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Experiences of introducing planetary health topics to medical school curricula: A meta-ethnography

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ABSTRACT

Introduction: Future doctors will need to adapt to the impact on health caused by the changing climate, whilst developing more sustainable practices to decrease the burden of healthcare on the environment. Planetary Health (PH) is emerging as a crucial subject area in medical education. This systematic review synthesises evidence on integrating PH into medical school curricula globally, focusing on experiences of medical students and educators.

Methods: MEDLINE, ERIC, and EMBASE were systematically searched to identify qualitative research studies focusing on experiences of medical students and staff in PH integration into medical school curricula. We included articles published in English and in peer-reviewed journals, from 2010 onwards. Articles were assessed for quality using the CASP checklist for qualitative research. Fourteen studies were identified and synthesised using meta-ethnography.

Results: This review identified a strong consensus on the necessity to incorporate PH into medical school curricula. Three inter-related third-order constructs shaped our synthesis. The first was challenging existing norms, as PH represented atypical scenarios with flattened medical hierarchies and reliance on student and faculty enthusiasm and advocacy. The second was a recognition of a moral dimension, with an ethical obligation to teach PH and a responsibility to manage 'climate anxiety' that can emerge in students. The third was an enthusiasm to innovate and influence, reflecting the importance of embedding PH longitudinally in teaching and assessment.

Discussion: Whilst some factors that shape PH implementation into medical curricula are consistent with other new subject areas, PH integration also raises unique considerations and dynamics. These include a power and knowledge shift away from staff, and a central notion of ethical justice linked to PH education. Medical education leaders should be mindful of these when embedding and growing PH as a core topic in the medical curriculum.

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Introduction

Environmental degradation poses unprecedented and growing threats to human health. Planetary Health education aims to prepare health workers for the health challenges of climate change, pollution and biodiversity loss, while also practicing healthcare sustainably. Planetary health (PH) is gaining significant recognition due to the rapidly growing awareness of how it intrinsically links to human health [1–4]. With the emergence of PH as a distinctive field within medicine, medical schools have started incorporating the concept into their curricula [3,5–7]. There is a consensus that this is an important aspect of medical education, that will become more prevalent in healthcare in coming years [8].

The term Planetary Health recognises the health of the human population is interdependent on the natural systems of our planet [1,9]. It is an overarching term encompassing climate change, global warming and sustainable practice [9], and the impact these have on human health, including excess mortality from extreme weather [10], deaths related to air pollution [11], and health

Practice points

- Planetary Health is an emerging crucial field in medicine.
- Planetary Health education has been successfully integrated into undergraduate medical education curricula globally.
- Faculty Development and improved eco-literacy on planetary health is needed.
- The impact of climate anxiety on students' well-being needs to be considered when teaching this topic.

consequences from changing vector ecologies [1,12,13]. These threats are likely to continue to increase in upcoming years as urbanisation, deforestation and climate uncertainty combine to contribute to global biodiversity loss, thereby threatening food security and worsening existing health inequities [1,13]. PH is a unique medical field, as it incorporates aspects of social and physical sciences within its domain, along with clinical sciences and medicine [14].

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Future doctors will not only work in a world shaped by the climate emergencies but must also acknowledge that they themselves unwittingly contribute to these crises [14]. Healthcare is estimated to contribute approximately 5% of total global environmental impact through air pollutants, greenhouse gases emissions and wasteful use of scarce resources [7,15]. Doctors need to adapt both to the impact on human health caused by the changing climate and develop more sustainable work practices [16]. Medical education must be at the forefront of raising awareness and understanding of the importance of planetary health [1]. Therefore, medical schools must become the fountain of knowledge, skills and innovation to address environmental challenges in healthcare [17]. In particular, raising awareness and focusing on educating the next generation of doctors on planetary health and sustainable practice within medicine.

As PH is a growing topic area, with its importance increasing, reviewing whether the early attempts to introduce PH to the medical curriculum have (or have not) been successful is essential to help guide further curricula development in this field. A meta-ethnography approach enables valuable insight into staff and students' experiences and perspectives across multiple different studies [18]. Exploring and evaluating developments on the introduction of PH into different medical school curricula globally can support and foster novel innovation, adaptation and collaborative approaches to address this urgent problem. The central research question guiding this review was: *what are the experiences of staff and students of introducing planetary health topics into medical school curricula?*

Method

Current studies exploring staff and students' experiences of the adoption of PH into the medical school curricula are often qualitative studies with varying methodologies. However, there is a gap in the literature collating these findings and so, we employed a meta-ethnography methodology to analyse and synthesise such qualitative research to provide an in-depth and broad understanding of this topic [18]. Meta-ethnography is an increasingly popular method in healthcare research, especially within medical education, in helping create new data within the field [19,20]. A meta-ethnography evaluates the analysis from multiple qualitative research sources, to try to identify new overarching themes and concepts, that are transferable through all the research sources analysed [18,19].

Meta-ethnography was first described by Noblit and Hare in the context of educational research, whereby the research team seek to translate studies into one another in 1988 [18,21]. This meta-ethnography follows Noblit and Hare's approach in interpreting results of individual studies, in identifying common threads and differences, and in 'creat[ing] new concepts through understanding and transferring ideas across these different studies' [22]. This is in-keeping with previous meta-ethnographies in medical education, which has been shown to be superior in creating new and relevant concepts, in comparison to literature reviews [19,20]. The eMERGe Reporting Guidance was used as a framework for the reporting of this meta-ethnography, ensuring all 19 criteria had been addressed [23].

Database searches

Three databases (MEDLINE, ERIC and EMBASE) were systematically searched in November 2023 by EN and SCCC. These databases were chosen to provide a broad range of access and results of articles, including journals from medical, healthcare, educational, and social science disciplines. A Population, Exposure, Outcome (PEO) method was used to allow for a structured search strategy, designed to target specific population groups, exposures, with defined outcomes [24]. Search statements were constructed with keywords that expressed the three key concepts to the study: planetary health; curriculum and qualitative research studies. Search terms and strategies used in databases are listed in Table 1.

As Planetary Health is a new and emerging field of medicine, the article year of publication was limited to 2010 onwards. Further limitations included articles written in the English language and published in peer-reviewed journals. Duplicates were identified and removed using a referencing tool (EndNote). 715 papers were identified at this stage.

The title and abstract review of all 715 articles was conducted by one researcher (EN). To ensure accuracy and increase validity in the article searches, 10% of the articles from the initial database searches were double screened by a second reviewer (ZA), with no discrepancies reported. Articles that were excluded by title and abstract review alone were predominately due to unrelated subject areas. Studies were only included in the final synthesis if they met all of the inclusion criteria:

1. Focus primarily on introducing planetary health into medical school curriculum (i.e. for medical students);
2. Seek the views or experiences of medical students and/or teaching staff;
3. Use a qualitative methodology (or mixed-method approach where there was significant qualitative data analysis);
4. Published in peer-reviewed journal;
5. Published in English language.
6. Published after 2010

To ensure all relevant articles were captured, 'snowballing' was used to find additional studies: 'forward snowballing', searching for studies that have cited any of the eligible articles, and 'backward snowballing' of manually checking the reference list of eligible articles [20]. Studies using mixed-method methodology were reviewed by three researchers (EN, ZA, MAR), and were included where there was evidence of significant qualitative data analysis. Through this careful review process of titles and abstracts, thirty-three articles were a match to all the inclusion criteria. Following full text review by EN and ZA, fifteen articles were identified through database searching, a further eight through snowballing and manual searching. Eleven articles were excluded at this stage, leaving twenty-two articles. The reasons for exclusion were: one was not in English language; seven had a limited focus on curriculum; one had no qualitative analysis and two were generic curriculum changes at university level (rather than medical school focused).

Table 1. Databases and search strategies.

Database	Search strategies
MEDLINE (through OVID host)	('planetary health' or 'environmental health' or 'sustainability' or 'climate change').
ERIC (through EBSCO host)	AND
EMBASE	('medical curricul*' or 'medical education' or 'health education' or 'medical school*' or 'medical student*')
(through OVID host)	AND
	('focus group*' or interview* or qualitative or transcript*)

The remaining twenty-two studies were independently appraised by two reviewers (EN and ZA) and the Critical Appraisal Skills Programme (CASP) qualitative research checklist was used to ensure there was consistency in the article reviews and rigour and transparency in the research. This checklist aims to ensure that any articles with poor methodology are excluded in the synthesis [20]. All the articles scored about 50%, therefore none were excluded based on quality concerns. The scores of each independent research were reviewed and compared and discrepancies were resolved by discussion between three researchers (EN, ZA, MAR).

The CASP criteria excluded a further eight articles, for the following reasons: one had no qualitative analysis; one was on generic curriculum changes at university level (rather than medical school focused); three had poor methodology and analysis and three had limited/no focus on experience of the curriculum introduction. The Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) chart is shown in Figure 1, summarising the article selection process for the meta-ethnography.

These remaining fourteen articles were categorised according to established criteria by Dixon-Woods et al. into 'key' and 'satisfactory' articles [25]. A 'key article' closely mirrored our research question; a 'satisfactory article' provided a smaller contribution to our analysis. This categorisation was determined through discussion by three researchers (EN, ZA, AR) after each independently reviewing the article. There were six key and eight satisfactory articles.

All fourteen articles were independently analysed and evaluated by three researchers (EN, ZA, SG), using a meta-ethnography approach. Following Noblit and Hare, direct quotations, known as 'first-order constructs' were extracted from the articles [18]. The interpretation of the first-order constructs, by the research team, formed the 'second-order constructs' [18]. All five researchers (EN, ZA, SG, SCCC, MAR) developed the second-order constructs together from their independent review and analysis of the articles.

All members of the research team (EN, ZA, SG, SCCC, MAR) discussed their interpretation and analysis of second-order constructs. According to Noblit and Hare, there are three possible synthesis methods when analysing second-order constructs to create third-order constructs: 'reciprocal translation'; 'refutational synthesis' and 'line of argument synthesis' [18]. Following reviewing the second-order constructs, the research team used the 'line of argument' synthesis, as the articles analysed in this study identified different aspects to the overall field of PH education [18,20]. These different aspects can be drawn together to create new interpretations and concepts [18,20]. In doing this, similar themes (and differences) occurring within the second order constructs helped develop the overarching themes that could account for the range and diversity of topics from the included studies [18,20,26]. The

collaborative approach by all five researchers ensured each individual interpretation was appropriately analysed and discussed.

Results

The fourteen articles were from Europe, North America and Australasia. A summary of key information from the included articles are displayed in Table 2. Fourteen second-order constructs were identified from the articles. These are detailed in Table 3, with corresponding first-order construct quotes. From these fourteen second-order constructs, themes were identified, and three overarching third-order constructs were generated:

- Challenging existing norms.
- Recognising a moral dimension.
- Enthusiasm to innovate and influence.

These third-order constructs, though distinct and independent, also overlap with one another and are therefore presented graphically to show connecting relationships in Figure 2. Likewise, the second-order constructs do not fit all individually into each third-order construct; they also overlap between the different themes. Each of the third order constructs have been discussed further below in turn.

Challenging existing norms

PH is rooted in a variety of scientific disciplines and therefore differs from the traditional biomedical and clinical sciences traditionally covered in the medical curriculum [5,27]. It represents a departure to the conservative norms of medicine. Some medical educators and professionals are thus unconvinced about the topic and its relevance to medical curricula [5,28,29].

Despite these pockets of scepticism and the lack of universal acceptance, PH has successfully integrated into multiple medical schools globally [5,27,28,30]. All articles included in the synthesis demonstrated an overall positive appetite for the topic, and were generally supportive of faculty and students having a greater understanding of PH, with plans to incorporate the topic further [17,27,29–34]. There was a clear view that future doctors will need to know how the health of the planet impacts human health and understand how their actions impact the health of the planet [27].

As an emerging field, expertise and interest in PH appears to be concentrated in junior faculty members and students [5,27,28,32–35]. In three papers, this unusual knowledge gradient was reported to have helped flatten existing hierarchies, as the most experienced clinicians or medical educators were the least knowledgeable in PH [5,32,35]. A 'bottom-up' approach was identified as being a

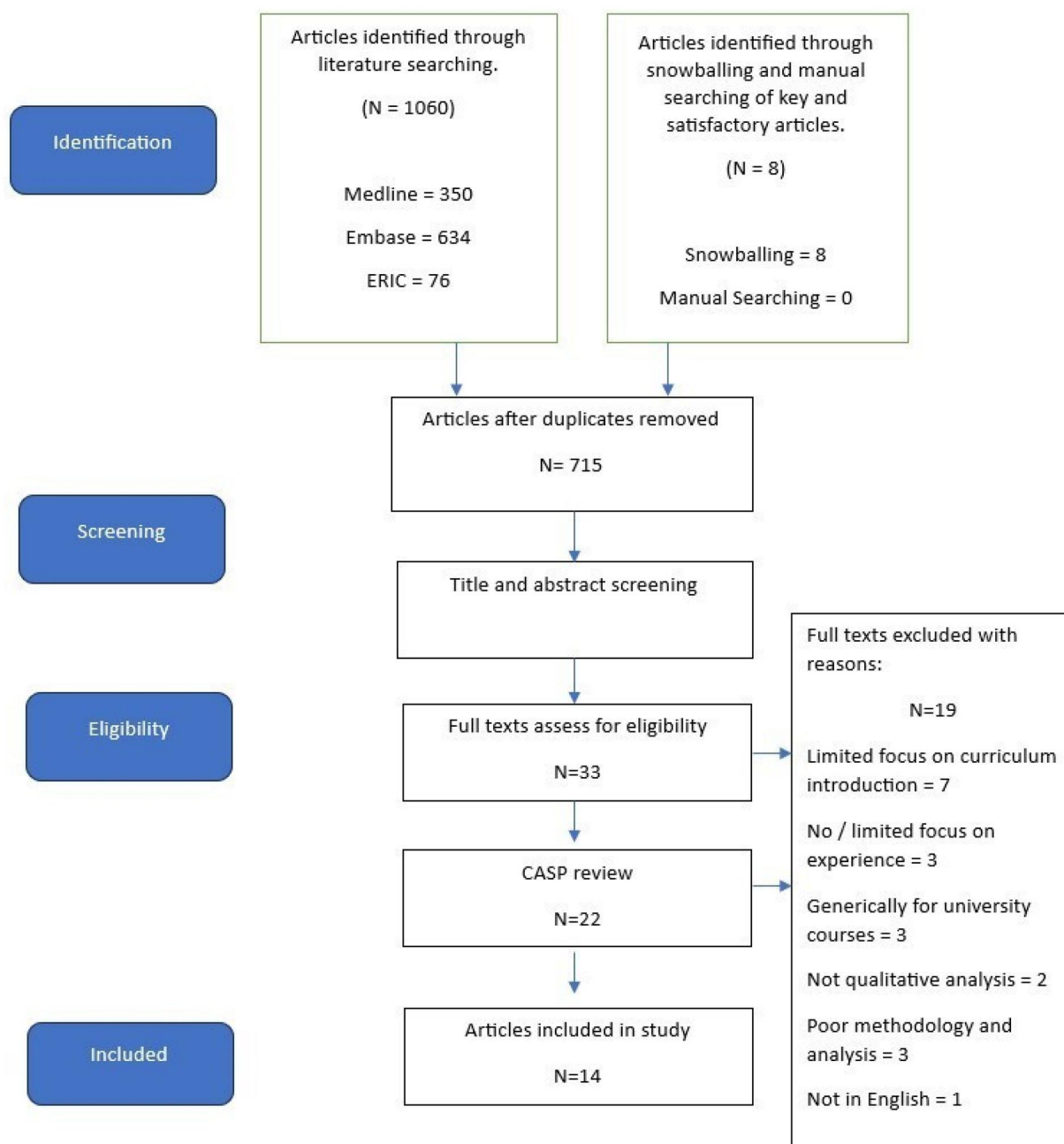


Figure 1. PRISMA chart.

positive aspect, with student advocacy being one of the driving factors for change and integration of PH into medical education [28,30,34].

However, this unusual hierarchy was not universally conceptualised in positive terms, with two papers describing that PH integration was only possible where faculty were interested and enthusiastic [17,28]. 'Climate denial' was only mentioned about faculty [28,29], with no articles reporting that students challenged the existence of climate change, although some acknowledged students lack of understanding of its relevance to medicine [5,31].

A lack of faculty knowledge and understanding (faculty eco-literacy) about PH was apparent, with ten papers identifying Faculty Development as part of their future recommendations [4,5,17,28,29,31–34,36]. The faculty's lack of knowledge and expertise led to hesitancy to teach and this was frequently described as a challenge when trying to implement PH content [32]. Additionally, training faculty

was found to help develop faculty advocacy on the importance of PH [17,36].

Student and faculty advocacy were needed to drive implementing PH teaching [34]. However, to sustain this, it was recognised that institutional support was necessary, particular to ensure sufficient educational time and funding [4,27–29]. A multi-faceted approach was promoted, including 'bottom-up' engagement from students and 'top-down' engagement from institutions and regulatory bodies [28,29]. Influences from regulatory and academic agencies, including the Association for Medical Education in Europe (AMEE) consensus statement, General Medical Council (GMC) Guidance in UK and Australian Medical Association (AMA) in Australia, were noted as important drivers to include PH in undergraduate medical curricula [28,29,32].

Unusually for a medical curriculum subject area, the political environment in different countries was cited to be an influencing factor on PH inclusion [28]. The political

Table 2. Summary of the articles.

No	First author	Publication year	Country	Sample size	Population group	Data gathering and analysis method	Key/Satisfactory
1	Lal et al. [28]	2022	Australia and New Zealand	10	Staff	Semi-structured interviews – Modified grounded theory	Satisfactory
2	Teherani et al. [36]	2023	America	17	Staff	Semi-structured interviews Thematic analysis	Satisfactory
3	Bates et al. [5]	2022	Ireland	12	Staff	Semi structured interviews Grounded theory analysis	Key
4	Slimings et al. [4]	2022	Australia	19	Students	Open ended survey questions Thematic analysis	Satisfactory
5	Dunne et al. [35]	2022	UK	55	Students	Open ended survey questions Thematic analysis	Satisfactory
6	Liu et al. [31]	2022	America	14	Students	Focus groups Thematic analysis	Key
7	Simon et al. [37]	2023	Germany	20	Staff Students	Semi structured interviews Thematic analysis	Key
8	Greenwald et al. [32]	2023	America	7	Staff	Semi-structured interviews Inductive approach	Key
9	Muller et al. [27]	2023	Germany	11	Students	Semi-structured interviews – Modified grounded theory	Satisfactory
10	Walpole et al. [30]	2015	UK	188	Staff	Questionnaires and focus groups Delphi methodology	Satisfactory
11	Walpole et al. [17]	2017	UK	16	Staff Students	Surveys, focus groups Participatory Action research	Satisfactory
12	Brand et al. [29]	2019	Australia	163	Staff	Open ended survey questions Thematic analysis	Satisfactory
13	Blanchard et al. [33]	2023	America	9	Staff	Semi structured interviews Thematic analysis	Key
14	Tun [34]	2019	UK	17	Staff	Semi-structured interviews Qualitative Explorative approach	Key

environment was considered important with regard to prominent bodies, such as the American Medical Association, and shift the perceptions of PH's importance in medical education [27,28].

Recognising a moral dimension

A recurring theme throughout the articles was the recognition of a moral and ethical obligation to teach PH to medical students [30,34]. This includes acknowledging the ethical dimensions of delivering sustainable healthcare and how this impacts clinical practice [27]. It was argued that doctors have a responsibility to consider the ethical issues created by the relationship between the environment and health when treating patients [27,36], demonstrating a clear need for students to acquire this knowledge whilst at medical school [28,37].

Multiple papers reported the negative impact of climate anxiety on students [4,5,27,28,34,37]. Addressing student welfare in the context of this topic was considered crucial, with an emphasis on providing support for students experiencing such anxiety [33]. Despite concerns about its potential negative effect on student wellbeing, it was still considered important to teach and educate medical students on PH [34].

In teaching PH, educators bridge global health issues with local community concerns to encourage positive engagement at the community level [17]. This approach aligns with the 'Think globally, act locally' ethos promoted through PH teaching and helped to create solutions to PH ethical dilemmas at a local level [4]. By focusing on supporting local communities and implementing changes locally, students are able to directly apply their learning from PH [27]. This direct action also helps to mitigate climate anxiety [27].

Enthusiasm to innovate and influence

As a unique topic in medicine, PH was thought to need innovative teaching methods. Nine articles compared PH to ethics and professionalism strands, suggesting it should be integrated throughout the curriculum, rather than being a standalone module [4,5,29–31,34]. PH was argued to be relevant to every aspect of medicine, and being integrated into the curriculum in a longitudinal manner throughout every year at medical school was considered the most effective method to do this [4,5,29,30]. Despite many papers and educators commenting on the challenges of trying to integrate PH into an already overfull curriculum, there was still significant interest and commitment to do so [17,35].

Novel approaches to teach PH were discussed in various papers, including lectures, flipped classroom, e-learning, small group work, and continual practical application in clinical and personal lifestyle contexts to help enforce the relevance [4,17,28,35]. Given the potential emotional impact of learning this topic, providing time for reflection and opportunities for discussion was considered beneficial [4,37]. The need to include PH in assessment processes was also a recurring theme, with several papers advocating for its inclusion [31,32,34,37]. Educators hoped that through curriculum integration, combined with assessments and a focus on community engagement, students would be well equipped to create positive PH changes in the future [31].

Discussion

In this synthesis of medical educators and students' perspectives on incorporating PH into medical school curricula, the ethical justice to teach PH and the universal appetite for knowledge on the topic transcended geographical locations [28,29,37]. Overwhelmingly, the studies support the fact that medical students need to understand both the

Table 3. First and second-order constructs.

2nd order constructs	Papers	1st order construct quotes
Criticisms of relevance to medical curriculum	3, 5, 6, 9, 10	<i>'I think that those who have grown up with the traditional curriculum consider this a very soft science ...'</i> (Bates et al. [5]) <i>'This area would not be considered essential for a graduate to be competent F1 doctor, perhaps something to develop as a postgraduate.'</i> (Walpole et al. [30]) <i>'[Planetary health] it's a waste of my time and a waste of their [students] time'</i> (Bates et al. [5])
Flattening existing medical education hierarchy	3, 5, 8	<i>'I think there are student groups that are already building from this, and I am sure they would be very much behind it. The surgical society, why not the Planetary Health Society?'</i> (Bates et al. [5]) <i>Students in this generation 'are more attuned to and more concerned with these issues,'</i> (Greenwald et al. [32])
Reliance on Faculty Interest	1, 11	<i>'Was at first seen as one of my pet extra projects'</i> (Walpole et al. [17])
Influence of external bodies	1, 8, 10, 12	<i>National politics (acts) as a barrier to getting traction in this area,</i> (Lal et al. [28]) <i>Australian Medical Association have declared a climate emergency.</i> (Lal et al. [28])
Local community engagement	2, 4, 5, 6, 11	<i>'We are missing a trick by not also selling a more local argument. I think this would help to pick up and involve students with a broader range of values.'</i> (Walpole et al. [17])
Climate anxiety	6, 7, 9, 14	<i>'Many of our students acknowledged the burden of climate change in their future professional and personal lives, with comments indicating some level of climate grief and anxiety'</i> (Liu et al. [31])
Institutional Support	1, 2, 3, 4, 6, 8, 11, 13, 14	<i>'The Head of School is very supportive in developing this new curriculum.'</i> (Lal et al. [28]) <i>One interviewee emphasized that for any curricular implementation to gain traction, they 'need buy-in' from the medical education department.</i> (Blanchard et al. [33])
Harnessing Student advocacy	1, 2, 4, 5, 6, 7, 8, 13, 14	<i>Many of them are passionate about what they can do to solve the problem ...</i> (Lal et al. [28]) <i>At the minute, it's from the ground upwards, because I don't see a lot coming from this side, even though organizations like the AMA, the Australian Medical Association have declared a climate emergency.</i> (Lal et al. [28])
Importance of varied engaging teaching methods	1, 2, 3, 4, 5, 6, 7, 9, 10, 11	<i>'I don't think a classical approach would do justice to the topic. Instead, it must be highly innovative, just like the topic itself.'</i> (Simon et al. [37])
Longitudinal integration into the Curriculum	2, 3, 4, 6, 7, 9, 10, 12, 14	<i>'[When content] is weaved in and out through all the different lectures, it helps to kind of make it into more easily digestible bits.'</i> (Liu et al. [31]) <i>'If you don't scaffold it through the curriculum, then it gets learned once and forgotten.'</i> (Brand et al. [29])
Inclusion in assessments	6, 7, 8, 14	<i>'So critical that we have a curriculum map and an inventory of where [the content] is taught and where it is assessed'</i> (Greenwald et al. [32])
Pressures to incorporate into an overfull curriculum	1, 3, 4, 5, 9, 10, 11, 12, 13, 14	<i>Medical students recognise the importance of climate-health and sustainability but feel that their current curriculum does not include sufficient teaching on the topic.</i> (Dunne et al. [35]) <i>'The main thing is to emphasise that most [PH content] can be integrated into existing teaching'</i> (Muller et al. [27])
Faculty Eco-literacy and Development	1, 2, 3, 6, 7, 8, 11, 12, 13, 14	<i>Participants felt that a challenge for developing sustainable healthcare education is lack of confidence amongst educators.</i> (Walpole et al. [17]) <i>Half of the educators interviewed suggested that a lack of perceived relevance to planetary health among faculty would constitute a potential barrier.</i> (Bates et al. [5])
Ethical justice to teach PH	1, 6, 7, 9	<i>Understanding that climate differentially affects people- climate injustice.</i> (Liu et al. [31]) <i>As a professional, doctors must consider the ethical issues posed by the relationship between the environment and health.</i> (Muller et al. [27])

impact of PH on patient health and the consequences of their healthcare actions and practices on the planet.

As an emerging field in medical education, there remain debates over integration and optimal educational approach for PH into the curriculum. UNESCO states all education should include sub-sections of PH (such as climate change) and a notable AMEE consensus statement likewise strongly encourages medical schools to include it [8,27]. However, with low faculty eco-literacy, PH may not be getting the attention it requires in medical schools. Therefore, drivers of this new curriculum still rely on the enthusiasm of student advocates or keen faculty in some institutes [17,28,34].

Introducing new topics into overfull curricula is a perennial challenge in medical education [38]. Common obstacles described throughout this research are expected from any curriculum changes, such as the importance of including topics in assessments to raise student awareness

and value [12,29,32]. However, integration of PH presents unique challenges, including its many political, moral, and constitutional dimensions, as well as the potentially emotionally charged nature of the topic, which must be carefully considered when incorporating it into the curricula [29]. The AMEE consensus statement has been an influencing factor for medical schools in reviewing and incorporating PH content in their curricula [8]. It recommends a spiral curriculum approach to ensure PH is embedded through every aspect of the medical curricula and assessments [8]. These recommendations are consistent with the findings from this meta-ethnography as being the most effective method for integrating the topic into existing curriculum

Bevan et al., in a survey of UK Medical schools, recognised that poor faculty eco-literacy was a barrier to including PH into UK medical school curricula, despite GMC recommendations [1]. Without medical educators understanding the unmet need, a gap in medical curricula is

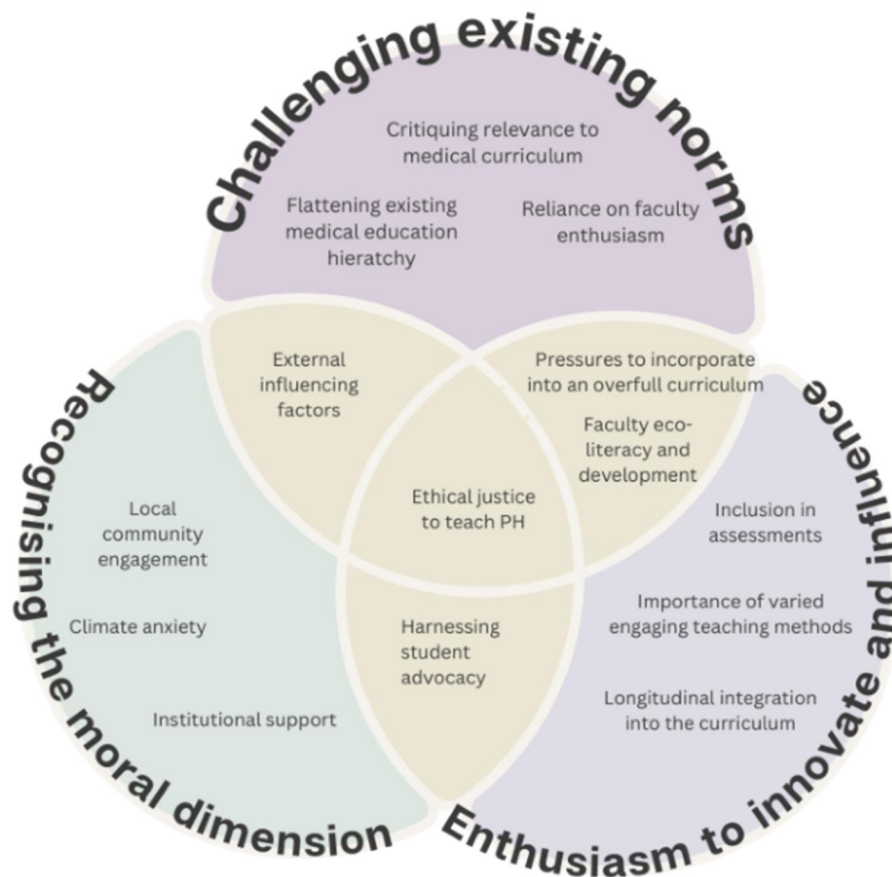


Figure 2. Third order constructs.

likely to persist. Further limiting factors to introducing PH, identified in existing literature, was the lack of senior leadership support and consensus on how best to teach PH [1,6], which is in keeping with our analysis.

Recent research has shown that only 15% of medical schools worldwide have introduced PH into their curricula [5,6]. There is clear enthusiasm from many stakeholders for more efforts to include PH into medical school curricula, who argue that a failure to do so may risk letting down the next generation of doctors and patients [3,12]. Furthermore, neglecting PH could exacerbate health inequalities and inequities, disproportionately affecting the most vulnerable population groups [6].

Implications for future research

PH is a new field within medical education, providing much opportunity for further research, to increase knowledge and understanding as PH importance rapidly rises. This meta-ethnography has demonstrated that further research is required to identify optimal approaches for integrating PH into an overfull curriculum, to devise innovative teaching methods, and to incorporate effective assessments. Such research could facilitate wider adoption of PH into curricula, whilst trying to mitigate climate anxiety in students.

Although our search criteria did not specify countries or locations, all our included studies are based in the global north. It is not clear if other countries not included in this study have addressed inclusion of PH in medical schools and healthcare, or if it is not being addressed. A review of medical school curricula in countries not included in this

study would be beneficial to see if and how much PH is being taught, and also whether this work is being shared in other platforms, including non-English language journals. It would be particularly interesting to note whether there are differences between global north and global south approaches and ideas around PH given the notion of 'climate injustice' that recognises the many historical and geopolitical factors that complicate the landscape [39].

Implications for future practice

This meta-ethnography suggests two main areas for future work on implementing PH into curricula: (1) Faculty development for both engagement and training is essential; (2) A continued focus to increase medical schools' commitment to PH, including institutional support, teaching and learning approaches and assessment. Alongside this, the recognition of climate anxiety in students and ways to mitigate this (for example, direct local action), needs to be considered.

International adoption of PH in medical schools' curricula and assessments are crucial. Medical schools and medical education can be the catalyst for change and innovation needed for PH. Further education of the topic and harnessing the enthusiasm and advocacy of students and faculty can drive this change.

Limitations and strengths

This meta-ethnography identified articles using a systematic approach and CASP checklist, and adhered to the Noblit and Hare methodology [18,19]. The included studies

with several methodological approaches across multiple countries and institutions. The research team came from a variety of cultural, ethnic, clinical and academic backgrounds, bringing their own expertise and generational experiences to analysing the data. Multiple researchers, all independently screening and reviewing the abstracts and papers, increased the rigour of the study and diversity into the research analysis.

There was unanimous support for the addition of PH teaching into medical school curricula in all studies, and it seems likely that educators who are passionate about PH issues are those who choose to teach them. Many of the studies included in this review express concerns that their studies may suffer from selection bias, as only those with an interest in PH will choose to participate. As support for PH amongst authors appears fundamental to those who teach it, this has been reflected in the third- order constructs and in the language of moral imperative that the researchers in this study have used to define them. One of the strengths of meta-ethnography as a methodology lies in its explicit interpretivist stance. Rather than seeing this unanimous support as selection bias in the data, this finding that those educators passionate about PH, are also often the ones to teach it, has been incorporated into the analysis. This allows a richer understanding of the experiences of educators in introducing PH to the curriculum.

A further limitation is the inclusion of English language only in the studies. This may be unintentionally related to the lack of geographical diversity of included studies and so it may be beneficial to synthesise global perspectives when PH is embedded in local and national politics and policies.

Conclusion

This meta-ethnography demonstrates a strong global commitment to embedding PH within medical education and emphasises the ethical and practical dimension for such integration. It highlights effective strategies and solutions to integrating PH into medical curricula, highlighting both successes and challenges, identifying steps for future change. These will help prepare medical students to effectively address the complex combined challenges of personal and planetary health.

Glossary

Planetary health: Human health and planet health are inter-linked: the health of the planet impacts human health, and how human health impacts the health of the planet.

Sustainable healthcare: Being able to provide healthcare today without damaging the healthcare we can provide in the future.

Author contributions

The contributors are all UK based clinical doctors, from General Practice and Surgical backgrounds, as well as being medical educators. They work across different Medical Universities and Institutes in London.

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