable healthcare communication [R1 score= 25]			
10.12 Research project report / presentation / journal articles [R1 score= 25]			
10.5 Multiple choice (MCQ) or Short Assessment questions (SAQ) on core topics [R1 score= 24]			
10.13 Role plays [R1 score= 24]			
10.11 Project supervisor assessment reports [R1 score= 23]			
10.14 Written assignments with a rubric [R1 score= 23]			
10.1 Assessing debates with a rubric [R1 score= 22]			
10.2 Assessments of concept mapping exercises [R1 score= 20]			

11. Proposed additional OPPORTUNITY FOR ASSESSMENT. Please select and comment below if you wish.

	Yes	Maybe	No
Multiprofessional problem solving case			

12. Please provide any comments on additional OPPORTUNITIES FOR ASSESSMENT

_____

Do you have any further comments or queries?

_____

THANKS - YOU WILL BE INVITED TO PARTICIPATE IN THE FINAL CONSULTATIVE WORKSHOP BEFORE THE END OF MAY

Appendix 8:

Supplementary Table 4.1. List of Delphi panellists

1	Dr Cornelle Young, Department of Nursing and Midwifery, Faculty of Medicine and Health Sciences, Stellenbosch University
2	Prof Poovendhree Reddy, Department of Community Health Studies, Durban University of Technology
3	Prof Rajen Naidoo, Discipline of Occupational and Environmental Health, College of Health Sciences, University of KwaZulu Natal
4	Dr Christian Lueme Lokotola, Division of Family Medicine and Primary Care, Faculty of Medicine and Health Sciences, Stellenbosch University
5	Prof Mohammed Aqiel Dalvie, Division of Environmental Health, School of Public Health & Family Medicine, Faculty of Health Sciences, University of Cape Town
6	Prof Bob Mash, Division of Family Medicine and Primary Care, Faculty of Medicine and Health Sciences, Stellenbosch University
7	Prof Jennifer Chipps, School of Nursing Division, Faculty of Community and Health Sciences, University of the Western Cape
8	Prof Laurel Baldwin-Ragaven, Department of Family Medicine and Primary Care, University of the Witwatersrand
9	Prof Andrew Ross, Department of Family Medicine, University of KwaZulu Natal

Appendix 9:

Supplementary Table 4.2. Learning objectives by learning domains, sub-domains and AfriMEDS health professional roles

Learning Domain [AMEE]	Learning sub-domains	Learning objectives (AMEE + proposed by panel)	R2 Score	R1 + R2 scores	Role of Health Professional
KNOWLEDGE (K)	K1 Understanding the environmental determinants of health	K1.1 Discuss how local and global ecological crises impact on individual patients and communities	44	84	HEALTHCARE PRACTITIONER
		K1.2 Describe the interaction between local and global ecological crises and the social determinants of health.	40	76	HEALTHCARE PRACTITIONER
		K1.3 Understand the interaction of environmental exposures	34		HEALTHCARE PRACTITIONER
		K1.4 Understand the drivers influencing environment & health relationships - political and economic (mostly), social and behavioral etc.	38		LEADER & MANAGER
		K1.5 Know the global environmental determinants of health	37		LEADER & MANAGER
		K1.6 Understand the environmental determinants of health in Africa	34		LEADER & MANAGER

		K1.7 Evaluate the environmental determinants of health in a community.	35		LEADER & MANAGER
		K1.8 Know the various environmental issues that make up the 'ecological crisis	36		LEADER & MANAGER
		K1.9 Know what planetary environmental systems support human health	41		LEADER & MANAGER
		K1.10 Understand how dysfunction in planetary systems leads to health consequences	41		LEADER & MANAGER
	K2 Understanding the environmental sustainability of healthcare	K2.1 Discuss how the promotion of environmental sustainability generally and in healthcare can support progress on social determinants of health, health equity and respect for cultural diversity, including Indigenous traditional knowledge.	41	79	LEADER & MANAGER
		K2.2 Know how to integrate principles within their own healthcare practice	32		LEADER & MANAGER
		K2.3 Understand how the health system contributes to the problem	**41**		**LEADER & MANAGER**
		K2.4 Know how the health system can mitigate its environmental footprint	42		LEADER & MANAGER

		K2.5 Understand how the health system can prepare to be more resilient in the face of the ecological crisis	43		LEADER & MANAGER
KNOWLEDGE & SKILLS (KS)	KS1 Enhancing the environmental sustainability of healthcare	KS1.1 Evaluate the environmental impacts of a patient pathway to care and identify ways to enhance environmental sustainability.	38	73	HEALTHCARE PRACTITIONER
		KS1.2 Describe how changes in disease burden due to environmental change may be identified, characterised and quantified and how such information can inform planning and practice to address health needs	43	80	LEADER & MANAGER
		KS1.3 Apply critical thinking, problem-solving and systems thinking to sustainable healthcare challenges.	39	75	LEADER & MANAGER
		KS1.4 Plan responses and interventions to these issues	40		LEADER & MANAGER
		KS1.5 Evaluate the preparedness of health services to be resilient	40		LEADER & MANAGER
		KS1.6 Evaluate the environmental footprint of health services	40		LEADER & MANAGER
	KS2 Critiquing environmental sustainability policy	KS2.1 Apply key policies and frameworks related to sustainable development including the SDGs to evaluate a population health challenge.	35	68	SCHOLAR
		KS2.2 Critique current environmental protections in the SA Constitution and other legislation i.t.o. how they affect other health rights of your patients,	**34**		**PROFESSIONAL**

		families and communities (eg: equity in housing, clean water, food safety, property ownership, etc.)			
	KS3 Advocating for planetary health and sustainable development	KS3.1 Communicate clearly with health professional colleagues when responding to an ecological challenge or opportunity in healthcare.	40	75	COMMUNICATOR
		KS3.2 Demonstrate how to motivate behaviour change to promote environmental sustainability at an individual, professional and community level	39	77	HEALTH ADVOCATE
		KS3.3 Demonstrate the ability to advocate for planetary health and the SDGs.	37	71	HEALTH ADVOCATE
		KS3.4 Identify how Indigenous traditional knowledge and voice can inform healthcare practice and promotion of planetary health and sustainable development in your local context.	37	70	COLLABORATOR
		KS3.5 Be able to speak out and advocate for change as health professionals	41		HEALTH ADVOCATE
		KS3.6 Be able to articulate concerns and advocate to a wider audience for changes to 'save our planet'.'	33		HEALTH ADVOCATE
		KS3.7 Identify and map local indigenous and other efforts that are happening in your specific context that are relevant to these themes, and with whom you can build coalitions to support the achievement of SDGs.	35		HEALTH ADVOCATE

KNOWLEDGE, VALUES, ATTITUDES & AGENCY (KVA)	KVA1 Eco-ethical leadership in healthcare	KVA1.1 Discuss examples of eco-ethical leadership.	36	69	HEALTH ADVOCATE
		KVA.1.2 Understand what is expected of health professionals in their personal and professional behaviour	**41**		**LEADER & MANAGER**
		KVA1.3 Discuss the role of health professionals in mitigation, adaptation, advocacy and activism in terms of sustainable development, planetary health and environmental stewardship.	42	81	PROFESSIONAL

Supplementary Table 4.2 (continued): ESH Learning objectives by Learning Domains and Core Graduate Competencies

Learning objectives	Role of Health Professional	Key undergraduate competency	Enabling competency
K1.1	HEALTHCARE PRACTITIONER	Acquire and maintain knowledge, skills, attitudes and character appropriate to their practice.	1.2.1 a) Reflect on, integrate, apply and evaluate core knowledge, skills, attitudes and character acquired during undergraduate training in the holistic management of functional and structural impairment, activity limitations and participation restrictions, all with reference to personal and environmental
K1.2	HEALTHCARE PRACTITIONER	Perform comprehensive assessments of patients/clients.	1.3.1 b) Elicit a history of the patient/client that is relevant, concise and accurate to context, for the purposes of disease prevention, health promotion, diagnosis and/or management.
K1.3	HEALTHCARE PRACTITIONER	Acquire and maintain knowledge, skills, attitudes and character appropriate to their practice.	1.2.1 a) Reflect on, integrate, apply and evaluate core knowledge, skills, attitudes and character acquired during undergraduate training in the holistic management of functional and structural impairment, activity limitations and participation restrictions, all with reference to personal and environmental
K1.4	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.c) Identify the health determinants of the population, such as genetic, demographic, environmental, socio-economic, psychological, cultural and lifestyle-related determinants.
K1.5	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.c) Identify the health determinants of the population, such as genetic, demographic, environmental, socio-economic, psychological, cultural and lifestyle-related determinants.
K1.6	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.c) Identify the health determinants of the population, such as genetic, demographic, environmental, socio-economic, psychological, cultural and lifestyle-related determinants.
K1.7	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.c) Identify the health determinants of the population, such as genetic, demographic, environmental, socio-economic, psychological, cultural and lifestyle-related determinants.

Learning objectives	Role of Health Professional	Key undergraduate competency	Enabling competency
K1.8	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.c) Identify the health determinants of the population, such as genetic, demographic, environmental, socio-economic, psychological, cultural and lifestyle-related determinants.
K1.9	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.c) Identify the health determinants of the population, such as genetic, demographic, environmental, socio-economic, psychological, cultural and lifestyle-related determinants.
K1.10	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.c) Identify the health determinants of the population, such as genetic, demographic, environmental, socio-economic, psychological, cultural and lifestyle-related determinants.
K2.1	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.e) Evaluate the elements of the local health system, taking into consideration the economic and practical constraints within which the service is delivered and the audit process to monitor its delivery.
K2.2	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.e) Evaluate the elements of the local health system, taking into consideration the economic and practical constraints within which the service is delivered and the audit process to monitor its delivery.
K2.3	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.e) Evaluate the elements of the local health system, taking into consideration the economic and practical constraints within which the service is delivered and the audit process to monitor its delivery.
K2.4	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.e) Evaluate the elements of the local health system, taking into consideration the economic and practical constraints within which the service is delivered and the audit process to monitor its delivery.
Learning objectives	**Role of Health Professional**	**Key undergraduate competency**	**Enabling competency**

K2.5	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.e) Evaluate the elements of the local health system, taking into consideration the economic and practical constraints within which the service is delivered and the audit process to monitor its delivery.
KS1.1	HEALTHCARE PRACTITIONER	Use preventative, promotive, therapeutic & rehabilitative interventions effectively	1.4.1 d) Formulate and implement appropriate holistic, cost-appropriate and effective management plans in collaboration with patients/clients and their families, emphasising the importance of healthy behaviour and the patient/client's right to choice.
KS1.2	LEADER & MANAGER	Participate in activities that contribute to the effectiveness of the healthcare organisations and systems in which they work	4.1.1 c) Participate in the quality process evaluation and improvement of systems, such as practice audits, mortality and morbidity meetings and patient/client safety initiatives, integrating the available best evidence and practice..
KS1.3	LEADER & MANAGER	Participate in activities that contribute to the effectiveness of the healthcare organisations and systems in which they work.	4.1.1 d) Demonstrate problem-solving enterprise and creativity in improving and managing a healthcare system, and by providing advice to relevant authorities, with support from superiors.
KS1.4	LEADER & MANAGER	Participate in activities that contribute to the effectiveness of the healthcare organisations and systems in which they work.	4.1.1 d) Demonstrate problem-solving enterprise and creativity in improving and managing a healthcare system, and by providing advice to relevant authorities, with support from superiors.
KS1.5	LEADER & MANAGER	Participate in activities that contribute to the effectiveness of the healthcare organisations and systems in which they work.	4.5.1.e) Evaluate the elements of the local health system, taking into consideration the economic and practical constraints within which the service is delivered and the audit process to monitor its delivery.
KS1.6	LEADER & MANAGER	Participate in activities that contribute to the effectiveness of the healthcare organisations and systems in which they work.	4.5.1.e) Evaluate the elements of the local health system, taking into consideration the economic and practical constraints within which the service is delivered and the audit process to monitor its delivery.
Learning objectives	**Role of Health Professional**	**Key undergraduate competency**	**Enabling competency**
KS2.1	SCHOLAR	Maintain and enhance professional competence through ongoing learning, both as healthcare professionals and as responsible citizens, locally and globally.	6.1.1 e) Reflect on, and learn from, challenges that are experienced in practice by posing appropriate questions, accessing and interpreting relevant evidence, integrating new learning with practice, evaluating the impact of change in practice, and documenting the learning process.

KS2.2	PROFESSIONAL	Demonstrate a commitment to their patients/clients, healthcare professionals and society through participation in profession-led self-regulation.	7.2.1 b) Recognise and interrogate public health policy in terms of ethics and human rights.
KS3.1	COMMUNICATOR	Convey relevant information and explanations accurately and effectively to patients/clients, families, communities, colleagues and other professionals as well as statutory and professional	2.3.1 c) Present well-documented assessments and recommendations effectively in written and/or verbal form in response to a request from another healthcare professional.
KS3.2	HEALTH ADVOCATE	Respond to the health needs of the communities that they serve	5.2.1 c) Identify opportunities for health promotion and disease prevention within the context of promoting a healthy environment and lifestyle.
KS3.3	HEALTH ADVOCATE	Respond to the health needs of the communities that they serve	5.2.1 a) Familiarise themselves with the communities they serve by obtaining insight into the functioning of the local health system, barriers to access care and resources, and other factors not directly part of healthcare.,
KS3.4	COLLABORATOR	Participate effectively and appropriately in multicultural, interprofessional and trans-professional teams, as well as teams in other contexts (the community included).	3.1.1. b) Recognise and respect – irrespective of profession, status, age, gender, race, class or beliefs – the diversity of roles, responsibilities and competencies of other healthcare team members. Appreciate diversity, and demonstrate the ability to adapt.
KS3.5	HEALTH ADVOCATE	Respond to the health needs of the communities that they serve	5.2.1 b) Identify vulnerable or marginalised populations and respond appropriately, with a commitment to equity through access to care and equal opportunities
Learning objectives	**Role of Health Professional**	**Key undergraduate competency**	**Enabling competency**
KS3.6	HEALTH ADVOCATE	Respond to the health needs of the communities that they serve	5.2.1 b) Identify vulnerable or marginalised populations and respond appropriately, with a commitment to equity through access to care and equal opportunities
KS3.7	HEALTH ADVOCATE	Respond to the health needs of the communities that they serve	5.2.1 a) Familiarise themselves with the communities they serve by obtaining insight into the functioning of the local health system, barriers to access care and resources, and other factors not directly part of healthcare.,

KVA1.1	HEALTH ADVOCATE	Respond to the health needs of the communities that they serve	5.2.1 b) Identify vulnerable or marginalised populations and respond appropriately, with a commitment to equity through access to care and equal opportunities
KVA1.2	LEADER & MANAGER	Provide effective healthcare to geographically defined communities.	4.5.1.e) Evaluate the elements of the local health system, taking into consideration the economic and practical constraints within which the service is delivered and the audit process to monitor its delivery.
KVA1.3	PROFESSIONAL	Demonstrate a commitment to their patients/clients, healthcare professionals and society through participation in profession-led self-regulation.	7.2.1 b) Recognise and interrogate public health policy in terms of ethics and human rights.

Appendix 10:

Supplementary Table 4.3.1 Core graduate competencies and roles related to ESH learning objectives (HEALTHCARE PRACTITIONER)

ROLE	1	HEALTHCARE PRACTITIONER	
	Abbreviated EC	**ESH Learning Objectives**	**Source**
KEY COMPETENCY	**1.1**	**Function effectively as entry-level healthcare practitioners**	
ENABLING COMPETENCIES (EC)	A. Perform a consultation or clinical encounter	K1.1 Discuss how local and global ecological crises impact on individual patients and communities	AMEE 2020
	B. Respond to ethical issues in care and clinical decision-making	KVA1.1 Discuss examples of eco-ethical leadership.	AMEE 2020
	C. Prioritise professional duties when caring for multiple patients/clients		
	D. Provide compassionate empathetic & patient/client centred care		
	E. Demonstrate commitment in primary health-care settings		

KEY COMPETENCY	**1.2**	**Acquire skills, knowledge, attitudes & character**	
ENABLING COMPETENCIES	A. Apply, integrate, reflect on & evaluate CORE knowledge, skills, attitudes & character	K1.1 Discuss how local and global ecological crises impact on individual patients and communities	AMEE 2020
	B. Apply life-long learning skills to enhance competence		
KEY COMPETENCY	**1.3**	**Perform comprehensive assessments of patients/clients**	
ENABLING COMPETENCIES	A. Identify issues in patient/client encounter in patient context & preferences		
	B. Elicit a concise accurate history of patient/client	K1.1 Discuss how local and global ecological crises impact on individual patients and communities	AMEE 2020
	C. Perform a focussed examination		
	D. Select investigative methods in a resource-effective &ethical manner		

	E. Judge and solve patient/client's problems by interpreting data & integrating info for diagnosis and a management plan		
	F. Demonstrate increasing proficiency in clinical decision-making		
KEY COMPETENCY	**1.4**	**Use preventative, promotive, therapeutic & rehabilitative interventions**	
ENABLING COMPETENCIES	A. Demonstrate timely application of therapeutic interventions		
	B. Include prevention & health promotion in management plan		
	C. Consider range of solutions for treatment and prevention of health problems for all ages and communities		
	D. Formulate cost-appropriate and effective management plans	KS1.1 Evaluate the environmental impacts of a patient pathway to care and identify ways to enhance environmental sustainability.	AMEE 2020
	E. Obtain appropriate informed consent for interventions		
	F. Use and/or adapt clinical care, patient guidelines and protocols to local settings		

	G. Develop and deliver follow-up and ongoing care		
	H. Recognize acute life-threatening emergencies and initiate treatment and/or referral		
	I. Compile care plan in context of SA healthcare system		
KEY COMPETENCY	**1.5**	**Demonstrate use of diagnostic & therapeutic procedural skills**	
	A. Perform diagnostic, therapeutic & rehabilitative procedures		
ENABLING COMPETENCIES	B. Document and disseminate information related to procedures performed and outcomes	KS3.1 Communicate clearly with health professional colleagues when responding to an ecological challenge or opportunity in healthcare.	AMEE 2020
	C. Follow-up care and care continuity for procedures performed		
KEY COMPETENCY	**1.6**	**Consult with other healthcare professionals**	
ENABLING COMPETENCIES	A. Demonstrate insight into own limitations of expertise		

	B. Demonstrate effective, appropriate and timely consultation of other healthcare professionals for optimal care	KS3.1 Communicate clearly with health professional colleagues when responding to an ecological challenge or opportunity in healthcare.	AMEE 2020

Supplementary Table 4.3.2 Core graduate competencies and roles related to ESH learning objectives (COMMUNICATOR)

ROLE	2	COMMUNICATOR	
	Abbreviated EC	**ESH Learning Objectives**	**Source**
KEY COMPETENCY	**2.1**	**Develop rapport, trust and ethical therapeutic relationships with patients/clients, families and communities from different cultural backgrounds.**	
ENABLING COMPETENCIES (EC)	A. Demonstrate patient/client-centred and community-centred approach	K1.1 Discuss how local and global ecological crises impact on individual patients and communities	AMEE 2020
	B. Practise good communication as a core clinical skill	KS3.1 Communicate clearly with health professional colleagues when responding to an ecological challenge or opportunity in healthcare.	AMEE 2020
	C. Establish positive therapeutic relationships		
	D. Respect patient/client confidentiality, privacy & autonomy		
	E. Motivate patients/clients/families/communities to take personal responsibility for their health	KS3.2 Demonstrate how to motivate behaviour change to promote environmental sustainability at an individual, professional and community level	AMEE 2020
	F. Demonstrate flexible communication skills		

KEY COMPETENCY	**2.2**	**Elicit & synthesise information & perspectives from patients, families & other professionals**	
ENABLING COMPETENCIES	A. Gather info about health conditions & functioning & patient/ client's beliefs, concerns & expectations	K1.1 Discuss how local and global ecological crises impact on individual patients and communities	AMEE 2020
	B. Find & synthesise info from relevant sources	KS1.2 Describe how changes in disease burden due to environmental change may be identified, characterised and quantified and how such information can inform planning and practice to address health needs	AMEE 2020
	C. Listen, clarify, probe, be aware of & responsive to non-verbal cues		
KEY COMPETENCY	**2.3**	**Convey information & explanations accurately & effectively**	
ENABLING COMPETENCIES	A. Retrieve info from clinical data system		
	B. Deliver info in humane manner & encourage discussion		
	C. Present well-documented assessments & recommendations	KS3.1 Communicate clearly with health professional colleagues when responding to an ecological challenge or opportunity in healthcare.	AMEE 2020
	D. Compile accurate reports for statutory & professional purposes		

KEY COMPETENCY	**2.4**	**Develop a common understanding of issues, problems & plans & a shared plan of action/care**	
ENABLING COMPETENCIES	A. Explore problems to be addressed from patient/client encounter		
	B. Respect diversity & difference and ethnicity, gender, religion, education & culture in decision-making		
	C. Encourage discussion, questions & interaction		
	D. Engage others in decision-making & development of plan of care/action	KS3.1 Communicate clearly with health professional colleagues when responding to an ecological challenge or opportunity in healthcare.	AMEE 2020
	E. Address challenging communication issues: obtaining consent, delivering bad news, anger, confusion & misunderstanding		
	F. Communicate costs and risks implicit in clinical interventions and care – avoid medico-legal issues		
KEY COMPETENCY	**2.5**	**Convey accurate oral and/or written information about a clinical encounter**	
ENABLING COMPETENCIES	A. Maintain clear, accurate records (written or electronic) of all clinical encounters		

	B. Present oral & written reports of clinical encounters & plans – apply visual, technology & numeracy skills C. Recognise ethical & legal issues in compiling patient/client documentation	KS3.1 Communicate clearly with health professional colleagues when responding to an ecological challenge or opportunity in healthcare.	AMEE 2020

Supplementary Table 4.3.3 Core graduate competencies and roles related to ESH learning objectives (COLLABORATOR)

ROLE	3	COLLABORATOR	
	Abbreviated EC	**ESH Learning Objectives**	**Source**
KEY COMPETENCY	**3.1**	**Demonstrate team work in a variety of situations/settings**	
ENABLING COMPETENCIES (EC)	A. Describe own roles & responsibilities to other professionals		
	B. Recognise & respect the diversity of roles	KS3.4 Identify how Indigenous traditional knowledge and voice can inform healthcare practice and promotion of planetary health and sustainable development in your local context.	AMEE 2020
	C. Work interdependently and share tasks		
	D. Collaborate with others	KVA1.3 Discuss the role of health professionals in mitigation, adaptation, advocacy and activism in terms of sustainable development, planetary health and environmental stewardship.	AMEE 2020
	E. Participate in interprofessional team meetings		
	F. Demonstrate leadership in healthcare team	KVA1.1 Discuss examples of eco-ethical leadership.	AMEE 2020

KEY COMPETENCY	**3.2**	**Promote positive professional relationships**
ENABLING COMPETENCIES	A. Have respectful attitude towards other team members	KS3.4 Identify how Indigenous traditional knowledge and voice can inform healthcare practice and promotion of planetary health and sustainable development in your local context.
	B. Employ negotiation skills to achieve consensus or resolve conflict	
	C. Recognise own and others' differences or limitations that may contribute to tension	
	D. Reflect on improving interprofessional & transprofessional team functioning	

Supplementary Table 4.3.4 Core graduate competencies and roles related to ESH learning objectives (LEADER & MANAGER)

ROLE	**4**	**LEADER & MANAGER**	
	Abbreviated EC	**ESH Learning Objectives**	**Source**
KEY COMPETENCY	**4.1**	**Participate in healthcare organisations and systems**	
ENABLING COMPETENCIES (EC)	A. Understand the structure & functioning of healthcare systems	K2.3 Understand how the health system contributes to the problem	Delphi R1
	B. Work in home & community-based care settings		
	C. Participate in quality process evaluation & improvement of systems		
	D. Use problem-solving & creativity to improve & manage health care system	KS1.3 Apply critical thinking, problem-solving and systems thinking to sustainable healthcare challenges.	AMEE 2020
KEY COMPETENCY	**4.2**	**Manage career and practice**	
ENABLING COMPETENCIES	A. Prioritise time, patient/client care, practice requirements, activities & personal life		

	B. Manage professional practice: finances, human resources & record-keeping		
	C. Improve personal practice	KVA1.2 Understand what is expected of health professionals in their personal and professional behaviour	Delphi R1
	D. Use information technology in managing healthcare environments		
KEY COMPETENCY	**4.3**	**Utilize finite healthcare resources**	
ENABLING COMPETENCIES	A. Use resources carefully and fairlly	KVA1.2 Understand what is expected of health professionals in their personal and professional behaviour	Delphi R1
	B. Achieve cost-appropriate care using good management & evidence		
KEY COMPETENCY	**4.4**	**Serve in administration and leadership roles as appropriate**	
ENABLING COMPETENCIES	A. Participate in committees & meetings		
	B. Participate in change where necessary	KS3.2 Demonstrate how to motivate behaviour change to promote environmental sustainability at an individual, professional and community level	AMEE 2020
	C. Plan elements of healthcare delivery (e.g. rosters, etc)		

KEY COMPETENCY	**4.5**	**Provide healthcare to geographically defined communities**	
ENABLING COMPETENCIES	A. Deliver profession-specific services in community, hospital & other facilities		
	B. Evaluate burden of disease: local, regional, national & global		
	C. Identify health determinants of population	K1.2 Describe the interaction between local and global ecological crises and the social determinants of health.	AMEE 2020
	D. Evaluate existing primary health-care practice & community health programmes	K2.1 Discuss how the promotion of environmental sustainability generally and in healthcare can support progress on social determinants of health, health equity and respect for cultural diversity, including Indigenous traditional knowledge.	AMEE 2020
	E. Evaluate elements of the local health system	K2.1 Discuss how the promotion of environmental sustainability generally and in healthcare can support progress on social determinants of health, health equity and respect for cultural diversity, including Indigenous traditional knowledge.	AMEE 2020
	F. Draw up a plan to manage health priorities & promote health in collaboration with others	K2.1 Discuss how the promotion of environmental sustainability generally and in healthcare can support progress on social determinants of health, health equity and respect for cultural diversity, including Indigenous traditional knowledge.	AMEE 2020
	G. Determine functional links between primary & public healthcare, hospital & home-based care, & principles of ethics & human rights		

Supplementary Table 4.3.5 Core graduate competencies and roles related to ESH learning objectives (HEALTH ADVOCATE)

ROLE	5	HEALTH ADVOCATE	
	Abbreviated EC	**ESH Learning Objectives**	**Source**
KEY COMPETENCY	**5.1**	**Respond to individual patient/client health needs**	
ENABLING COMPETENCIES (EC)	A. Identify individual health needs in cultural context	K1.1 Discuss how local and global ecological crises impact on individual patients and communities	AMEE 2020
	B. Promote health & disease prevention ethically & by human rights principles	KS3.2 Demonstrate how to motivate behaviour change to promote environmental sustainability at an individual, professional and community level	AMEE 2020
	C. Advocate health needs of poor & marginalized	KS3.4 Identify how Indigenous traditional knowledge and voice can inform healthcare practice and promotion of planetary health and sustainable development in your local context.	AMEE 2020
KEY COMPETENCY	**5.2**	**Respond to health needs of communities**	
ENABLING COMPETENCIES	A. Gain insight into functioning of local health systems, resources & health care	KVA1.3 Discuss the role of health professionals in mitigation, adaptation, advocacy and activism in terms of sustainable development, planetary health and environmental stewardship.	AMEE 2020
	B. Identify vulnerable & marginalised populations & respond appropriately	KS3.3 Demonstrate the ability to advocate for planetary health and the SDGs.	AMEE 2020

	C. Identify opportunities for health promotion & disease prevention	KS3.2 Demonstrate how to motivate behaviour change to promote environmental sustainability at an individual, professional and community level	AMEE 2020
	D. Enable communities to identify, prioritise & address healthcare needs		
	E. Recognise & respond to competing interests within a community		
	F. Apply ethical & professional principles inherent in health advocacy		

Supplementary Table 4.3.6 Core graduate competencies and roles related to ESH learning objectives (SCHOLAR)

ROLE	**6**	**SCHOLAR**	
	Abbreviated EC	**ESH Learning Objectives**	**Source**
KEY COMPETENCY	**6.1**	**Maintain ongoing learning locally & globally**	
ENABLING COMPETENCIES (EC)	A. Reflect on strengths & limitations of own knowledge & skills		
	B. Enhance knowledge & skills using a personal development plan		
	C. Use strategies & opportunities for CPD & life-long learning		
	D. Maintain accurate records for good practice, audits & research		
	E. Document learning process – pose questions, interpret evidence & integrate learning into practice	KS2.1 Apply key policies and frameworks related to sustainable development including the SDGs to evaluate a population health challenge.	AMEE 2020
	F. Know HPCSA regulations for CPD		

KEY COMPETENCY	**6.2**	**Question practice, evidence, information & sources & apply the information**	
ENABLING COMPETENCIES	A. Phrase clear, answerable questions related to practice		
	B. Critically evaluate health-related literature to keep up to date with new developments		
	C. Access relevant research findings from reliable resources		
	D. Appraise retrieved evidence for quality and relevance & interpret findings		
	E. Consider research findings for own setting		
	F. Understand basic principles of research design & analysis & ethics	KS1.2 Describe how changes in disease burden due to environmental change may be identified, characterised and quantified and how such information can inform planning and practice to address health needs	AMEE 2020
	G. Comply with laws of plagiarism, confidentiality, intellectual property		
KEY COMPETENCY	**6.3**	**Facilitate learning of others**	

ENABLING COMPETENCIES	A. Identify learning needs & outcomes of others	KS3.4 Identify how Indigenous traditional knowledge and voice can inform healthcare practice and promotion of planetary health and sustainable development in your local context.	AMEE 2020
	B. Select teaching strategies & content to facilitate learning of others		
	C. Reflect on teaching encounters & seek feedback to guide future learning		
	D. Create supportive & enabling learning environment		
	E. Listen & provide feedback		
	F. Seek & use opportunities to develop facilitators & mentors		

Supplementary Table 4.3.7 Core graduate competencies and roles related to ESH learning objectives (PROFESSIONAL)

ROLE	**7**	**PROFESSIONAL**	
	Abbreviated EC	**ESH Learning Objectives**	**Source**
KEY COMPETENCY	**7.1**	**Demonstrate commitment & accountability through ethical practice**	
ENABLING COMPETENCIES (EC)	A. Exhibit and promote professional behaviour	KVA1.2 Understand what is expected of health professionals in their personal and professional behaviour	Delphi R1
	B. Deliver quality care		
	C. Recognize and respond to ethical, legal and human rights issues		
	D. Recognize and manage conflict of interest		
	E. Recognize the principles and limits of patient/client confidentiality		
	F. Maintain professional relations		

KEY COMPETENCY	**7.2**	**Participate in profession-led self-regulation**	
ENABLING COMPETENCIES	A. Adhere to ethical, professional and legal codes of practice		
	B. Recognize and interrogate public health policy in terms of ethics and human rights	KS2.2 Critique current environmental protections in the SA Constitution and other legislation i.t.o. how they affect other health rights of your patients, families and communities (e.g.: equity in housing, clean water, food safety, property ownership, etc.)	Delphi R1
	C. Demonstrate accountability and fulfil regulatory & legal obligations		
	D. Recognize, address and report unprofessional behaviour		
	E. Maintain professional competence through ongoing self-reflection & peer review		
KEY COMPETENCY	**7.3**	**Demonstrate commitment to own health & sustainable practice**	
ENABLING COMPETENCIES	A. Make informed career choices		
	B. Balance personal & professional priorities for health and a sustainable & effective practice	KS1.1 Evaluate the environmental impacts of a patient pathway to care and identify ways to enhance environmental sustainability.	AMEE 2020

	C. Demonstrate insight and develop problem solving strategies for physical, psychological, social & spiritual well-being		
	D. Recognize and respond to other professionals in need		

Appendix 11:

Supplementary Table 4.4. Barriers to curriculum integration of ESH

Barriers	R1 Score (%)
Lack of educators who are knowledgeable about sustainable health care	26 (96)
Lack of understanding about the relevance of sustainability teaching to healthcare	25 (93)
Too many competing educational interests	24 (89)
Lack of faculty leadership on sustainability	23 (85)
Lack of time / space in the teaching curricula	23 (85)
Lack of certainty about where to locate sustainability teaching in the curricula	21 (78)
Lack of teaching & learning resources for sustainable health care	20 (74)
Difficulty in assessing learning about sustainable health care.	17 (63)

Appendix 12 Informed consent for PHRC participants, UCT FHS

Primary Health Care Directorate

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Opportunities and Barriers to Implementing Education for Sustainable Healthcare in Africa: A South African Case Study (Phase 3 of a mixed methods PhD study)

Dear Colleague

Thank you for agreeing to participate in this study.

Your participation will contribute to a better understanding of how we can better prepare our health professional graduates as leaders of change for sustainable healthcare in South Africa.

Please note that your participation is entirely voluntary, and that you may withdraw at any time without any consequences. There are no potential risks from participating in the study.

This study has been approved by the University of Cape Town Faculty of Health Sciences Human Research Ethics Committee (HREC 358 /2021).

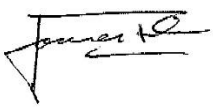
If you would like any information regarding your rights as a research participant please contact Professor Marc Blockman, Chair of the Human Research Ethics Committee (marc.blockman@uct.ac.za; 021 406 6492).

If you have any queries related to the survey, please contact:

James Irlam, *PhD researcher,* James.Irlam@uct.ac.za

Prof. Hanna-Andrea Rother, *Principal Investigator* & *PhD Supervisor,* Andrea.Rother@uct.ac.za

Yours sincerely



James Irlam

DECLARATION OF INFORMED CONSENT BY INTERVIEWEE

- I hereby acknowledge and understand the conditions for participating in the research study.
- I understand that my participation is voluntary and that I may withdraw at any stage without consequence.
- I have had the opportunity to ask questions and have had these questions answered.
- I agree to have my responses used anonymously for research purposes.
    - ☐ I consent
    - ☐ I do not consent

Name	
Signature	
Email	
Date	

Appendix 13:

Supplementary Table 5.1. Characteristics of PHRC interviewees, UCT FHS

Code	Name of Department	Discipline/ Division	Role
ES01	Office of Sustainability	UCT Main Campus	Director of Sustainability
ES02	Office of Sustainability	FHS Operations and Services	Occupational Health & Safety Manager
ES03	Office of Sustainability	UCT Main Campus	Senior Horticulturist
FHS01	Integrative Biomedical Science	Public Health	Deputy Dean: Undergraduate Education, FHS
FHS02	Health Sciences Education	Health Sciences Education	Head of Dept.
FHS03	FHS: Research Ethics	Research	Manager: Research Intelligence
GS01	Surgery	General Surgery	Head of Dept.
GS02	Surgery	Global Surgery	Head of Dept.
GS03	Surgery	General Surgery	MBChB Year 5 convener & Surgery course convener
GS04	Surgery	Urology	Head of Clinical Unit
HRS01	Health and Rehabilitation Sciences	Division of Comm. Sciences & Disorders	Speech & Language Programme Convenor
HRS02	Health and Rehabilitation Sciences	Division of Comm. Sciences & Disorders	Senior Lecturer -Audiology
HRS03	Health and Rehabilitation Sciences	Division of Comm. Sciences & Disorders	Head of Division
HRS04	Health and Rehabilitation Sciences	Division of Disability Studies	Head of Division
HRS05	Health and Rehabilitation Sciences	Division of Nursing & Midwifery	Head of Division
HRS06	Health and Rehabilitation Sciences	Occupational Therapy	Head of Dept.
HRS07	Health and Rehabilitation Sciences	Occupational Therapy	Year 1 academic convener
HRS08	Health and Rehabilitation Sciences	Occupational Therapy	Head of Division
HRS09	Health and Rehabilitation Sciences	Physiotherapy	Programme Convenor

HRS10	Health and Rehabilitation Sciences	Physiotherapy	Head of Division
HUB01	Human Biology	Biokinetics	Head of Division
HUB02	Human Biology	Physiological Science	MBChB Year 1 academic convener
HUB03	Human Biology	Physiological Science	MBChB Year 1 academic convener
MED01	Medicine	Division of Rheumatology	MBChB Year 6 academic convener
MED02	Medicine	Division of Acute General Medicine	MBChB Year 4 academic convener
PH01	Public Health	Public Health	Course co-convener
PH02	Public Health	Public Health	Course co-convener
PH03	Public Health	Public Health	Course convener
PH04	Public Health	Public Health	Honorary lecturer (Quality Improvement)
PH05	Public Health	Public Health	Course co-convener
PH06	Family Community and Emergency Care	Family Medicine	Head of Division
PH07	Family Community and Emergency Care	Family Medicine	MBChB Year 2 academic convener
PHC01	Family Community and Emergency Care	Primary Healthcare Directorate	Convener: Critical Health Humanities
PHC02	Public Health	Social and Behavioural Sciences	Convener: Critical Health Humanities
PTH01	Pathology	Anatomical Pathology	MBChB Year 3 academic convener
SHW01	SHAWCO	-	Executive Director
SHW02	SHAWCO	-	Student President 2022
UCT01	African Climate & Development Initiative (ACDI)	-	Deputy Director
UCT02	Dept. of Civil Engineering	Future Water Institute	Research Fellow

Appendix 14:

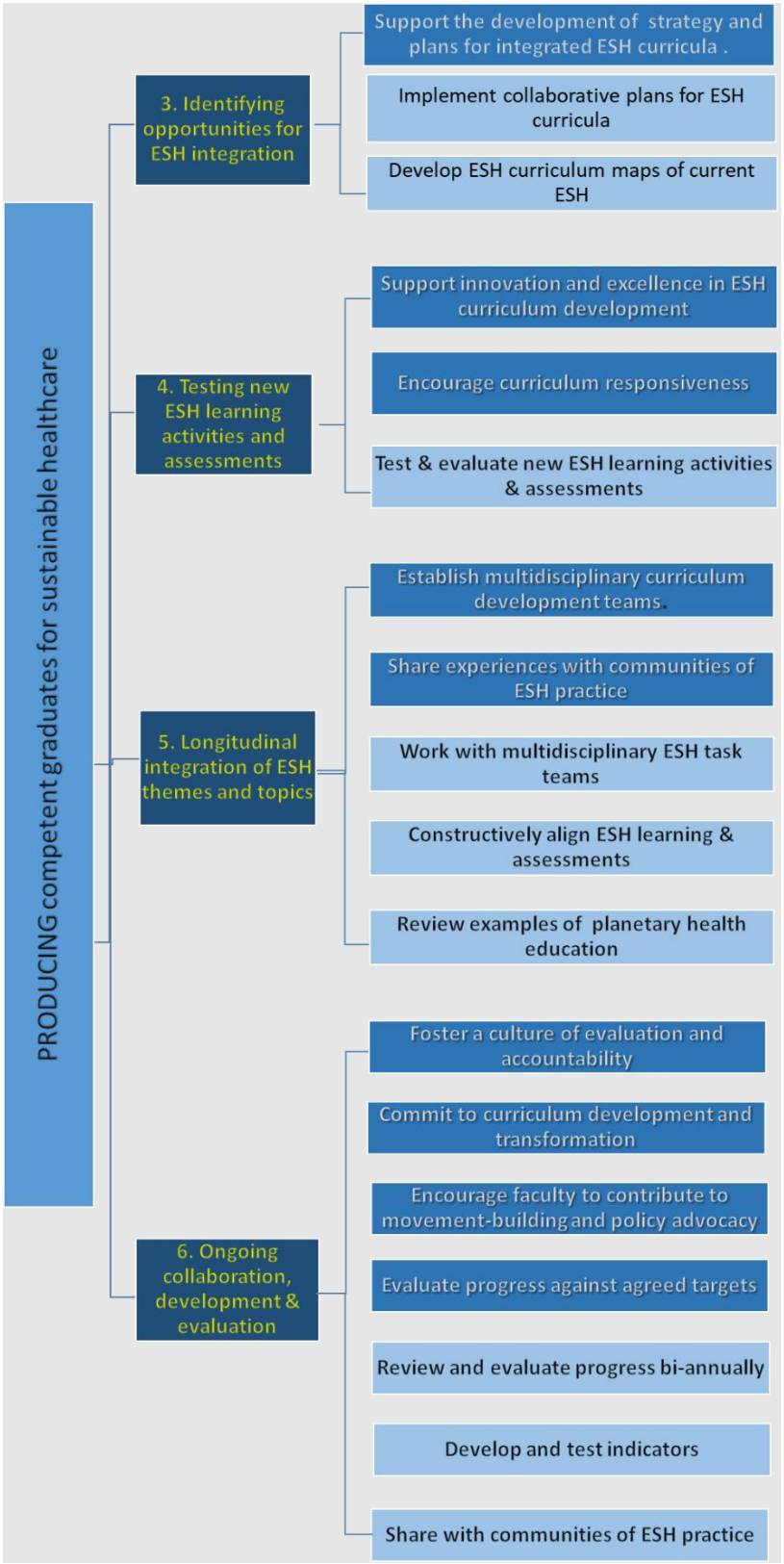
Supplementary Table 5.2. Planetary health grades for the UCT FHS

Category (Weighting %)	Score	Max. score	%	Grade
Planetary Health Curriculum (30%)	39	72	54,2%	C
Interdisciplinary Research (17.5%)	9	17	52,9%	C
Community Outreach and Advocacy (17.5%)	5	14	35,7%	D+
Support for Student-led Planetary Health Initiatives (17.5%)	3	15	20,0%	D-
Campus Sustainability (17.5%)	13	32	40,6%	C-
OVERALL	**69**		**42,4%**	**C-**

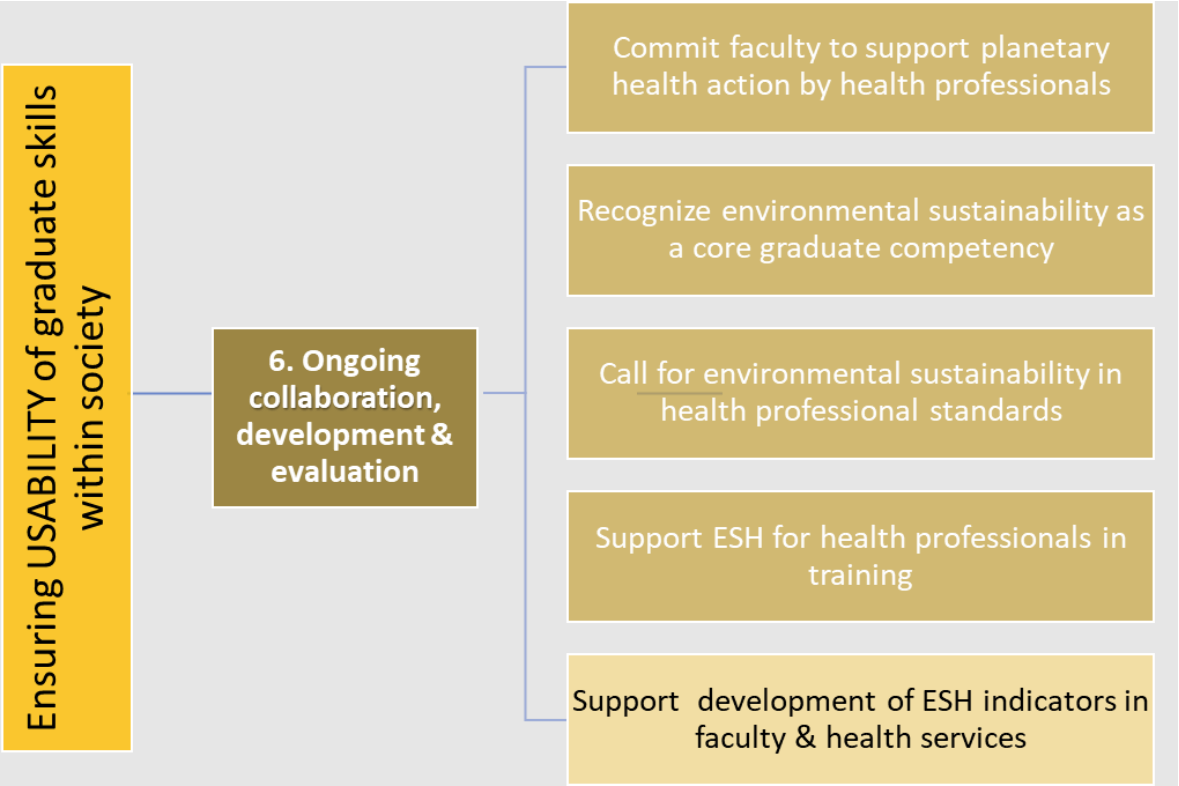
Appendix 15:

Supplementary Figure 6.1.1 Summary Framework for ESH Curricular Development (CONCEPTUALISATION Domain – Focus Areas 1 to 2 – Actions for Faculty Leaders/ Educators)

Supplementary Figure 6.1.2 Summary Framework for ESH Curricular Development (PRODUCTION Domain – Focus Areas 3 to 6 – Actions for Faculty Leaders/ Educators)



Supplementary Figure 6.1.3 Summary Framework for ESH Curricular Development (USABILITY Domain – Focus Area 6 – Actions for Faculty Leaders/ Educators)



Appendix 16:

Supplementary Figure 6.1.4 Summary Process for ESH Curricular Development