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Towards Youth-Centred Planetary Health Education

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Abstract: This paper presents data and analyses from our Planetary Health Film Lab (PHFL) and its sister project the Youth Climate Report. Qualitative data include semi-structured interviews with youth and their educators and content analysis of films produced by young people (ages 19–25) from six countries (Australia, Columbia, Ecuador, Italy, India, Canada). The educative processes designed for the Planetary Health Film Lab are illustrative of our work to build the field of planetary health education that is with/for young people whose educative projects are mobilized in turn to educate wider audiences and for policy change. The analyses show how youth document and record planetary health concerns alongside responsive projects that are embedded in awareness of climate justice and their interconnected ecological systems. The qualitative content analyses of selected films resulted in three themes: (1) Anthropogenic footprints, (2) Ecological and climate justice, and (3) Collective local/global solutions. Data also illustrates how young people's participation in educative film projects contribute to the education of others and address related intergenerational justice issues. Implications for the knowledge, ethics and practices of youth-centred planetary health education are discussed as they augment the Framework for Planetary Health. Youth are crucial but overlooked collaborators in redressing planetary health education, an error we begin to correct through transdisciplinary approaches with/for young people who could help define the field.

Keywords: youth; wellbeing; planetary health education; Anthropocene; qualitative methods; youth-centred films

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1. Introduction

This paper presents data and analyses from our Planetary Health Film Lab (PHFL) and its sister projects the Youth Climate Report (YCR) and Partnership for Youth and Planetary Wellbeing (Go-Well Youth); youth-centred projects designed to educate, empower and support young people as they learn about and record planetary health defined as, "the health of human civilization and the state of the natural world on which it depends" [1]. Both projects were presented at the 2022 Planetary Health Alliance (PHA) conference at Harvard University in separate sessions by authors Kate Tilleczek and Mark Terry as works in progress for defining the field and meeting challenges. This paper provides details into how the PHFL is being designed to educate and support young people as they learn about and record planetary health and how we strive to build the field of planetary health education. We begin by describing the transdisciplinary and youth-centred approaches to our work before presenting methods and emerging thematic analyses from selected qualitative data. Implications for the nascent PHA *Framework for Planetary Health Education* [2] themes (Connections with nature, Equity and justice, Systems thinking, Movement building and Health in the Anthropocene) are suggested by young project participants as they engaged in educative film projects that align with, illustrate, and suggest new possibilities for its ongoing development.

1.1. A Transdisciplinary Context

Designing new possibilities for planetary health education requires serious consideration of transdisciplinary literatures and concepts. The first is the Anthropocene, which Paul Crutzen was first to define in a peer-reviewed journal *Nature* [3] as the current epoch in which humankind is now the predominant global geological force in the shift. The Anthropocene Working Group [4] describes this time as one in which human-made environmental changes are layered into a geological record and knowledge of these Anthropogenic changes and footprints at planetary scale is a fundamental content of consideration for planetary health education [2].

The second related concept is planetary health itself, arising from the Rockefeller Foundation-Lancet Commission on Planetary Health report *Safeguarding human health in the Anthropocene Epoch*. Here, planetary health is " . . . the highest attainable standard of health, wellbeing, and equity worldwide through judicious attention to the human systems—political, economic, and social—that shape the future of humanity and the Earth's natural systems and defines the safe environmental limits within which humanity can flourish [1]. The report cites a growing body of evidence of linkages between human and environmental health and states how, by its actions, humanity threatens to destabilise the Earth's key life-support systems . . . such that continuing degradation of natural systems threatens to reverse the health gains seen over the last century. In short, we are foreclosing on the health of future generations to realise economic and development gains in the present [1].

Embedded within current responses to planetary health is a centuries-old concept and field of study; namely Education and specifically education that is with/by and for youth whose wellbeing is being forfeited. Indeed, there are growing calls across the education landscape for an "educational revolution" oriented toward improving the health of people and the planet [5]. Brown [6], for example, calls for " . . . a growing imperative and mandate across the education space (e.g., learners, educators, education institutions, decision makers) for transformative, inclusive, integrative—and sometimes disruptive—approaches to learning that strengthen our capacity to work toward the goals and imperatives of planetary health." Advocates also assert that this educational transformation must not be limited to the post-secondary level but should include primary and secondary schools to take full advantage of the experience of youth growing up on an altered planet, and to prepare and support them as future agents of change [5]. In 2018, the Planetary Health Alliance (PHA) published a preliminary set of cross-cutting principles for planetary health education that intersect education at all levels, across all scales, and in all regions of the world [7]. This was followed in 2021 by PHA's Framework for Planetary Health Education, intended "to guide the education of global citizens . . . , practitioners, and professionals able and willing to address the complex Planetary Health challenges of our world today (p. 3, [2])."

In addition to incorporating planetary health content into educational curricula, there have been urgent invitations to engage youth not as passive recipients of information, but as active participants and agents of change in the design and promotion of planetary health education. Zeinali et al. [8], for instance, assert that planetary health should set an example for other fields by championing intergenerational leadership across public, private, and civic sectors (see also Arora et al. [9] and Spajic et al. [10]). In order to do so however, we must actively work to break down the structural and institutional barriers restricting youth participation in planetary health education and advocacy. Arora et al. [9] outline a four-pronged strategy by which governments, organisations, and the planetary health movement can champion youth leaders and foster intergenerational climate health leadership. The strategy consists of: (1) meaningful consultation and integration of youth participation and perspectives; (2) the development and promotion of planetary health education with/for/by youth; (3) showcasing the lived experience of youth through climate health story-telling; and (4) monetary and non-monetary investments to provide youth with the resources and support needed to effectively participate in planetary health education and action (see also Zeinali et al. [8]; Spajic et al. [10]). Indeed, our Partnership for Youth

and Planetary Wellbeing engages each of these strategies as aims and outcome measure for our work [11].

1.2. Youth-Centred Education

Our work responds to these interconnected calls for a new kind of planetary health education with youth-centred education for intergenerational justice [12] as youth are becoming a global power for reshaping the world [13]. Young people react to pressing ecological challenges at a time when new ethics, modes of science and policies are required to redress global environmental issues [14]. An increasing number of youth are engaging in climate change and justice work that requires transformative education, amplification and support [15]. For instance, the United Nations Office of the Envoy on Youth [16] reports that 73 percent of young people experience the effects of climate change within their communities, 89 percent feel that they can make positive changes, and 84 percent request better education to guide their actions. The Berlin Declaration on Education for Sustainable Development [17] calls upon UNESCO member states to develop such partnerships to re-imagine and share the fruits of such education at UN Climate Change Conferences.

It is within these calls for transformative education from both young people and global policymakers that our youth-centred educational designs have been developed and are situated [18,19]. Our educative work *with/by* Indigenous Williche youth and their communities in southern Chile [20,21] has helped to re-animate fundamental processes of education as suggested by Paulo Freire [22–24] to include *conscientization*; the process of becoming critically conscious about the state of the world through reflective action and learning as praxis. In our collaborative projects, Williche youth, communities, Elders, scholars and educators worked together with youth to further develop and enact the critical consciousness of young people so they could apprehend and respond to local and global planetary health challenges through co-design of educative projects that meet the needs for youth and planetary wellbeing [20,21,25–27]. They did so through engagements with anticolonial education as based in Indigenous world views, knowledge and practices that honour and centre projects that are in care and reciprocity with land, water, humans, and other beings and towards living well together on the planet [28–33].

This youth-centred anticolonial education works to blend philosophical with technical learning and to include many ways of learning through story telling, art making and film projects that help build local and global networks for ecological justice [34]. Educative projects are approached through pedagogies of hope, care and relevance as ways of teaching and learning that are grounded in understanding how youth people live well and navigate the current nexus of ecological and social interrelationships [21–37]. Youth-centred planetary health education is transdisciplinary in both content and pedagogy and draws upon wisdom from across the fields of education, youth wellbeing and planetary health. It works to avoid tokenism and exploitation by careful recognition and support of youth leadership [10] that is "policy active" to invite and support young people in sharing their work with wider policy and public audiences [38,39] and it employs educative and empowering youth-centred research and assessment [25,40–42].

1.3. Youth Climate Report and Planetary Health Film Lab

The *YCR* is a project envisioned by Mark Terry who invented this Geo-Doc to connect multimedia components of GIS mapping and youth-made documentary films to be shared with policymakers, practitioners, and the public. The Geo-Doc provides a global overview of youth responses to planetary health as their films are mapped to their region of origin. Terry explains that the YCR was "Never intending to replace the scientific papers and written texts previously submitted to the policymaker . . . it enhances these data by providing a visual context to the written word" but to showcase youth stories about planetary health [43]. The Geo-Doc prototype (*YCR*) was launched in 2015 in Paris at the Conference of the Parties (COP)21 where "delegates responded favourably to the living documentary project (i.e., new content can be added indefinitely) [38]" as "UN delegates could now

easily select those film projects that related directly to the regions of the world that interested them most [44].” The significant appreciation of the *YCR* project by the public and policymakers led to the PHFL project to further educate and support young people to produce new films as a video curation project [that] is part of the *Youth Climate Report* and associated with the UN Framework Convention on Climate Change (UNFCCC). More than 650 videos produced by young people (aged 18–30 years) reside on the Geographic Information System global map, showcasing visible evidence of the research, effects, and solutions to climate change (p. 1, [44]).

2. Methods

2.1. Youth Participants

The PHFL is an ongoing youth-centred education project that is now in its third iteration and through which we continue to learn about youth-centred planetary health education. In its first iteration in 2020, the PHFL team recruited young participants online with support from partner organizations who reached out directly to youth in their communities. The Dahdaleh Institute for Global Health Research, the Young Lives Research Lab, and York University also promoted the opportunity through their various channels and networks All participating organizers used the same digital outreach methods to recruit participants. This is done primarily through website and social media postings. In instances where the organizers were familiar with eligible candidates (former or existing students of the organizers, for example), a direct contact was made. In each case, potential participants were directed to an online application form which they complete and submit for consideration.

Interested applicants did not need to be university students, but met the following eligibility requirements: between 18 and 30 years of age; able to travel to/stay in Toronto, Canada for the duration of the program; able to secure necessary documentation (e.g., travel visa); proficient in written and spoken English; able to work on projects within the time frame of the program; and committed to bringing some film footage from their home countries and communities for their project. The seven youth (five identified as female and two identified as male) were between the ages 19–25 and were living in Australia (1), Canada (1), Columbia (1), Ecuador (2), India (1) and Italy (1) when they applied to participate. Participants were committed to telling stories from their communities within the three central themes of the Dahdaleh Institute for Global Health Research: *Planetary Health*, *Global Health and Humanitarianism*, and *Global Health Foresighting* [45].

The small number of selected youths, the strict inclusion criteria, budgetary constraints and one-week time frame for face-to-face workshops and meetings are limitations that we are actively working to mitigate. For example, in its third iteration in 2022, 16 Indigenous youth from 11 communities throughout Ecuador participated in a summer-long program which included a week-long intensive workshop in Quito where they all gathered to live and work together to complete their films at the Escuela Polytechnica Nacional. Partnerships with this university as well as with the Pontificia Universidad Católica del Ecuador and the Quechua Academy of Humanities provided valuable infrastructure, equipment, facilities, and support for the project. Both the second and third iterations of the PHFL are being written up separately for upcoming publications and will not be discussed here.

2.2. Processes

In the first iteration the intensive one-week course consisted of workshops, meetings and film production time provided in Toronto at the York University Dahdaleh Institute for Global Health. It was designed for educative, social, technical, creative and critical thinking experiences for youth participants who worked together to learn and develop film projects. In advance of the face-to-face workshop, online workshops were conducted with selected participants to provide initial training in documentary filmmaking and the particular style and standards expected by the United Nations Framework Convention on Climate Change (UNFCCC). This UN organization administers the YCR, a digital

database of short documentary films to which the finished films of each year's PHFL are uploaded and subsequently presented at that year's COP conference. Participants were also encouraged to film interviews (with an Elder, an Expert, a community member directly impacted by the profiled planetary health issue, etc.) and shoot B-Roll (footage that the subjects discuss in their interviews). Ongoing correspondence with youth and educators and data collection continue during and post-completion. This included a brief Entrance survey that provided a baseline understanding of participants previous knowledge and experience with filmmaking, advocacy, and planetary health, as well as qualitative Exit surveys that demonstrated to what degree the PHFL supported participants in learning about these same topics. Administered to all participants as an electronic survey they could complete from their smartphone, the results were analyzed by the Project Leads and are currently held at the Young Lives Research Lab, but are not yet available to the public.

The educative design of the PHFL invited cross cultural engagement, collaboration, and learning about the social and ecological contexts of young people from other parts of the world. Both group and individual activities were designed focusing first on teambuilding to share perspectives, experiences, and worldviews. The series of workshops and seminars was designed by the team and led by 10 academics, emerging scholars, industry experts and Indigenous Elders, all of whom brought expertise and lived experience about their topic of presentation. Workshops are being updated as new iterations take place. The content covers theoretical, empirical and technical learning about planetary health including living sustainably, environmental protection and activism, varying impacts of climate change across communities and nations in the global North and South, precarity and inequality of climate change, Indigenous perspectives on ecology and modes of storytelling. Workshops were delivered on the theories and practices of filmmaking with an overall intention to educate, engage and support these young filmmakers in telling and reflecting on their stories and sharing their learning with global audiences.

Participants arrived on a weekend and attended an orientation session before commencing workshops and meetings. The first three mornings held workshops and seminars on ecological education, activism, communication, and filmmaking. In the afternoons youth worked on discussing and incorporating these lessons into their productions and conducting their own interviews with scholars and experts regarding their topics. Participants were encouraged to find their own experts for interviews, but organizers assisted in identifying potential interviewees and making introductions. Production requirements of the United Nations were reviewed and as were the fundamentals of linear documentary film production (framing, interviewing, editing, etc.). The fourth day was designed for youth to enter a post-production phase to edit and add titles, credits, and music. They worked together the following day to meet a 5:00 p.m. deadline for film productions followed by preparations for the premiere of their films (3–5 min in each case). The premiere was the first public screening and allowed for discussion and input from new audiences. All participants completed their films in the allotted seven days.

Public and policy outreach followed with Mark Terry posting the resulting films to the *YCR* for viewing by the United Nations Climate Change Office (UNCCO), the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP), and the United Nations Education, Scientific, and Cultural Office (UNESCO) where they were viewed by delegates to the COP25 climate summit in Madrid. When applying to participate in the PHFL applicants were made aware that their resulting film would be made public via the YCR and other online platforms, and through a public screening at a Micro Film Festival at completion of the PHFL, they were also aware they may be invited to speak about their film at the COP. On 26 March 2021, participants Kai Millen (Australia), Karla Cajas (Ecuador), and Monica Monroy (Colombia) were featured on the main stage of the United Nations' Sustainable Development Goals Global Festival of Action to screen their films and speak about their films and experiences with the PHFL.

2.3. Methods and Analysis

In the first iteration, three descriptive methods were used to study if and how the PHFL supported youth-centred planetary health education: (i) Youth surveys, which were administered by team members as part of the participation process (Entrance and Exit, one each per participant); (ii) Interviews with youth participants (n = 7), educators, mentors and program leads (n = 8); and (iii) Analysis of youth made films (n = 7). The Entrance Surveys asked baseline questions to understand prior learning, such as: Before coming to the PHFL, how many films have you made?; What do you hope to achieve through documentary filmmaking?; What does planetary health mean to you?; How do you think planetary health affects human wellbeing and how are these connected?; Have you seen impacts of climate change in your community?; What do you hope to learn by participating in the PHFL? Exit surveys and interviews probed further into these lines of questioning. Thematic analyses of the films then proceeded in line with quality practices [46] such that three team members separately watched all films (at least twice), agreed upon a brief synopsis of each, then collectively developed a coding frame for main themes across films. All coders reached consensus on three key themes across the seven films: (i) Anthropogenic footprints, (ii) Ecological and climate justice, and (iii) Collective local/global solutions. The cinematic and technical aspects of the films were not analyzed nor were the youth participants engaged in the thematic analysis. These are limitations we are addressing in new iterations. The results of the thematic analysis of the films are presented below along with selected survey and interview data that provide context about participants, enhance thematic understanding, and illustrate how youth and educators perceived the educative processes. Additional comment is made within each theme as to how the youth-centred data relates to each of the five domains of the *Framework for Planetary Health Education* (Connections with nature, Equity and justice, Systems thinking, Movement building and Health in the Anthropocene) [2].

3. Results

3.1. Youth and Their Films

While all seven participants were encouraged to complete the entrance survey only six youth did so, all of whom indicated an interest and prior experience in documentary filmmaking. The seventh participant neglected to complete the entrance survey, which did not significantly impact the comparison data. Five of the six had observed impacts of climate change in their community but only three had some understanding of the concept of planetary health while three had no prior knowledge of it. All participants were keen to use documentary filmmaking as an educational tool to learn about, raise awareness and engage others in education and action. They were all intent on learning technical filmmaking skills, learning about other cultures, developing "greater empathy with people," understanding climate related problems around the world, sharing ideas and connecting with people in their own communities, and increasing their activism on climate justice. The educators noted that these were highly motivated youth, one stating that "I think it speaks to the selection process, but I thought they were all extremely passionate [...] they care about their country, their place, their project."

The films showcased local environmental issues from the youth perspective and with support of unique narratives garnered through interviews with experts in the field (both on location in Toronto and in their own communities). The films can be viewed online here ('Winter 2020 Films'). A brief synopsis of each as follows:

1 Sea level rise and the role of politics and competing interests in issues of climate change and the need for a collective commitment to environmental protection in Italy.
2 The disproportionate effect of climate change on vulnerable people and communities, particularly small-scale agriculture producers in rural Ecuador, and the need to establish global food security.
3 The impacts of climate change on the mental health of students in India.

4 Human-induced climate change resulting in mass environmental emergencies in Australia and the need for society to be solution-focused to make changes to support Planetary Health.
5 The human impacts of deforestation and industrial overconsumption of water on the environmental and human health and wellbeing in Columbia.
6 The impacts of the fashion industry on the environment, specifically the oceans, and the need for policy reform for sustainable fashion in Canada and around the world.
7 Glacier melt and changing precipitation patterns in Ecuador and the need for education about where drinking water comes from and how to protect it.

The number of 'views' for each as is based on YouTube viewer metrics as of 8 December 2022.

Welcome to Venice by Thierry Ancilotto Toto [47] (212 views): Provides insights into the impacts of (a) rising sea levels on the lives of the people of Venice; (b) frustration in getting help from government and others and (c) a shift in priority from the individual to the many needed to create solutions to save Venice from being underwater by 2099.

Ecuador by Karla Cajas [48] (221 views)-Depicts impacts of climate change on the most marginalized people of Ecuador, focusing on (a) climate change as affecting the most vulnerable people; (b) farmers losing their "assets" as severe climate events destroy crops and farmland; and (c) relocated rural people that cannot adapt to urban environments.

Climate Change & Anxiety by Ishika Mitra [49] (147 views): Shares personal experiences of the psychological impacts of climate change on young people in India. Themes include (a) high temperatures in urban settings leading to lethargy and depression; (b) climate-induced depression causing anxiety in many, including young students; and (c) non-urban environments alleviate anxiety by reconnecting with nature.

The Paradise I Call Home by Kai Millen [50] (722 views): Presents examples of Australia's forest fires and dying coral reefs including (a) the 2019 forest fires of Australia; (b) the continuing decline of the coral reefs and (c) the need to believe the science and focus on solutions to stop these natural disasters.

The Subachoque River: Pollution and Climate Change by Monica Monroy Botero [51] (115 views): Illustrates an understanding of how pollution and climate change have taken their toll on Colombia's Subachoque River by examining how (a) industrial pollution is impacting life in and around the Subachoque River; (b) climate change is compounding these problems and (c) the drying of the river is impacting nearby farms requiring water for crops.

My Relationship with the Ocean by Vivian Guido [52] (133 views): Provides a first-hand account of how the Pacific Ocean has changed through the eyes of a young scuba diver by discussing (a) decline in aquatic biodiversity in oceans worldwide due to microfibers, plastic and pollution; (b) Warming of ocean water in the Arctic causing new diseases for residents and, (c) the need for the fashion industry to be regulated to reduce environmental impact.

The Páramo by Jacquelin Montoya Hidlago [53] (108 views): Identifies impacts of climate change on the agricultural region of Ecuador known as the Páramo through examples of (a) survival of the biodiversity of the Páramo despite harsh impacts of climate change; (b) reliance of millions of people on the ecosystems of the Páramo and (c) changes in availability of water due to glacial melt and the need for people to be made aware in order to secure alternative sources of water.

It's important to note that Kai Millen, whose film has significantly higher views than his fellow PHFL participants, was inspired by his experience with the Planetary Health Film Lab to create his own documentary film production company called Life Media. In promoting this new company, he used his film to showcase the work he is capable of to investors and media. This extended promotion resulted in increased viewership.

3.2. Themes

The first seven films from the PHFL covered a range of countries, communities, and specific but interconnected challenges to planetary health. Each film also addressed possible

solutions to ecological problems such as rising sea levels, impacts on rural agriculture, disappearing water sources, forced migration to urban settings, forest fires, declines of coral reefs and aquatic biodiversity, devastating changes in the Arctic and the environmental impacts of the fashion industry. Together, they address three main themes:

3.2.1. Anthropogenic Footprints

The films record a range of anthropogenic footprints that have been left on the planet and are seen as interconnected effects on humans, plants, animals, biospheres, oceans, reefs and rivers. In one filmmakers' words: "[we're facing] our own possible extinction caused by ourselves . . . there is a vicious cycle" [of the footprint]. The film from Australia covered the forest fires of 2019 where "48 million animals are killed in wild-fires" as well as "the decline of coral reefs." In Ecuador, two films covered the impacts of climate change on the country's agricultural sector and how the rich biodiversity of the country is being impacted by "increasing temperatures and changing weather patterns" and the "changing patterns of precipitation . . . affecting the drinking water supply." One film from Colombia examines the damage caused by anthropogenic influence on the Subachoque River through farming activities, industrial deforestation, and polluting the river with plastic and other non-biodegradable materials such as discarded rubber tires, all contributing to the drying-up of the river. Rising sea levels are addressed with first-hand accounts from Venice, Italy. The relationship between declining youth mental health and heat waves is covered in the film from India. Additionally, the scuba diving specialist from Canada illustrated sweeping changes to marine life in the Pacific Ocean caused by "man-made synthetic fibers" which are reported to be "one of the main sources of micro-plastic waste in the ocean." One youth participant stated that, The Planetary Health Film Lab "helped [them] think rationally about climate change and the various impacts it has on human health" while others explained the 'connections' between the human and other-than human world as exemplified by one youth participant: "I learned that climate change is something which troubles the whole world. I could also understand that there is a way that things should be in the world, and everything is somehow connected. If one thing is out of place, there is likely to be a strong consequence to it."

The examples in this theme illustrate that young people attended in their films to the two larger contexts of the *Framework for Planetary Health Education*; namely Anthropogenic changes at planetary scale and the local conditions in which they operate as well as the domain of Health in the Anthropocene [2]. The films demonstrate knowledge and concern about human caused ecological degradation for five of the seven Anthropogenic changes listed in the *Framework* (i.e., biodiversity shifts, land-use change, global pollution, climate change, extreme weather conditions). In addition, these young participants addressed the range of impacts of such changes on human health and mental health as serious outcomes with which their communities are contending given the interconnection of human and ecological systems (another key domain of the *Framework)*.

3.2.2. Ecological and Climate Justice

Youth participants spoke to the ways in which injustice becomes entrenched when humans seek causes and solutions to planetary health that are individualized rather than seeing and attending to the larger connections to extractive industries such as fast fashion or fossil fuels, political corruption, greed, and the precarity of marginalized communities and people (e.g., in the Global South). In the filmmakers' words: "the problem is in the unheard voices of the people." "Young people do not realize that it is the climate that is doing this to them."

The films and interviews addressed aspects of ecological injustice reported by Newell et al. [12] including *intergenerational injustice* wherein future generations are being unduly affected by problems that they did not create. They also addressed *procedural justice* to insist on fair, accountable and transparent decisions about impacts and responses to climate change; "What happened [...] was not just an exceptional [weather event] [...] it was

exceptional proof of failed political, cultural, and mental systems which put the interests of individuals and groups before the [best] interests of the entire community." Finally, *recognition justice* was acknowledged to understand and record which peoples and places are facing the worst outcomes and discriminations and how to guarantee equal rights for all people, communities and ecologies. One film *Ecuador* [48] reported that: "Climatic changes and increasing temperatures and changing weather patterns are affecting exactly the people that are the most vulnerable. The farmer, the marginalized farmer, is very poor, they don't have any government support [...] so if there is any natural disaster because of climate change, like heavy rainfall or heatwave, that can actually destroy the whole production system." Another film from Ecuador, *The Páramo*, Ref. [53] reports how: "We are just now observing the impacts of climate change on the agriculture sector and how it is related with poverty. And now, the policy makers, the leaders, communities, the people, they are recognizing that yes, it is making the poverty situation worse."

The examples provided by young people in this theme of ecological and climate injustice resonate directly with the domain of Equity and Social Justice in the *Planetary Health Education Framework* which states that:

"The environmental and health impacts of a changing planet are not distributed fairly across populations, species, geographies, and generations. For example, while the world's high and upper-middle-income countries are responsible for the vast majority of carbon emissions, the burdens of climate change are disproportionately felt by vulnerable populations, including low-income countries, island nations, Indigenous peoples, young and future generations" [2]. The *Framework* also suggests that "learners must be able to apply social justice and equity principles to Planetary Health issues and professional practices (p. 35). It calls for a planetary health education that commits to acknowledging injustices and imagining bold alternatives as did these young filmmakers.

3.2.3. Collective Local/Global Solutions

The third theme encapsulates how the young filmmakers provided first-hand accounts of their experiences and added expert analysis from professionals through interviews to address potential for bold alternatives and solutions. One key informant stressed the point that "there are many people willing to make a change, what's missing right now are people able to create order, and a network between individuals, bureaucrats, institutions." In the spirit of the collaborative design, participants learned about the planetary health challenges in each other's countries as well as important aspects of respective cultures, lived experiences and worldviews. With five continents represented by seven participants, some intercultural exchanges took place. Educators noted that the diversity among cultures and contexts added to learning experiences; "they were from all over the world, but the [climate change] problems [they were experiencing in their home countries] were different dimensions of the same issue." Having all participants stay together on the university campus, each in their own room, afforded space for mutual discovery as they lived, learned and explored their host city together. Much of their time was committed to developing and editing their films, and participants often supported each other during workshops and in the evenings if working late. One afternoon was dedicated to a trip into the city centre for team building, sightseeing, and a reprieve from the editing room. For some, this international and intercultural aspect was important for their learning and engagement as one young participant explained. "I learned about the other participants, about their cultures, their problems, and I saw how this united all of us, that we can generate a change, something big, something important, so that everyone can know what we are facing. So, yes, there was much learning, much understanding . . . "

Together their films depict how problems of planetary health are highly connected, intertwined and require collective action for solutions that are at once local, national, transnational and global (e.g., United Nations, World Health Organization). In the filmmakers' words, what is needed is a "network between all these people with solutions and ideas, [without letting] personal interests and greed get in the way". "The world is

disappearing, soon life will be impossible". One participant explained that "this [Planetary Health Film Lab] allowed all of us to expand our boundaries in climate activism and environmental degradation topics, as well as social, mental health and sustainable consumption related topics."

In addition, youth participants spoke in this theme about the importance of connecting with nature when seeking bold new solutions, "get out into nature. Learn, discover, make memories and connections with [nature], because without getting to know the environment, it's difficult to understand why protecting it is so important." They also hoped that their films would help guide solutions based in forging connections and educating others through filmmaking to "get [others] interested in global issues through media and film". For some, understanding filmmaking as a tool to inform and engage was a new concept, "I realized filmmaking, patience and time can really be used to share [. . .] positive and useful messages". Some youth participants stated that the experience "changed [their] lives" through ongoing pursuit of activist filmmaking projects. The participants from Australia and Ecuador are currently producing films with other local youth to create documentary projects intended to inform and influence changemakers in their respective countries. All participants were keen to share their learning and skills with friends and peers at home, feeling that they better understood planetary health and potential solutions, as stated by one youth participant:

"[The Planetary Health Film Lab] has enforced that climate change is happening, and we as individuals can make a change. With documentaries and Geo-Docs there is a lot of information we can teach youth and adults back at home. If we all tell our story surely that's going to turn heads." They all felt that their films would "open the eyes" of others to enact change in their communities and the whole planet. It was regarded as 'highly important' that their films would be included on the *YCR* where policy and changemakers could view them, for example: "We're noticing that some changes need to be made and they need to be made now. UN and other policy makers have the power to do that. And we know they've heard us, but the sooner they can start to make changes at a faster place will really benefit not only the environment, but also the relationships that we all have."

The educative filmmaking of these young people both embodies and illustrates the two domains of Movement Building and Systems Change and Connections with Nature as described in the *Framework* that calls for students to "coalesce visions for a just and sustainable future, as well as inspire cross-sector, inclusive partnerships to co-create a better future for all members of Planetary Health (p. 40, [2])." The young participants of the PHFL are doing just that and ensuring that other youth, communities, and local/global audiences are part of the collaborative process, as stated by one youth participant: "This experience is one I plan to replicate back home. I will encourage my friends to create short films such as the one I made and pass on the documentary filmmaking techniques and storytelling approaches I learned with the policymaker in mind. As much as I wanted to do something about the challenges facing the environment, it seemed too big a problem for me to do anything about it. The Planetary Health Film Lab gave me the opportunity and the tools to make a significant contribution, one I plan to share with my friends."

4. Discussion

Research into youth-centred educational processes points to four important and interconnected design elements; (1) content (i.e., *what* to teach), pedagogy (*how* to teach), structures (*where* to teach) and relationships (*who* is teaching), elements to be considered in relation to the particular group of young people who are to benefit from improved wellbeing for themselves, their communities and the planet [19]. In terms of content, planetary health science is complex and constantly changing and must be updated and taught in engaging ways. In addition, youth-centered planetary health education could engage critical and ethical questions of pedagogy: Why and how do we educate? Who is included in meaningful ways? Which relationships (human and more-than-human) and structures best engage and support young students? The PHFL and its associated *YCL* provide some

answers by showing promise in animating a youth-centred planetary education that weaves transdisciplinary ideas and practices from the fields of education and planetary health to support youth as they learn and contribute meaningfully as partners. The project sought to educate alongside young people by engaging them in film making projects and dialogue about planetary health so that they could tell the stories on film as grouped in their specific communities. The approach both meets and exceeds recent calls for "practice points" of consultation, facilitation, accountability, and evidence when engaging youth in planetary health education [38]. The PHFL addresses provision of space for consultation, making opportunities to set agendas and make decisions, providing support and resources for tangible outcomes, working with marginalized groups, identifying and removing barriers, allocating funding, inviting collaborative design and evaluation, and providing feedback as called for by Spajic et al. [10] However, a youth-centred educative design also allows for meaningful policy activism to engage both youth and decision-makers through the potential for policy reach as an authentic and effective outlet [44].This is of value to these youth; "that's what we're looking for" one young participant explained, "to be listened to, to be seen by policy makers and to make a change, that's the main goal." We have begun to engage young people as crucial partners in policy activism [54] that releases policy making from individualistic or one-size fits all processes by inviting young people to make their lives and local ecological contexts visible to decision-makers [38,44].

Educative filmmaking has enhanced this visibility in ways noted by one participant, "film is a universal language," yet filmmaking "is both necessary and necessarily incomplete" (p. 2, [55]) in the complex work of reimaging a transformative planetary health education. The seven youth-made films analyzed here provide important themes from youth and community perspectives and in concordance with photographer and cultural critic Susan Sontag [56] who notes that such creative projects " . . . could simply *make us care*. This ethic of invocation of care and relationship is the central practice in youth-attuned videography" (p. 4, [57]) as it works for intergenerational justice. As one youth participant explains, "education and art are a great way to educate people... The more people know, the more they are willing to make a change."

Limitations

We remain cautious about foreclosing on the meanings of these first seven films for planetary health education as they continue to be seen and interpreted by audiences and policy makers and we have yet to assess these broader impacts. To date they have been seen by over 1600 people, but that is a relatively small number, and we are not certain who has viewed them, for what purposes and what has come from their viewing. Indeed, we are still at work in analyses of survey and film data and of films from the Ecuador project and will therefore build upon this analytical structure. At the UNFCCC held in Spain in 2019, delegates found the youth-produced films to be useful in their policy sessions as they provided visible evidence of climate research, impacts and solutions specific to policymakers' respective region of representation. However, we have yet to assess the extent to which these policy-decisions matter and the extent to which the youth films are enacted within them. We also are aware of budgetary and time limitations of the Planetary Health Film Lab that might inhibit support for these youth in educating their peers on their return to communities. The newest work in Ecuador is leading to development of more fulsome peer-training models and means of collaborative analysis of data with the young participants [45].

5. Conclusions

In summary, the PHFL and its sister project the *YCR* are functioning as youth-centred planetary health education projects based on transdisciplinary and youth-centred approaches and in resonance with the five domains (Connections with nature, Equity and justice, Systems thinking, Movement building and Health in the Anthropocene) of the *Framework for Planetary Health Education* [2] and global frameworks (e.g., UNESCO's *Futures*

of Education Project) that call for youth to *Learn to know* about the unknown and a diversity of ways; *Learn to do* through engaged action for inclusive and equitable lives and futures; and *Learn to live together* as we coexist with all life on the planet and become more sustainable [57]. For example, the young participants worked collaboratively to record and map out a range of anthropogenic footprints across places, countries and communities. They illustrated ecological and climate injustice, and suggested solutions which are collective, active, local and global. They also described their experiences in current ecological and climate crises as an ongoing 'struggle' as they describe the "suffering of their communities," decline of their mental health, and their desire to find ways to enact change in response to climate change. They desired and responded to better understanding planetary health, because "everything is connected (animals, plants, humans, sea, wind etc.). Since we are the dominant species, it's up to us take care of our home". The ways in which young people approach planetary health through youth-centered education is well summarized by one participant: "We cannot have an approach that is just about people or just about nature. People depend on nature but at the same time these activities that people realize are impacting natural resources. [We all] need to understand that [our] activities are having an impact on these resources, but it's hard, because if [we] don't have another alternative, how can [we] live? How can [we] survive? It's challenging but I think we can do it."

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