

# The Planetary Health Academy—a virtual lecture series for transformative education in Germany

Sophie Gepp\*, Laura Jung\*, Katharina Wabnitz, Frederick Schneider, Friederike v Gierke, Hannah Otto, Sylvia Hartmann, Theresa Gemke, Christian Schulz, Sabine Gabrysch, Marischa Fast†, Eva-Maria Schwienhorst-Stich†



The planetary crises require health professionals to understand the interlinkages between health and environmental changes, and how to reduce ecological harm (ie, ecological footprint) and promote positive change (ie, ecological handprint). However, health professions' education and training are mostly lacking these aspects. In this Viewpoint, we report findings from the evaluation of the Planetary Health Academy, the first open online lecture series for transformative planetary health education in Germany. In a retrospective online survey, 458 of 3656 Planetary Health Academy participants reported on their emotions towards climate change, attitudes towards health professionals' responsibilities, self-efficacy, and the contribution of the Planetary Health Academy to their knowledge and actions. Additionally, motivators and barriers to acting were assessed. Our findings provide insights that can inform future efforts for transformative education. Combined with network and movement building, education could act as a social tipping element toward actions to mitigate global environmental changes.

## Introduction

The climate crisis and the crossing of several other planetary boundaries as described by Steffen and colleagues<sup>1</sup> increasingly threaten planetary health, including human health, wellbeing, and ultimately survival.<sup>2</sup> Profound transformation of all areas of human activities is needed to address this existential threat. Whitmee and colleagues<sup>3</sup> named three interconnected challenges that need to be overcome to achieve planetary health concerning: imagination, knowledge, and implementation. In this concept imagination means the challenge of developing a shared vision of health and wellbeing for all within the planetary boundaries, knowledge refers to the recognition of the complex interlinkages between global environmental changes and human health, and implementation points to those transformative measures that are needed to achieve the visions. Effective planetary health education needs to address all three challenges.<sup>4</sup> This goal requires a transformative focus; ie, not just fostering learners' factual knowledge but also their values, practical skills, and a sense of self-efficacy.<sup>5–8</sup> Integrating these elements is a prerequisite for learners to appreciate the need for societal transformation and to drive action towards transformation for planetary health.<sup>8</sup>

UNESCO, in its Education for Sustainable Development approach, defines the transformative role of education as central to achieving sustainable development. The learning experience needs to include knowledge transfer to become aware of certain realities, critical analysis to understand the complexities beneath those realities, and experiential exposure to connect to those realities.<sup>9</sup> UNESCO also note that for transformation to happen, a level of disruption, courage, and determination is necessary. Relatedly, the emerging field of planetary health education seeks to enable and equip learners across all levels and disciplines to protect and restore the planet and health while working towards the Sustainable Development Goals.<sup>7</sup>

A useful concept in planetary health education is the ecological handprint, which expands upon the ecological footprint. The ecological footprint is considered the ecosystem area (and its resources) required to support the lifestyle of specific human populations or individuals. Generally, the ecological footprint of individuals residing in high-income countries is too high to enable future generations to fulfil their needs and thrive.<sup>10,11</sup> Therefore, motivating learners to reduce individual ecological footprints is one objective of planetary health education. However, the concept of the ecological handprint moves beyond the focus on harm reduction through small-scale behaviour change to instead foster change towards planetary health on the level of societies.<sup>12</sup> The ecological handprint includes being active politically or in advocacy, as well as network and movement building and motivating others through examples of good practice.<sup>13</sup> In our view, planetary health education's truly transformational impact lies in enlarging learners' ecological handprint and their understanding of it.

Health professionals need to be prepared to reduce the health effects of the ecological crises on patients through adaptation. Their professional ethos also mandates action for minimising the health burden due to the ecological crises by engaging with mitigation efforts. As trusted figures in societies, health professionals can play a special role as agents of change in driving transformation for planetary health.

Despite international calls to include planetary health education in standard curricula, it is still rare to find in health professionals' education.<sup>8,14–18</sup> To address the scarcity of education on planetary health, the German Alliance on Climate Change and Health aims to empower health professionals to become agents of change. Founded in 2017 as a network of individuals, organisations, and associations from across the health sector, the alliance provides a German-speaking platform to inform, connect, and act on planetary health. As of 2019, it has been substantially supported by its spin-off Health for Future,

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\*Joint first authors

†Joint last authors

Research Department 2, Potsdam Institute for Climate Impact Research (PIK), Potsdam, Germany (S Gepp MSc, Prof S Gabrysch PhD); Institute of Public Health (S Gepp, Prof S Gabrysch) and AG Computational Medicine, Berlin Institute of Health (S Hartmann MD), Charité-Universitätsmedizin Berlin, corporate member of Freie Universität Berlin and Humboldt-Universität zu Berlin, Berlin, Germany; German Alliance on Climate Change and Health (KLUG), Berlin, Germany (S Gepp, L Jung MD, F v Gierke MD, H Otto MD, S Hartmann, T Gemke, C Schulz MD, M Fast PhD); Centre for Planetary Health Policy, Deutsche Allianz Klimawandel und Gesundheit, Berlin, Germany (S Gepp, K Wabnitz MD); Division of Infectious Diseases and Tropical Medicine, Leipzig University Medical Center, Leipzig, Germany (L Jung); Lehrstuhl für Public Health und Versorgungsforschung, Institute for Medical Information Processing, Biometry, and Epidemiology (IBE), Ludwig-Maximilians-Universität München, Munich, Germany (K Wabnitz); Department of Anaesthesiology and Intensive Care, TUM School of Medicine, Technical University of Munich, Munich, Germany (F Schneider MD, C Schulz); Medical Faculty, Albert-Ludwigs-Universität Freiburg, Freiburg, Germany (H Otto); Medical Faculty, Johannes Gutenberg University Mainz, Mainz, Germany (T Gemke); Heidelberg Institute of Global Health, Heidelberg University, Heidelberg, Germany (Prof S Gabrysch); Department of General Practice and Family

Medicine, University Hospital Würzburg, Würzburg, Germany (E-M Schwienhorst-Stich MD); Teaching Clinic of the Faculty of Medicine and Institute of Medical Teaching and Medical Education Research, University of Würzburg, Würzburg, Germany (E-M Schwienhorst-Stich)

Correspondence to:

Dr Laura Jung, Division of Infectious Diseases and Tropical Medicine, Leipzig University Medical Center, Leipzig 04103, Germany  
laurajung.gh@gmail.com

For more on the Planetary Health Academy see <https://planetary-health-academy.de>

a fast-growing network of local activist groups. When the COVID-19 pandemic started to unfold and a country-wide lockdown started in March, 2020, in Germany, the German Alliance on Climate Change and Health and Health for Future sought to keep up the momentum and connectedness among their membership, building on the experience of existing online resources and massive open online courses on planetary health.<sup>19,20</sup> Collaboratively, the Planetary Health Academy (PHA) was conceived as the first open online lecture series for planetary health education in Germany pursuing objectives of transformative education. The PHA can be regarded as an Open Educational Resource, providing freely accessible online teaching and educational materials on its website. Furthermore, it turned the looming loss of momentum during the lockdown into the opportunity of reaching a large number of people and extending the German Alliance on Climate Change and Health and Health for Future networks. Since May, 2020, the lecture series has been offered every summer and winter term (ie, twice in German and twice in English), with a varying thematic focus. The PHA was honoured by the Federal Ministry of Education and Research and the German UNESCO Commission for its great commitment to Education for Sustainable Development with the National Award for Education for Sustainable Development 2022–23.

We evaluated the PHA as an approach for transformative planetary health education and present our findings and lessons learned for future educational efforts in this Viewpoint. We hypothesised that the PHA participation could not only contribute to the increase of planetary health knowledge but might also be a motivator for action. We therefore investigated participants' emotions, attitudes, and self-perceived efficacy after taking part in the course and how participation contributed to planetary health knowledge and action. All outcomes are self-reported and therefore display reported actions or intentions. Furthermore, we explored barriers that prevented participants from acting for planetary health.

## Methods

### The PHA

The PHA is a virtual learning space including lectures and workshops. The first lecture was held in May, 2020, the last lecture included in this analysis took place in December, 2021. The first three lecture series covered topics ranging from planetary boundaries, tipping points, and the health effects of crossing planetary boundaries to more specific fields like communication or mental health. The fourth lecture series focused on planetary health in the clinical setting (appendix p 1). Each series consisted of six to nine sessions of 90 min with two to four speakers from different countries and backgrounds. Each speaker presented for approximately 20 min, then an interactive conversation including questions from the audience was facilitated.

Elements to bridge the knowledge–action gap were the

showcasing of specific examples of transformative actions by members of the planetary health community, and the involvement of local groups, which facilitated the direct exchange of participants in post-lecture discussions. Therefore, the distinguishing feature from pure knowledge transfer is: the inclusion of transformative examples, in the classical sense of learning from the model; addressing the gap between knowledge and action in the lecture and reflecting with our speakers on how knowledge can translate into action, especially in health care; and establishing the political reference frame, eg, reporting on new resolutions of the German Medical Congress and their importance for the transformation of health care (appendix p 1). In addition, support was provided for local groups to advocate for the integration of planetary health education into their university or training curricula. The video recordings and presentation slides of the lectures are freely accessible on the PHA website, to increase the reach and availability of materials.

Additional workshops and locally organised reflection sessions accompanied the lectures. These sessions gave participants the opportunity to connect with others, share experiences, and develop new ideas. By carefully selecting planetary health topics and experts, the PHA aimed to enable participants to use and increase their handprint to become agents of change for planetary health. Community examples for transformative action and interactive workshops sought to inspire transformative action thus aiming to address all three challenges described by Whitmee and colleagues:<sup>3</sup> knowledge, imagination, and implementation. In fact, the slogan of the PHA is: from knowledge to transformative action.

### Study design

A retrospective, cross-sectional, self-administered online survey was conducted from Dec 22, 2021, to Jan 12, 2022. Participants were eligible if they had participated in at least one lecture.

### Questionnaire development

On the basis of existing literature on planetary health and transformative education,<sup>21–24</sup> in December 2021, survey items were generated in an iterative manner. A draft questionnaire was presented to three external reviewers (NM, MJ, and ME) with backgrounds in psychology, public health, medicine, and planetary health education for revision in an interactive workshop, which resulted in the final questionnaire.

Among the planetary boundaries being transgressed, climate change is the most prominent. Therefore, we decided in some cases to use climate change as a proxy for all environmental changes encompassed in the concept of planetary health, however, other planetary boundaries were also included in the questionnaire. The survey domains were: (1) participation in the PHA, (2) emotions towards climate change (derived from the More in Common Study),<sup>25</sup> (3) attitudes towards health

See Online for appendix

professionals' responsibility regarding climate change (derived from Bugaj and colleagues),<sup>26</sup> (4) self-efficacy (derived from Beierlein and colleagues),<sup>27</sup> (5) planetary health knowledge and whether the PHA contributed to this knowledge, (6) self-reported action and whether the PHA contributed to this action, (7) personal benefit of participating in the PHA, and (8) demographic data. All questions in domains three to six were assessed on 6-point Likert scales. Additionally, participants were asked to respond to open-ended questions on self-perceived motivation and barriers to act.

We classified actions as pertaining to the realms of footprint or handprint. As described previously, footprint refers to actions that reduce resource use and ecological damage, often with a focus on individual lifestyle. Handprint refers to actions that aim at influencing other individuals, the workplace environment, or networks, or at changing political or societal structures at the local, national, or international level, with the aim to decrease society's footprint at large. This classification was not visible to the survey participants but informed the survey development and analysis. Questions were developed aiming to be unambiguous in English and German.

### Survey administration

The survey was piloted with six participants (four German-speaking and two English-speaking) with resulting adjustments to language and scaling. The final questionnaire (appendix p 3) was programmed using the survey tool EvaSys. Invitations to participate were sent out via email to all 7360 email addresses registered for the PHA, with two reminders. Only those who had participated in at least one lecture were eligible to fill in the survey. Additional reminders were sent out via social media (ie, Instagram) accounts and mailing lists of the German Alliance on Climate Change and Health and Health for Future. Informed consent was sought from all participants before participation in the survey. The study was approved by the University of Würzburg Ethics Committee (20211223 02).

### Statistical analysis

Data are presented in a descriptive manner. Mean and SD are calculated from ordinal data from the Likert scale items. To examine differences between participants who responded after reminders in the social media and network-related mailing lists and those who responded immediately, and between participants who used the English versus the German version, item-wise comparisons were computed using the Mann-Whitney-U test for ordinal data and the Pearson  $\chi^2$  test for nominal data. We used SPSS statistics (version 27.0) for analysis.

### Analysis of free-text answers

We used summarising qualitative content analysis to inductively develop categories with a view to summarise the data under each question in a concise, yet com-

prehensive manner.<sup>28</sup> The first round of analysis was carried out by one researcher and the results were validated by a second researcher. Any discrepancies were resolved through discussion. Analysis comprised the following steps: German answers were first translated into English, then all answers were paraphrased to describe their important content in a condensed manner and on a similar linguistic level across all answers. Answers that contained different aspects were split into units of meaning and paraphrased separately. Paraphrases were then generalised into categories on a similar level of abstraction. Categories were sense-checked. An active process of reflection about the researchers' positionality accompanied the qualitative data analysis (appendix p 8).

### Results

After the removal of duplicates, of 7360 recipients initially invited, 3656 people were identified to have participated in at least one lecture of the four lecture series. Of those, 458 completed the evaluation questionnaire (13%). 390 responded to the German version of the questionnaire (85%), whereas 68 participants (15%) preferred the English version. Although in total, there were 29 lectures across the four cycles, one lecture cycle consisted of six to nine lectures. Participants indicated an attendance rate of 6.5 lectures on average (median 5 lectures [IQR 3–9]). No major differences were found between early and late responders and between those using the English and German questionnaires (data not shown). 331 (72%) respondents identified as female ( $n=14$ , 3% preferred not to say), and 415 (91%) lived in German-speaking countries. 361 (79%) indicated being health-care professionals or students of health professions, and 174 (38%) were university students. 261 (57%) were active in one or more networks or organisations related to the environment or health. 151 (33%) were members of the German Alliance on Climate Change and Health, Health for Future, or both (table 1).

### Quantitative analysis

Participants were asked to choose up to three of 12 emotions they usually feel towards climate change. The question was evaluated only for the German questionnaire ( $n=390$ ) because responses were used for comparison with the More in Common study<sup>25</sup> (which had a representative sample of the German population). Additionally, translation, that lead to loss of nuance, made a direct comparison of emotions between the two language versions not appropriate. The three emotions most commonly selected were motivation to act ( $n=207$  [53%]), helplessness ( $n=179$  [46%]), and rage ( $n=143$  [37%]; table 2).

Regarding the respondents' attitude towards the role of health-care professionals, many health-care professionals ( $n=360$ ) agreed that they have an elevated social responsibility in relation to climate change

	n (%)
Age, years	
18–29	184/444 (41%)
30–49	125/444 (28%)
50–64	98/444 (22%)
≥65	37/444 (8%)
Sex	
Female	331 (72%)
Male	113 (25%)
Prefer not to say	14 (3%)
Country of residence	
Germany, Austria, and Switzerland	415/442 (94%)
Other	27/442 (6%)
Country of birth	
Germany	387/456 (84%)
Other	69/456 (15%)
Background of migration*	78/432 (18%)
Current employment	
University student	174 (38%)
Employed	215 (47%)
Retired	33 (7%)
Other	31 (7%)
Activity in groups or organisations (multiple answers possible)	
German Alliance on Climate Change and Health	74/419 (18%)
Health for Future	108/419 (26%)
Other networks on the environment, climate, and health	65/419 (16%)
Organisations for environmental protection	97/419 (23%)
Professional associations	75/419 (18%)
Occupation	
Medicine	241/455 (53%)
Nursing	9/455 (2%)
Physiotherapy	12/455 (3%)
Psychology or psychotherapy	59/455 (13%)
Public health	23/455 (5%)
Others	111/455 (24%)
Participants' background regarding health professions	
Health professional	242 (53%)
Student of health profession	119 (26%)
Not a health professional	97 (21%)

Data are n (%) or n/N with available data (%). \*Either participant or both parents are not born in the country of current residency.

**Table 1: Demographics of respondents to the survey on the online Planetary Health Academy organised in Germany (n=458)**

(mean 3.5 [SD 1.2]), to be social role models (3.9 [1.5]), to have an educational role (3.9 [1.2]), and have a duty to inform society (3.1 [2.0]) and patients about climate change (3.3 [2.0]). Respondents (n=457) had a high level of perceived self-efficacy, affirming that they can rely on their own abilities in difficult situations (mean 3.9 [SD 0.8]), that they are able to solve most problems on their own (3.7 [0.9]), and that they can usually solve even challenging and complex tasks (3.8 [0.8]).

	n (%)
Helplessness	179 (46%)
Disappointment	141 (36%)
Rage	143 (37%)
Fear	127 (33%)
Doubt	39 (10%)
Guilt	70 (18%)
Confidence	47 (12%)
Grief	68 (17%)
Motivation to act	207 (53%)
Serenity	11 (3%)
Surfeit or weariness	24 (6%)
Pity	21 (5%)
None of the above	2 (1%)

Data are n (%). Participants (n=390) could choose up to three options. These options were only displayed for respondents to the German questionnaire for comparison with the More in Common study<sup>25</sup> (which had a representative sample of the German population) and because of a programming error in the English version, which alongside differences in translation that lead to loss of nuance, made a direct comparison of emotions between the two language versions difficult.

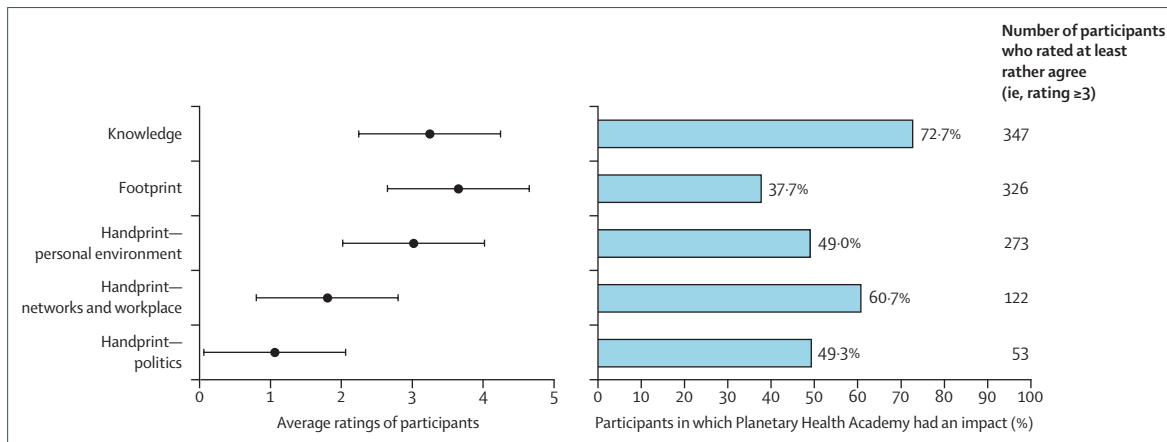
**Table 2: Emotions towards climate change among participants of the Planetary Health Academy**

The mean self-rated knowledge on planetary health was 3.25 (SD 0.74), with 379 (83%) stating that the PHA contributed to this knowledge. In addition, 326 (71%) said that they tried to reduce their own ecological footprint at least partly due to their participation in the PHA. Respondents also tried to influence others for positive change (handprint), most commonly in their personal circle, less commonly at their workplace or professional environment, and some also through political action at the local, national, or international level. Nearly half of the participants affirmed that the PHA contributed to their handprint regarding personal and political activities; more than 60% said that the PHA influenced their handprint in networks and their workplace (figure 1). About 70% of respondents stated that the PHA was influential in making them talk to friends (n=248 [67%]) and family (n=234 [69%]) about climate change and health and slightly less (n=158 [67.2%]) were inspired to take action at their workplace, eg, through having planetary health discussions with colleagues (figure 2).

### Qualitative analysis

Of 458 participants, valid responses to the free text questions were provided by 259 for question one and by 279 for question two. Categories developed to summarise the answers to both questions, including a definition and illustrative quotes, can be found in the appendix (p 9).

For the question, what about the lecture series you attended particularly motivated you to take action, most described the lecture series both as a source of evidence-based knowledge and of new awareness of the interconnectedness between global environmental change



**Figure 1: Reported knowledge and actions on footprint and handprint regarding planetary health among participants of the Planetary Health Academy (n=458)**

Responses to each item are shown as means (SD) of participants rating their knowledge (ie, very low to very high or no answer) or agreement (do not agree at all to completely agree or no answer) to statements about their action on a 6-step Likert scale. Only participants who at least gave a rating of  $\geq 3$  to an item were asked whether the Planetary Health Academy contributed to this rating or not.

and human health. Examples of projects and activities that aim at instigating change on different levels as well as tangible suggestions for how to become active were also salient as a source of motivation. The lecture series was perceived as generating a great sense of community, not least because of the high number of participants present (appendix p 1), which was communicated regularly during the lectures. Participants mentioned that they acquired an awareness for the scale of the impacts caused by environmental changes and developed a sense of urgency regarding the need to act. They also felt inspired by the attitude and experiences of individual speakers and other participants as well as certain specific content, for example the concept of social tipping points.<sup>29</sup> The atmosphere during the webinars was positively described as motivational and inspirational, including through the emphasis that was placed on the collective impact of individual actions and the notion that change is still possible and action not futile. Some also described the commitment of health professionals that was visible through the PHA and the new sense of personal responsibility as a source of motivation. People who were already engaged in the field beforehand indicated that the PHA did not change this involvement and a few mentioned that the PHA had not further motivated them to act.

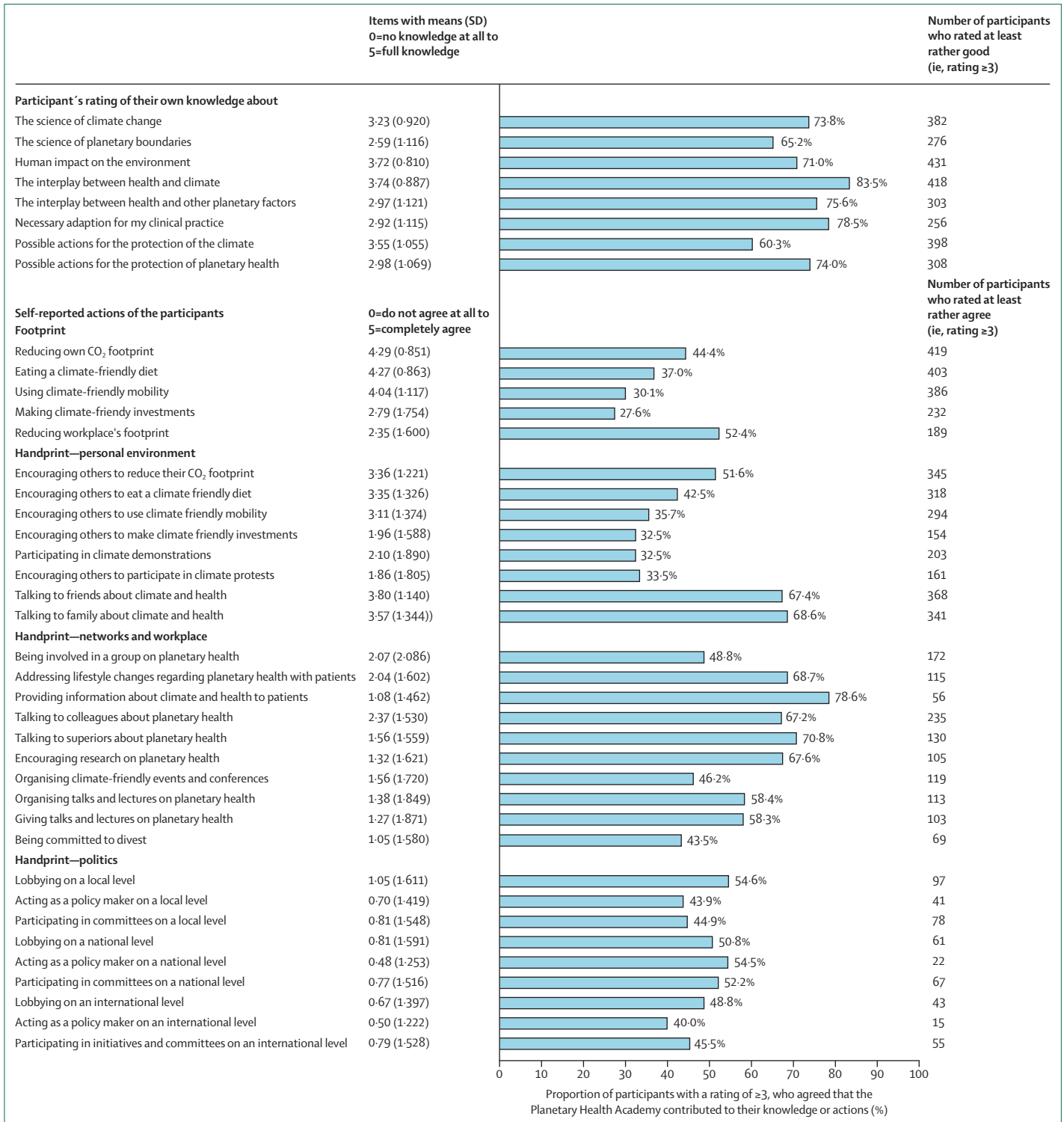
For the second question, what in general prevents you from acting for planetary health, the most salient barrier was little or no time due to professional and personal responsibilities as well as other commitments. Little or no connection to like-minded people and little or no relevant knowledge or skills were also salient. Not experiencing enough self-efficacy, being in a difficult personal situation, including for health or work-related issues, were other striking obstacles. Others felt discouraged, reporting a sense of futility sometimes intensified by the ignorance of other people who might

not be receptive to efforts to change the status quo. Inertia regarding changes, both on a structural level (eg, regarding existing power hierarchies) and on a personal level (eg, regarding difficulties in changing personal habits or lethargy) was also described as a barrier. Some participants also mentioned that they were afraid of hostility or rejection by others in reaction to their activism. Little or no material resources, including financial and infrastructural, as well as not having a supportive social environment was another obstacle. Few participants mentioned that the ongoing COVID-19 pandemic prevented them from being active.

## Discussion

The biggest challenge for planetary health education is to develop educational formats that result in transformative action. Our intention was to understand to what extent the PHA, with 3656 participants at the time of this study, could contribute to this goal. Overall, across quantitative and qualitative data, we observed a strong sense of commitment among respondents. They reported feeling responsibility and motivation to act as well as high levels of self-efficacy. Many provided high ratings for knowledge and action on their personal footprint, some reported having acted in their respective networks, and even political action in some instances. Across all categories of knowledge and action, the participants reported a contribution of the PHA (figure 1).

The PHA was conceptualised and implemented by members of the German Alliance on Climate Change and Health and the Health for Future network. By tailoring planetary health topics to health professionals, the PHA aimed to link these issues to the realities of its target group, a prerequisite for action. On the basis of our results, we would cautiously claim that online lectures might have the potential to motivate individuals



**Figure 2: Reported knowledge, footprint,\* and handprint† regarding different aspects of planetary health among participants of the Planetary Health Academy (n=458)**

Participants were asked about knowledge increase regarding planetary health topics and their personal behaviour regarding their ecological footprint and handprint on different levels. Responses to each item are given as means (SD). Participants who at least gave a rating of ≥3 to items were asked whether the Planetary Health Academy had contributed to this rating or not. \*Ecological footprint, defined as the ecosystem area required to support specific human populations, on an individual level indicates the resources an individual consumes to sustain their lifestyle. †Ecological handprint is defined as transformative action performed by individuals or groups to move towards planetary health.

to join or start a local climate and health group and, reciprocally, local groups provided practical examples and thus inspired other participants.

The PHA is characterised by a continuous and vivid exchange with the Health for Future network. During the period of the four lecture series, the Health for Future movement grew immensely: the number of local groups increased from 40 to 71. Although we cannot attribute this growth to the PHA using results from the present study, we suggest that the close connection of this educational format to local networks through local discussion groups and sharing local examples of transformative action could have contributed to translating newly encountered knowledge into action, including network building. Accordingly, although the PHA was reported to have had an effect on personal ecological footprints, participants' reported attribution to the PHA was even greater with respect to the ecological handprint, especially for starting conversations with others on the importance of planetary health and addressing environmental issues in the workplace. To illustrate the dynamic field such conversations occurred in, the 125th German Medical Assembly in November, 2021, called for a carbon-neutral health-care sector by 2030, with a roadmap for this transformation yet to be defined.<sup>30</sup>

On the basis of the qualitative analysis, we suggest that planetary health education can strengthen participants perceived self-efficacy to take transformative action. We also suggest that being able to connect and exchange experiences with like-minded people and the feeling of being part of an expanding movement could contribute to developing a common vision for the future, thus addressing the imagination challenge. Changing norms and values were suggested to be a key lever for transforming societies.<sup>29</sup> Changes in values can be achieved, among others, through being inspired by role models.<sup>31</sup> Therefore, inspiration through lecturers and participants could present a starting point for a shift or consolidation in values that are conducive to achieving planetary health.

Action in professional environments, networks, the workplace, and through political outreach were less frequently reported than actions on personal footprints, likely reflecting a more limited sphere of personal influence. Among participants who did increase their handprint, around half reported that the PHA had been influential for their actions, which might indicate an effect. Showcasing practice examples during the lectures and motivating participants to transfer these into their lives, even if adopting transformative practices includes moving outside their own comfort zone, could be an important asset of transformative education interventions in planetary health. Similarly, other educational interventions, such as sustainability workshops tailored to health professionals, have shown a positive effect on participants' sense of agency, and empowering beyond knowledge.<sup>32</sup>

Qualitatively, participants reported isolation, little to no agency and self-efficacy, and perceived futility of action as barriers to act. Some of them described the PHA as providing a solution. Little to no time was one of the most prominent barriers and often due to prioritisation of other activities, professional and personal commitments. Although these competing demands on individuals' time might not be easily changed in many cases, a possible contribution of online lectures, such as the PHA, might be to increase the sense of urgency in the face of the health impacts of environmental changes and the feeling of encouragement, which could contribute to a change in personal value systems and hence shifting of priorities in participants.

More than half of the participants of the PHA felt motivated to act—this emotion being the most frequently reported. The result from our sample is clearly different from a sample of the German national population, of whom only 12% felt motivated to act on climate change.<sup>25</sup> Frequency of unpleasant emotions, such as helplessness, disappointment, rage, and fear, were comparable in both samples. The demographics of our sample, with three times more female participants than male participants and a relatively young population, is comparable to those of other studies on planetary health online education.<sup>20</sup> The high number of female participants might be partly due to the high proportion of females in the health sector.<sup>33</sup> The predominant involvement of young women has also been observed in many recent environmental movements, in particular Fridays for Future.<sup>34</sup> A large proportion of the sample were university students, which could be explained by the fact that the PHA was explicitly aimed at students and trainees of health professions, using relevant mailing lists.

To our knowledge, this study is the first of this kind evaluating a planetary health online education initiative aiming to increase participants willingness to act. It combined quantitative and qualitative questions to gain a broad understanding of how participants felt impacted by the PHA. However, this study has several limitations. With a response rate of 13%, our sample is not representative of all participants of the PHA. Furthermore, participants of this online academy can be assumed to be a group particularly committed to planetary health and thus drawing conclusions regarding the general population is not possible. The fact that the different series had a varying focus, alongside our retrospective study design, did not allow for comparisons between series; eg, we cannot say whether certain lectures or topics had a bigger effect on participants' actions than others. As this evaluation has been carried out retrospectively, participant baseline data has not been systematically collected for all lecture series and can therefore not be presented. We furthermore cannot provide a pre-analysis and post-analysis to best estimate the effect of the PHA on participants, since the first PHA was an immediate reaction to keep climate action going during the COVID-19 crisis and the related

lockdowns, leaving no time for a pre-survey. However, further research should consider a pre-survey to draw more comprehensive conclusions. Especially assessing the emotions before and after an educational intervention can help to verify whether emotions such as motivation to act or confidence increase, or on the contrary, emotions like helplessness increase, which needs to be avoided. In addition, qualitative research on the impact of the education initiative on activity within local Health for Future groups could add another piece to the picture.

Social desirability bias must be considered and could potentially lead to an overestimation of the PHA's role in increasing planetary health knowledge and action. However, the qualitative analysis provides important indications as to how the PHA contributed to knowledge, motivation, and finally action. Further research needs to be done on the interlinkages and mutual influence between individuals, networks, and transformative education and how transformative planetary health action can emerge from and contribute to these, ie, whether the effect logic of the ecological handprint is valid.

## Conclusion

In conclusion, the PHA provided an unprecedented learning and exchange platform during COVID-19 lockdowns. The huge interest of hundreds of participants in each series underscored the need and perceived gap for practice-oriented educational content on planetary health. The online learning and exchange aimed to address the knowledge challenge and, more importantly, the imagination and implementation challenges. Participants reported being motivated to reduce their own ecological footprint, to start conversations about planetary health in private and professional environments, and to advocate for planetary health in their workplaces. Our findings suggest that transformative education has the potential to increase learners' ecological handprint and their understanding of it, which could be a starting point for institutional change. They also underline that one of the most difficult aspects of planetary health education is to empower people to become active beyond their immediate social circle. This study also sheds a light on the potential role of network interactions and movement building to ignite change, supporting the claim that education could act as a social tipping element for planetary health.<sup>29</sup>

## Contributors

LJ, SGe, E-MS-S, and MF contributed to the idea, concept, and coordination of the project. LJ, SGe, E-MS-S, MF, and KW carried out a literature search on the background of planetary health education. LJ, SGe, E-MS-S, MF, KW, HO, and SGa contributed to the development and implementation of the questionnaire as well as data collection. FS and CS verified the data set. All authors had access to the study data. E-MS-S, LJ, SGe, and MF guided the data analysis. The quantitative analysis was carried out by FS with support from TG and CS, the qualitative analysis was carried out by KW and FvG. FS, LJ, SGe, CS, KW, and FvG with support from SGa and E-MS-S created the figures and tables. All authors were involved in the writing and review of the draft.

## Declaration of interests

TG works for the Planetary Health Academy as a member of the organising team. SGe and HO previously worked for the Planetary Health Academy as members of the organising team. SGe and KW work at the Centre for Planetary Health Policy, which receives institutional funding from Stiftung Mercator. All other authors declare no competing interests.

## Data sharing

Deidentified participant data can be made available on request by contacting the corresponding author up to 5 years after article publication.

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