

## Article

# Ecological Bodies and Relational Anatomies: Toward a Transversal Foundation for Planetary Health Education

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**Abstract:** As planetary health education enters medical and health professional training, transversal implementation across curricula is critical in developing its full potential and enabling future health professionals to meet the social, environmental, and health challenges of current and future generations in an integrated manner. To advance the transversal implementation of planetary health education, our study proceeded through: (1) a sequence analysis of documents framing physiotherapy education to identify relevant nexus points; (2) an explorative implementation of planetary health into foundational anatomy and physiology modules identified as critical nexus points; (3) practical implementation during the 2021 autumn semester. Implementation in the operative foundations of healthcare education—anatomy and physiology—enables the emphasis of the ecological nature of human bodies and interconnection with our planetary environment. Musculoskeletal joints accentuate the relational nature of bodies highlighted across current research and traditional knowledges, as dynamically pervaded and in interaction with culture, technology, objects, ideas, plants, planets, etc. Teaching relational anatomies thus highlights planetary health as the transversal foundation of medical and healthcare education. Making this foundation more explicit will be critical for the transversal implementation of planetary health education and subsequent practice, as well as the fundamental shifts in our understanding of human lives and health they require.

**Keywords:** planetary health; education; anatomy; physiology; ecology; relationality



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## 1. Introduction

Planetary health is making its way into medical and health curricula around the world to enable current and future health professionals to meet today's social, environmental, and health issues in an integrated manner. Relevant core dimensions, competencies, learning outcomes, content, and pedagogical approaches are increasingly discussed and developed. The present task at hand is to ensure that planetary health is embedded transversally, across curricula, and corresponding to diverse social, economic, and environmental contexts of health education programs around the world [1–3].

The transversal implementation of planetary health education will not be achieved without overcoming barriers along the way. Health education curricula are crowded with content already competing for time and resources of students and staff alike [4,5]. Critically, most of this content is deeply implicated in a long tradition of Western science and medicine focused on individual human health abstracted from wider society and our planetary ecosystem [6]. The abstraction of some humans and culture, and other humans and nature, has underpinned the exploitation of human and natural resources over the last four centuries and been the driving force behind longstanding health, social, and environmental problems [7–10].

The rigid distinction of individuals, society, and environment is also in direct opposition to a central tenet underpinning traditional and indigenous knowledge systems, traditional oriental medicine, and modern developments like planetary health and resonant approaches,

as well as the UN Agenda 2030 Sustainable Development Goals [11–17]. Simplistically, this foundation echoes through many variations of the well-known adage that everything is connected. Applied to the present context, this implies that health, environment, and society can neither be understood nor addressed separately. The entanglement of these dimensions must therefore be woven into healthcare education as a transversal theme.

In this article, we take our involvement in an ongoing effort to implement planetary health into physiotherapy education around the world as a starting point to advance this interweaving in three methodological strands [18]. Based on an empirical approach, we engage in the explorative and theoretical development of a different way of thinking about human bodies in line with planetary health. Given our professional involvement, this work is predominantly oriented toward health professional education. It argues for the transversal implementation of planetary health beginning in the very foundations of health professional training, in both anatomy and physiology education, and emphasizes human (health) and its relational entanglement with ecology. Specifically, the combination of document analysis, conceptual development, and reflections on implementation leads us to argue for *ecological bodies* and *relational anatomies* as foundations for transversal planetary health.

## 2. Methods

With an initial focus on ‘interconnection within nature’, a core dimension within planetary health education [1], we first conducted a sequence analysis of documents that frames physiotherapy education at two tertiary education institutions in Norway and Germany. This analysis provided an overview of existing nexus points for the transversal implementation of planetary health, and requisite areas needing more deliberate development. The identification of existing and requisite nexus points guided our subsequent focus on two first semester modules in anatomy and physiology (Table 1) for the explorative implementation of planetary health in a second phase of analysis and conceptual development. As a final methodological instance, we trialed the developed concepts and materials in our anatomy and physiology teachings during the autumn semester of 2021 to gain further insights into their problems and potentials.

**Table 1.** Documents included in sequence analysis.

Level & Publisher	Date	Document
International: World Physiotherapy	2021	Physiotherapist Education Framework. Available online: <a href="https://world.physio/what-we-do/education">https://world.physio/what-we-do/education</a> (accessed on 10 December 2021)
	2019	Education Policy statement. Available online: <a href="https://world.physio/sites/default/files/2020-04/PS-2019-Education.pdf">https://world.physio/sites/default/files/2020-04/PS-2019-Education.pdf</a> (accessed on 15 October 2021)
	2011a	Physical therapist professional entry level education—Guideline. Available in Supplementary Materials File S1
	2011b	Standard evaluation process for accreditation/recognition of physical therapist professional entry level education programs—Guideline. Available in Supplementary Materials File S2
	2019	Ethical principles—Policy statement. * Available in Supplementary Materials File S3

Table 1. Cont.

Level & Publisher	Date	Document
National (Germany): Bundesministerium der Justiz und für Verbraucherschutz	1994	Gesetz über die Berufe in der Physiotherapie (Masseur- und Physiotherapeutengesetz—MPhG). Available online: <a href="https://www.gesetze-im-internet.de/mphg/BJNR108400994.html">https://www.gesetze-im-internet.de/mphg/BJNR108400994.html</a> (accessed on 23 October 2021)
	1994	Ausbildungs- und Prüfungsverordnung für Physiotherapeuten (PhysTh-APrV). Available online: <a href="https://www.gesetze-im-internet.de/physth-aprv/BJNR378600994.html">https://www.gesetze-im-internet.de/physth-aprv/BJNR378600994.html</a> (accessed on 23 October 2021)
National (Germany): Deutscher Verband für Physiotherapie (ZVK) e.V.	2019	Berufsordnung für Physiotherapeuten. Available online: <a href="https://www.physio-deutschland.de/fachkreise/news-bundesweit/einzelansicht/artikel/detail/News/physio-deutschland-berufsordnung-und-leitbild-aktualisiert.html">https://www.physio-deutschland.de/fachkreise/news-bundesweit/einzelansicht/artikel/detail/News/physio-deutschland-berufsordnung-und-leitbild-aktualisiert.html</a> (accessed on 23 October 2021)
National (Norway): Kunnskapsdepartementet	2019a	Forskrift om nasjonal retningslinje for fysioterapeututdanning. Available online: <a href="https://lovdata.no/dokument/LTI/forskrift/2019-03-15-410">https://lovdata.no/dokument/LTI/forskrift/2019-03-15-410</a> (accessed on 18 October 2021)
Local (Norway): UiT The Arctic University of Norway	2019b	Studieplan Bachelor i Fysioterapi. Available online: <a href="https://uit.no/utdanning/program/279978/fysioterapi_-_bachelor">https://uit.no/utdanning/program/279978/fysioterapi_-_bachelor</a> (accessed 18 October 2021)
	2020	Emnebeskrivelser: FYT-1110, FYT-1120 FYT-1130, FYT-2110, FYT-2120, FYT-2130; FYT-2610, FYT-2620, FYT-2630. Available online: <a href="https://uit.no/utdanning/emner?ar=2022&amp;semester=H&amp;sted=179933">https://uit.no/utdanning/emner?ar=2022&amp;semester=H&amp;sted=179933</a> (accessed on 18 October 2021)
Local (Germany): Furtwangen University (HFU)	2021a	Modulhandbuch Physiotherapie. Available online: <a href="https://www.hs-furtwangen.de/studiengaenge/physiotherapie-bachelor/details-zum-studiengang/">https://www.hs-furtwangen.de/studiengaenge/physiotherapie-bachelor/details-zum-studiengang/</a> (accessed on 23 October 2021)
	2021b	Themenbeschreibungen der Module. Not public; internal working paper for specification of the official module manual. (Topic description/ Specification of the Module manual)

\* This document was chosen because ethical aspects of the profession are also always ethical aspects of their education.

### 2.1. Identifying Nexus Points

Sequence analytic document analysis (sequence analysis) is generally used for pattern recognition in data; for example, patterns of interaction that emerge from successive utterances, usually by multiple speakers, are analyzed with particular attention to the wider context of the utterances [19,20]. In our case, the context is delineated by a variety of international, national, and local documents that frame and regulate physiotherapy education in Norway and Germany respectively. Based on many years of involvement in our profession, a search of official websites of legislators and international and national professional physiotherapy organizations was sufficient in identifying all relevant documents that define this context (Table 1). Within these categories, our analysis included instances where terms like sustainability, ecology, and the environment were related to social, work, living, education, and similar environments. To identify how often, and in which thematic contexts, relevant terms and topics appear or are excluded in the documents in question, this first stage culminated in a quantitative summary of the frequency of occurrence and a qualitative analysis of relevant passages. We color-coded corresponding text passages and analyzed them by interpreting coded terms and expressions within their respective (sentence, paragraph, and thematic) contexts in the documents (Table 2). The coding process was validated additionally by one investigator performing the primary coding of one document followed by a review

performed by a second investigator. In case of a disagreement, corresponding text passages were discussed until consensus was reached.

**Table 2.** Sequence analysis categories, descriptions, and anchoring examples.

Category	Description	Anchor Example
Environment/ecology does not appear despite necessity	There are no mentions of relevant references to the environment and ecology, although these would be appropriate. Appropriateness is always given if at least two other superordinate aspects from the areas of economy, technology, social, or psyche are addressed, or it is about activity and participation in the sense of the ICF.	<p>“Recognizing that there is considerable diversity in the social, economic, and political environments in which physiotherapist education is conducted throughout the world, . . . ” (p. 34)            → lacks explicit mention of ecological environments</p> <p>“Physiotherapy practice in the 21st-century happens within health systems that are complex, interprofessional, integrated, technology-mediated, uncertain, and constantly changing.” (p. 27)            → Should mention ecological changes or climate crisis as relevant too</p>
Environment/ecology is addressed implicitly	Environmental and ecological aspects are not clearly addressed but can be identified if there is an awareness of the issue, often through the use of the non-specific, overarching term “environment” in the ICF sense.	<p>“The physiotherapist’s extensive scientific knowledge of the body structure and function, its movement needs and potential, and environmental and personal factors, are central to determining diagnosis and intervention strategies.” (p. 12)            → Mentions environment in an unspecific manner, could be interpreted as natural/ecological environment or implicitly includes natural environments insofar as it follows ICF terminology</p>
Environment/ecology is explicitly addressed	Environmental and ecological aspects are clearly identified.	<p>“The programme also needs to be flexible enough to respond to the changes in the social, economic, political, cultural, historical, environmental, and regulatory contexts in which graduates will practice.” (p. 24)            → The term “environmental” is explicitly related to an understanding as natural/ecological environment.</p>

All exemplary quotes in this table are from: World Physiotherapy. Physiotherapist Education Framework 2021. Available online: <https://world.physio/what-we-do/education> (accessed on: 10 December 2021).

## 2.2. Explorative Implementation

Building on the identification of nexus points through the analysis of overarching documents, we subsequently focused on our teaching materials for two first semester modules that we were preparing to deliver—‘introduction to anatomy and physiology of the locomotor system’, and ‘movement analysis and functional assessment of the knee’—for the explorative implementation of planetary health. The sequence analytic approach quickly revealed a lack of explicit integration of planetary health dimensions and a range of implicit or requisite points of ‘interconnection within nature’ [1]. Drawing inspiration from resonant arguments for current developments in eco-philosophy and posthumanism, we proceeded to analyze and amend the latter to emphasize connections between anatomy and ecology [21]. In the following, we briefly illustrate how we used a range of nexus points for the explorative implementation of this planetary health dimension, and how this led to the conceptual development of a cross-cutting planetary health foundation for healthcare education.

## 3. Results

### 3.1. Critical Nexus Points in the Foundations of Healthcare Education

The quantitative summary (Table 3) illustrated a promising trend showing more frequently explicit mentions of terms like climate, sustainability, and environment in more recent documents. However, in the case of the document with most frequent and explicit mentions of these terms, the high frequency was attributed to one of our leading

involvements and deliberate effort to implement planetary health education into a new study plan and corresponding module descriptors. Outside of this, relevant terms were featured only scarcely and were mostly used in an unspecific manner as with the term ‘environment’ alternately referring to living, work, home, social, education, and other environments. Even this partial mention of relevant terms offers various nexus points for more systematic implementation, but it also confirms that ecological aspects related to environment, sustainability, and planetary health remain marginalized to date.

**Table 3.** Frequency of occurrence of sequence analysis categories across analyzed documents.

Item	Total	Climate	Ecolog*	*Pollution, Heat	Biodivers*	Sustainab*	Work	Home	Living	Learning	Academic	Social Care Healthcare	Clinical, Practice	Protection	Other
1. (WCPT 2021)	33	0	0	0	0	3	4	2	3	8	5	2	0	0	6
2. (WCPT 2019a)	6	0	0	0	0	0	0	0	0	0	0	4	1	0	1
3. (WCPT 2011a)	22	0	0	0	0	0	4	1	7	0	0	2	4	0	4
4. (WCPT 2011b)	8	0	0	0	0	0	0	0	0	0	2	1	3	0	2
5. (WCPT 2019b)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. (GER 1994a)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7. (GER 1994b)	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
8. (GER 2019)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9. (NOR 2019a)	2	0	0	0	0	1	0	0	0	0	0	1	0	0	0
10. (NOR 2019b)	2	0	0	0	0	0	0	0	0	1	0	1	0	0	0
11. (NOR 2020)	11	0	0	0	0	2	2	1	1	1	0	0	0	0	4
12. (GER, HFU 2021a)	3	0	2	0	0	0	0	0	0	0	0	0	0	1	0
13. (GER, HFU 2021b)	60	18	1	3	0	8	0	0	0	0	0	0	2	4	24
Total	161	18	3	3	0	14	10	4	11	10	7	11	10	6	41

Other, e.g., political environment, environmental aspects, environmental factors, environmental reference, environmental awareness, environmental understanding, environmental impacts, environment oriented, natural environment. Use of Ecolog\* was meant to indicate the inclusion of all terms beginning with these letters, like ecology, ecological, etc. The same in other cases where we have used \* in this table.

In the documents we reviewed, we found this marginalization perpetuated especially by a persistent, mechanistic view and an overbearing focus on the body [22]. The chronological positioning and relative size of anatomy and physiology modules preserves the body-as-machine as the pivotal fixture across medical and healthcare education programs and consequent professional socialization [23,24]. As a result, anything outside of the body is thus understood to be relegated to being a peripheral concern, or, at best, to enabling or disabling ‘environmental factors’ [25]. Given their firm roots in Western natural sciences, it is not surprising that anatomy and physiology education remain strongholds that perpetuate the separation of health and environment. From laboratories and textbooks to surgical theatres, hospitals, clinical, diagnostic, and treatment rooms, anatomy and physiology underpin the abstraction of the human body from its social and ecological environments [6,9,26]. Because of the transversal influence of anatomy and physiology on healthcare education and its ensuing practice, our initial sequence analysis highlighted the critical need to weave planetary health education into these operative foundations of healthcare education with precision.

### 3.2. Ecological Bodies

That cultural, gender, and racial representation ‘matters’ has been argued extensively in healthcare, academia, and many other arenas [27–29]. Anatomy and physiology edu-

cation have long been related to visual arts and media but, to date, largely fail to move beyond white, static, heteronormative representations of the body. While 16th and 17th century anatomical illustrations sometimes represented bodies before landscape backgrounds featuring trees, mountains, buildings, and more [30], modern teaching materials show images of skeletons, joints, and muscles free-floating on a white background, and highlight an additional lack of ecological representation in the *views* of the body we are passing on. To resist this subliminal messaging, we exchanged the opening imagery and accompanying commentary in our teaching materials towards diverse representations of people and bodies, within different social and ecological environments like streets, parks, workplaces, etc.

The diverse and ecologically contextualized representation of human bodies gave way to including a brief segment on the evolutionary context of human life and health on Earth from an overview of Earth history and its role in: human life, the rise of oxygen in oceans and atmosphere, multicellularity, plant and animal evolution, and the ecological conditions of the Holocene [30–34]. Without making it an overbearing focus, we found this segment to present a meaningful reminder that human bodies have a functioning continual dependence on the entire history of our planetary ecosystem.

Because Earth history has contributed to the collective evolution of a high degree of biodiversity, we further added a brief visual juxtaposition of other mammalian skeletal structures to our introductory overviews of the human skeletal structure. Traditional and indigenous knowledges and modern eco-philosophies consistently argue for the need to recognize kinship with non-human others as one of the grand transformations required in the Anthropocene [10,11,18,35,36]. Highlighting human skeletal similarity with other species might present a very small, yet meaningful, reminder that human exceptionalism has underpinned cruelty towards other humans and other non-humans and is culminating in today's sixth mass extinction [37].

Where our teaching materials touched on the mineral composition of bones and the role of minerals in synaptic transmission and muscle function, the prior recourse to Earth history prompted us to integrate reflections on the geologic nature of bodies. We accentuated the predominantly inorganic composition of human bodies that links their evolution and functioning to eons of extra-/terrestrial history and ongoing geologic processes like calcium cycling that are equally essential to human anatomy, physiology, tectonics, climate, and the carbon cycle [38–40]. Integrating these concepts highlights our being 'made of star-stuff' [41], and thus provides another opportunity to increase awareness of that pervasive 'interconnection within nature' [1].

Reviewing the trabecular structure of bones from this emerging perspective highlighted several other ways in which human bodies are affected and interpenetrated by ecology, including a dynamic relationship with gravity that permeates and literally shapes us *to the bone* [42]. The ecological pervasion of anatomy and physiology across planetary, macroscopic, and microscopic scales is equally evident in links between thermoregulation, ambient temperature, and climate, as well as in the way bodies depend on food for structure and function, and recent research on the intestinal microbiome, virome, mycobiome, etc. [43–47]. The incremental emphasis of this pervasive relationship in all layers of the composition, structure, and function of the body across our teaching materials clearly highlighted how (human) *bodies are ecological* through and through.

Recognizing that bodies are ecological implies that human bodies have much less clearly defined boundaries than is relayed in conventional anatomy and physiology education and its accompanying imagery [48–51]. The idea that the body is permeable and the environment is a beneficial or dangerous intruder was a common theme in older humoral cosmologies from around the world [51]. However, where the latter risk suggested a need for declaring, controlling, and defending boundaries, more recent work reaching across biology, sociology, technology, philosophy, the arts, and other fields highlights that the ecological nature of bodies 'challenges the ways in which the biological subdisciplines have characterized living entities' as singular and separable from their environment [44,47,51–54].



Ecological bodies, always necessarily in the plural because no ecological body is just one, challenge and raise fundamental questions about biomedical definitions of the human body:

*'Is it possible, for instance, to know with clarity when an oxygen molecule in the atmosphere becomes part of 'me'? If not, in what ways am I spatially connected with the plant that produced the oxygen through photosynthesis? And how then does this change my relationship to the ecology of the planet?' [55]*

### 3.3. Relational Anatomies

The term 'relational anatomy' appears in a small number of publications over the last 120 years, primarily in relation to anatomy education for medical students [56–58]. As early as 1901, a paper on the methodology of teaching relational anatomy criticized teaching anatomy in distinct structures and systems like the locomotor or nervous system, rather than in terms of relationships between them and the body surface [59]. Jackson (1901) thus suggested teaching relational anatomy via horizontal sections of the body to reveal positional relationships of individual structures to each other within the body and its surface. Since then, the concept and field of relational anatomy has hardly changed. Magiros et al. [60] expand Jackson's approach using a combination of plastination and MRI imaging but, like others, only use the term in reference to intracutaneous relations of anatomical structures [61–63]. However, neither the intracutaneous nor singular delimitation of *relational anatomy* is ecologically consistent in the present sense.

Continuing our explorative implementation of ecological elements into our teaching materials, introductory and specialized sections on the structure and function of joints were proved to be a pivotal nexus point to further expand our thinking and teaching toward pluralistic, ecological anatomies and physiologies. Structural classifications distinguish fibrous, cartilaginous, and synovial joints, while functional classifications distinguish immovable, slightly movable, and freely movable joints, with the latter being the most abundant in the human body [64]. However, functionally speaking, joints are critical for establishing and mediating relationships with the environment; a knee joint enables me to sit on a chair, while a shoulder enables me to reach for the arms of that chair and stabilize it or pull it closer. In another situation, my shoulder enables me to reach for an apple on a tree, while my ankle helps adjust my height such that my finger joints can curl around that apple, and so on.

Of course, joints only fulfill such functions in concert with muscles, ligaments, blood circulation, vital organs, etc., but their role in such interactions makes an exemplary case of the extent to which body structures and functions are both shaped by and continuously engaged in relationships with the environment. The obvious way in which *joints are relational* highlights the relational nature of bodies and, more generally speaking, the result of both different structures coming into relation and in service of these relationships. Additionally, the joints commonly recognized in anatomical classifications support the creation of a near infinite number of contingent ecological articulations over the course of a lifetime. Our hands dynamically articulate as we reach for each other in greeting, as do our feet and the ground underneath, or our elbows and the disinfectant dispenser or door handle during the COVID-19 pandemic.

If ecological joints could be argued to differ from musculoskeletal ones based on variations in in/organic composition (rather than substance), the relational nature of their structure and function further diminishes their distinction, as does the fact that the latter cannot function without the former (because there is no gait without ground to walk on, no swinging without a tree branch, and no swimming without water). Recognizing this relational nature of ecological joints and bodies has significant implications for anatomy education insofar as it requires: (a) embracing a much more complex view of bodies and much broader array of articulations than has previously been the case, (b) teaching human anatomies in conjunction with a lifetime of diverse relationships that bodies depend on, (c) the potential to lead to a more ecological teaching of pathologies that affect them and

therapeutic interventions they require in their support, and thus ultimately, (d) reconceptualizing and grounding itself on *relational anatomies*.

#### 4. Discussion

##### 4.1. A Broader View on Planetary Health Education

In the outset of our investigation, we opted for a narrow definition of environment and ecology closer to notions of ‘natural environment’ or ‘planetary ecosystem’ aligned with much of the planetary health discourse. Yet even our initial sequence analysis highlighted a broader use of the term environment resonating with the International Classification of Functioning, Disability and Health’s (ICF) inclusion of products and technology, human-made environments, attitudes, social relationships, systems, and policies into its definition of ‘environmental factors’ [24]. Due to the anthropocentric juxtaposition of environment and human function, and the relative marginalization of natural environments in the ICF model and documents under analysis, we initially proceeded with the narrower use of related terms to emphasize their explicit implementation as a key dimension of planetary health education. However, even the ecological perspective gradually developed in this article requires further expansion to do justice to the full relational implications of the myriad articulations of ecological bodies.

In contrast to our deliberately narrow use of ecological terms, one of the central arguments of posthumanism and resonant eco-philosophies has been that the distinction of nature and culture is not sensible, not least due to the permeable boundaries between people, plants, animals, and things [65–69]; rather, ecology is understood to encompass geological, technological, social, and other dimensions, including even ‘the scary, ugly, artificial, harmful, and disturbing’ and so ‘collapses any distinction between nature and not-nature’ [68]. Current knowledge of human influence on natural environments by way of increasing or decreasing biodiversity, and on shaping the Earth’s surface and its biogeochemical cycles, merely serves to underscore this complex interweave of nature and culture [70–73].

For several decades now, researchers across post-/humanities, social sciences, critical rehabilitation, disability, physiotherapy, body studies, and other fields have therefore argued against a reductive biomedical view of bodies, even where it encompasses natural environments and other biological organisms. They have highlighted that the biomedical dimensions of human bodies are equally entangled with culture, technology, politics, economics, experiences, objects, ideas, plants, planets, etc. [66,74–80]. Resonant understandings of bodies and their relations as multiple and dynamic also reverberate through centuries of indigenous ontologies, rightfully accompanied by calls for implementation in Western medical and healthcare research, practice, and education [11,81–84].

Crucially, the complex relational entanglements of human bodies do not imply the total amalgamation and collapse of anatomy and physiology, quite literally, under the weight of the world. As sociologist Raewyn Connell pointed out in rethinking disability from Southern perspectives, ‘biology and society cannot be held apart; but also cannot simply be added together. A much deeper and more complex interconnection must be acknowledged’ [85]. Drawing on musculoskeletal joints as a central allegory of relational anatomies confirms the notion that relations are only possible where some distinctions are maintained, while factual contact between entities (e.g., bones) results in disadvantageous (arthritic) fusions. By ‘holding flesh together-in-its-difference’, musculoskeletal joints might, in fact, provide critical inspiration for debates about the in-/distinction of entities and interconnections within nature [69].

Without attempting to resolve what remains one of the most intricate questions in philosophy until today [86], the productive point here is that taking the basic ecological assumption of planetary health seriously situates us among sophisticated multidisciplinary debates about human life, bodies, and health that can no longer be ignored in mainstream medical, healthcare, or emerging planetary health education. Rather than presenting a problem, this affords the opportunity to draw on a wealth of insights and ideas from



philosophy, feminism, indigenous knowledges, queer, critical race and disability theory, science and technology studies, environmental humanities, and many more, to explore, develop, and teach relational anatomies in line with the ecological foundations of planetary health, and, in some resonance, to past and persistent ideas about the ecological and relational nature of human bodies [31,60–67]. As an immediate intervention along this path, we might, as we have suggested here, begin by integrating teaching about articulations between the foot and the ground, the hand and the smartphone, or particulate matter and the lungs, to emphasize how these contribute to diverse *relational anatomies* and physiologies at different times and in different places.

#### 4.2. Toward a Planetary Health Foundation for Healthcare Education

Our first experiences with gradually implementing *ecological bodies* and *relational anatomies* in two first year modules provided valuable insights for further development. According to students' feedback, linking the functional-anatomical content to environmental aspects enabled a very good understanding of bidirectional interactions between humans and environment. This also became evident in student questions and discussions throughout the teaching process. Students also found teaching in relational anatomy of the knee particularly memorable and interesting in comparison to other first year functional anatomy modules. The brevity of the latter module in the context of the full semester and year, however, confirmed the need for transversal integration of planetary health for lasting impacts, as resonant themes were not integrated into other functional anatomy modules.

Taken together, our study and initial experiences highlight needs for further research and development. Our methodological approach deviated slightly from common applications of sequence analysis insofar as we analyzed on official, institutional documents rather than direct actions or statements of people. The action-oriented, sociological aspect of sequence analysis was nonetheless meaningful because of the authority and effect of these documents on physiotherapy education and subsequent practice.

Transferability of the study design and results to other healthcare education is also given due to the cross-cutting role of anatomy, physiology, and ecology to all health professions and planetary health alike. Our documented analytic approach could be equally fruitful for any other subject area of the curriculum and applied as a focus on other dimensions of planetary health education or their intersections [1]. Though it could be argued that more standardized tools for curriculum analysis could be used, no such tools have been established in planetary health education yet and it is questionable whether the scientific logic and procedures that underpin them should be perpetuated in a world eager for transformative change. Taking the more open approach that we have employed here, might be more suitable for the further development of the complex, yet still rather young, field of planetary health and its transversal implementation in healthcare education.

## 5. Conclusions

Our study confirms the relative scarcity, and thus urgent need for a more deliberate transversal implementation of planetary health across healthcare education legislation, frameworks, curricula, and teaching materials at international, national, and local levels. As we argue here, the basic requirement for successful implementation is a modified understanding of the human body as ecologically or relationally entangled. In addition, our study exemplifies the productive possibilities of highlighting the implicit presence of planetary health dimensions in existing healthcare education, both within and as a considerable challenge for currently defined subject fields. Anatomy and physiology remain the fundamental and most transversal element across healthcare education, yet transport a Eurocentric, mechanistic, heteronormative image of humans isolated from broader society and the biosphere. Explorative implementation of planetary health dimensions in introductory anatomy and physiology teaching materials accentuated the contrary argument championed by indigenous cultures, oriental medicine, and posthumanist eco-philosophies alike: 'being ecological' is not about adding something special; rather, it is recognizing that

we are ecological, multiple, diverse, permeated by, and in constant dynamic relationships with the world [68]. Based on this theoretical understanding, then, our *ecological bodies* and *relational anatomies* highlight that *planetary health is already the transversal foundation of all healthcare education*. The task before us is to make this foundation more explicit and develop its full implications for healthcare education, research, and practice. Understanding and consistently communicating the ecological and relational nature of human bodies might play a pivotal role in this process while fostering that ‘deep awareness of belonging to nature’ required in planetary health education [1].

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/challe13020039/s1>. Supplementary Materials File S1: World PT 2011 Guideline Entry-level-education; Supplementary Materials File S2: World PT 2011 Guideline Accreditation; Supplementary Materials File S3: WCPT-2019-Ethical-principles.

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