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Simulation-Based Learning in Global Health: Insights from LiegeWHO

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Abstract

LiègeWHO is a student-led initiative that offers an immersive simulation of the World Health Assembly (WHA)—the decision-making body of the World Health Organization (WHO)—within the University of Liège. As the first simulation of its kind to be conducted in French and in Belgium, it provides a unique platform for students to engage with global health diplomacy and policymaking. Despite the growing popularity of simulation-based learning, research on their impact remains limited. Few studies have thoroughly examined whether such simulations contribute to deeper learning outcomes, particularly for the development of employable skills. Moreover, Francophone research on this topic is virtually non-existent, highlighting a significant gap in the literature. This study addresses this gap by employing a pre- and post-questionnaire methodology to assess students' motivations, expectations, prior knowledge, and skills before the first francophone WHA simulation, as well as their learning outcomes and skill acquisition afterward. Findings indicate that the LiègeWHO simulation positively influences student learning, fostering knowledge gains and critical professional skills such as collaboration, policy analysis, and diplomatic negotiation. The high satisfaction level of participant, coupled with the substantial gains in knowledge and skills observed, strongly suggests that simulation-based learning could offer an effective pedagogical approach for global health education. Further research is essential to investigate the long-term impact of such simulation initiatives and their role in shaping students' professional trajectories.

Introduction

A Global Legacy of simulations with a Belgian touch

LiègeWHO is a student-led initiative offering an immersive simulation of the World Health Assembly (WHA), the decision-making body of the World Health Organization (WHO), hosted at the University of Liège. Organized by the Department of Public Health Sciences at the Faculty of Medicine, it provides participants with a practical deep dive into the complexities of the international response to global health challenges.

Simulations of international organizations have a long history, with one of the earliest being the Model United Nations (MUN) launched in 1947, just two years after the founding of the United Nations (Kabdesov, 2022; Obendorf & Randerson, 2013). Today, simulation exercises are increasingly popular and have become a "global phenomenon" (Obendorf & Randerson, 2013). A variety of simulation models, such as the Model World Health Organization (Model WHO) (B. L. Wong et al., 2020) and the European World Health Organization simulation (EuWHO)(Fitchett et al., 2013) have been developed to simulate complex scenarios and train future decision-makers in collective action. The WHO itself, in collaboration with the World Federation of United Nations Associations (WFUNA), hosted its first in-person Global Model WHO in October 2024, following an inaugural virtual edition in 2023 (World Federation of United Nations Associations, n.d.).

LiègeWHO draws inspiration from similar initiatives in major cities such as London (LonWHO) and Paris (ParisWHO). It stands out as the first simulation of its kind to be conducted in French and in Belgium, aligning with Belgium's longstanding tradition of democratic simulation exercises, including the *Parlement Jeunesse de la Communauté Française* (PJCF) launched in 1997 and the *Jeugd Parlement Jeunesse* (JPJ) at the federal level since 2008.

The format of these simulation exercises is flexible and can vary depending on the audience, context or the theme (da Vinha, 2021). They can differ significantly, spanning from global conferences hosted by UN associations to brief sessions held in classroom settings (Shahbaz, 2024). For instance, a recent study used an online WHA simulation to analyze the sociotechnical challenges associated with the global implementation of digital vaccine passports in the context of COVID-19 (Godinho et al., 2023). Other simulations, such as the Manipal Model World Health Organization (MMWHO) simulation, focus on specific regional contexts (Godinho et al., 2021). These variations highlight the versatility of simulation-based learning in addressing global health challenges in diverse geographical and professional contexts.

The increasing prevalence of these simulations reflects a broader pedagogical shift towards experiential learning. This shift acknowledges some limitations of traditional teaching methods in preparing students for the complexities of global health and international relations. In the context of health professional education, the Commission on the Education of Health Professionals for the 21st Century underscores the need for substantial reforms in both teaching strategies and institutional frameworks. These reforms should prioritize two key outcomes: transformative learning, which extends beyond conventional informative and formative stages, and interdependence in education, which promotes cross-disciplinary collaboration (Crisp & Chen, 2014).

The Significance of Model UN and WHO Simulations in learning

Model UN and WHO simulations represent innovative pedagogical tools that go beyond traditional classroom learning by immersing students in active, experiential learning environments (Hammond & Albert, 2020; Lateef, 2010). These simulations enable participants to directly engage with complex global issues, offering a dynamic and hands-on approach to learning that closely mirrors real-world policy and diplomatic processes (Lei et al., 2017).

Grounded in Kolb's experiential learning theory (1984) — which posits that knowledge is constructed through a cyclical process of concrete experience, reflective observation, abstract conceptualization, and active experimentation, simulations foster deeper understanding by positioning learners as co-constructors of their own knowledge. Unlike traditional teaching methods, often reliant on passive information intake through textbooks or lectures (Raymond & Usherwood, 2013), simulations like MUN and WHO simulation events require active participation. Participants must collaborate, analyze complex issues, negotiate diverse interests, and solve problems in real-time scenarios. The WHA Simulation has been described as « a ground-breaking experiential learning opportunity for students to apply global health knowledge and skills in a real-world setting. » (World Health Assembly Simulation, 2023), underscoring its pedagogical potential in enhancing both cognitive and interpersonal competencies, as well as long-term knowledge retention.

Beyond content acquisition, these simulations serve dual educational functions: they act as engaging tools for content delivery while also responding to the pedagogical imperatives of modern higher education (Obendorf & Randerson, 2013). By applying theoretical frameworks in realistic and dynamic settings, participants strengthen core competencies such as critical thinking, adaptability, effective communication, negotiation and leadership. This impact is not

confined to political science or international relations; studies show similar benefits across disciplines—ranging from improved communication and teamwork in nursing education (Azzouzi & Gantare, 2024) to enhanced managerial competencies in business programs (Dorta-Afonso et al., 2024).

Far from being simple role-playing exercises, these simulations are carefully structured learning environments that mirror the complexities of international negotiations and policymaking. Their design encourages participants to immerse themselves in real-world scenarios, and help them develop critical thinking, research, and negotiation skills through hands-on experience. As noted by Khalid (2023, p. 23), "This adherence to realism not only enriched the learning experience but also aligned with the National Society for Experiential Education's best practices".

There is growing evidence that simulation-based education can play a significant role in shaping students' professional development (Kerins et al., 2025; Khalid et al., 2023). By placing learners in realistic, high-stakes decision-making scenarios – by "learning by experiencing" (Hammond & Albert, 2020, p. 441), simulations help cultivate the professional mindset and practical competencies essential in today's globalized workforce, particularly in domains such as health diplomacy.

Within the broader landscape of "new diplomacy," growing scholarly attention has been directed to the importance of global health diplomacy (Lee & Smith, 2011). Professor Kickbush aptly emphasizes this evolution, noting: « Global health diplomacy is at the coal-face of global health governance — it is where the compromises are found and the agreements are reached, in multilateral venues, new alliances and in bilateral agreements." (Kickbusch, 2007a) She further notes that the role of the diplomat has evolved: "'No longer do diplomats just talk to other diplomats — they need to interact with the private sector, nongovernmental organizations, scientists, activists and the media, to name but a few, since all these actors are part and parcel of the negotiating process. » (Kickbusch, 2007a)

The growing demand for expertise in global health diplomacy underscores that governments and multilateral organizations can no longer afford to wait decades or even years for their knowledge and capacities to develop (Katz et al., 2011). Modern health diplomacy requires professionals to rapidly acquire diverse competencies across disciplines, as noted by Wong et al., who observe: "Modern health diplomats blend knowledge from a wide range of disciplines and fields beyond their traditional domains […] adapting to the multidisciplinary and interconnected nature of global health challenges. Their roles extend beyond forging alliances and sharing information to include negotiating agreements with a balanced view of national interests and global needs and benefits. This comprehensive, multidimensional approach is critical for successfully navigating complex global health issues and advancing global health objectives."(B. L. H. Wong et al., 2024, p. 2)

Through these simulations, participants understand and embody the multifaceted, collaborative nature of global health governance—gaining not only theoretical insights but also practical competencies that are essential for navigating the complex realities of international relations and health diplomacy.

Experiential Learning and Skill Development

The immersive design of MUN and WHO simulations makes them powerful tools for developing essential skills such as critical thinking, problem-solving, and effective communication skills (Krain & Shadle, 2006; Lei et al., 2017). Students are encouraged to conduct in-depth research, analyze complex information, and formulate evidence-based arguments (Godinho et al., 2021). The structured process of drafting, debating, and negotiating resolutions closely mirrors real diplomatic processes (Krain & Shadle, 2006), sharpening students' ability to build consensus and reach compromises.

In addition to reinforcing analytical skills, these simulations provide opportunities to strengthen highly transferable competencies such as public speaking, negotiation, and conflict resolution (Lei et al., 2017). As emphasized by Lei and colleagues, "With an increasingly integrated and globalizing world, future global health leaders are faced with multifaceted issues that require a skill set in negotiating and forming policies with other global health players" (2017, p. 164). The emphasis on teamwork also nurtures interpersonal communication and fosters the ability to work effectively within diverse, multidisciplinary groups — a key asset in both national and international work settings (World Health Assembly Simulation, 2023).

Fostering Engagement and Participation

Beyond skill acquisition, simulations are particularly effective in fostering student engagement and motivation (Raymond & Usherwood, 2013), two elements closely tied to successful learning outcomes (Perrin, 2014). By taking on the roles of country delegates or organizational representatives, students are not only encouraged to actively participate but also to collaborate across cultural and disciplinary boundaries (Hastrkolu, 2019). Debating and negotiating with peers from diverse backgrounds nurtures intercultural understanding and mutual respect - qualities essential for leadership in global contexts.

Understanding Health Diplomacy through Simulation

Simulations are recognized as an effective pedagogical method in the teaching of international relations, particularly for addressing complex issues such as diplomacy, negotiation, and global governance. Within this framework, WHA simulations are especially valuable for introducing students to the rapidly evolving field of health diplomacy. Nearly two decades ago, experts foresaw the educational shift toward experiential training in global health. As Kickbush (2007b) notes « Academia has begun to shape global health training programmes to inform health professionals through cross-disciplinary didactic and experiential learning. »

Simulations like WHA not only introduce students to the formal architecture of global health institutions but also expose them to the ethical, political, and strategic complexities involved in policy negotiation. As Wong and colleagues argue, "Modern health diplomats blend knowledge from a wide range of disciplines and fields beyond their traditional domains […]. Their roles extend beyond forging alliances and sharing information to include negotiating

agreements with a balanced view of national interests and global needs and benefits”(2024, p. 2). These simulations thus serve as a practical training ground for understanding the real-life stakes and dynamics of global health diplomacy.

Moreover, the evolving landscape of international health governance demands that future professionals interact with a wide array of stakeholders—not only diplomats but also scientists, NGOs, media representatives, activists, and private sector actors. Simulations replicate these multistakeholder dynamics, helping students develop the communication and coordination skills necessary for such environments.

By offering a safe, structured environment for students to engage in these interactions, simulations such as the WHA enable them to apply theoretical knowledge in a concrete way, while also gaining critical insights into international cooperation, negotiation strategies, and policymaking. As Wong et al. affirm, « Experiential learning approaches which incorporate role- playing and real- world scenarios, such as global health diplomacy training programmes and Model WHO Simulations, equip emerging leaders with the practical skills and insights needed for effective health diplomacy in practice. » (2024, p. 3) The authors advocate for the widespread adoption of these educational techniques.

Bridging the Gap: Assessing the Educational Impact of Simulations

Despite their growing popularity, simulations such as MUN or WHA remain surprisingly under-researched in the scientific literature (Hammond & Albert, 2020). There is a lack of comprehensive research on the contribution of role-play simulations to student learning in the context of international negotiation (Schnurr et al., 2014). In contrast, a robust and expanding body of work has emerged in the domain of medical simulation, aiming to optimize the integration of simulation-based methods within healthcare education (Elendu et al., 2024; Lateef, 2010; Motola et al., 2013; Sun et al., 2024). Existing studies on non-clinical simulations are often outdated, largely descriptive in nature, and tend to emphasize content acquisition —particularly in the field of political science— rather than examining the broader pedagogical value of these experiential learning tools. To date, only a few studies have rigorously investigated the outcomes of such approaches in global health education and training (Khalid et al., 2023).

Even when studies adopt a more analytical lens, they frequently concentrate on discipline-specific knowledge outcomes, offering limited insight into the impact of simulations on deeper learning processes such as critical thinking, reflexivity, or the development of transferable skills (Hammond & Albert, 2020). Yet, in an era where higher education is increasingly expected to prepare students for complex, interdisciplinary professional environments, the cultivation of such transversal competencies—like negotiation, teamwork, problem-solving, and adaptability—has become as important as knowledge itself.

Moreover, research on this topic within the Francophone context remains virtually non-existent, underscoring a critical gap in the literature. While much has been written in English-language scholarship, there is a clear need to explore how these simulations function within Francophone educational settings, where linguistic, cultural, and pedagogical dynamics may differ.

This gap further highlights the necessity for a more comprehensive evaluation of simulation-based learning in Francophone contexts, particularly in areas such as global health, diplomacy, and international relations.

In response to this gap, our study adopts a pre- and post-questionnaire design to assess students’ expectations, interests, prior knowledge, and perceived skill development in the context of the LiègeWHO simulation, the first simulation of its kind to be conducted in French and in Belgium. By capturing these dimensions before and after the event, our research aims to go beyond descriptive accounts and offer robust insights into the pedagogical contributions of WHO-style simulations. Ultimately, this study seeks to shed light on how such initiatives can enhance not only academic learning but also the acquisition of essential skills relevant to a wide range of professional domains. Our approach aims to respond to the call by Raymond and Usherwood (Raymond & Usherwood, 2013) for systematic assessments that evaluate whether the specific learning outcomes associated with a simulation exercise have been achieved.

LiègeWHO in Practice

Similar to other Model WHO simulation exercises (Wong et al., 2020), LiègeWHO recreates the procedures of the WHA, the decision-making body of the WHO. Participating students were assigned specific roles (such as representatives of a Member State, a non-governmental organization, the media, etc.), which they must defend, along with their respective positions and interests. Member State representatives engage in discussions and negotiations over policy documents. During plenary sessions, all Member State representatives came together, formulated political stances, expressed their opinions with conviction, proposed amendments, and build strategic alliances, while non-state actors play an influential role. To ensure a well-informed and immersive experience, participants were encouraged to thoroughly research their assigned roles and draft a position paper in advance. This essential step enables them to fully embody their role and engage in meaningful, strategic debate.

The first edition of LiègeWHO, focused on the theme *'One Planet, One Health: Promoting Social Equity in the Face of Climate Change*,' took place from April 12 to 14, 2024, on the University of Liege campus. The event brought together 24 participating students, 10 organizing students, and 10 experts. The student participants represented a range of academic disciplines – including medicine, public health, pharmacy, political science and law - and were at different stages of their academic journey, including bachelor's, master's, doctoral, certificate, and Erasmus programs.

The experts—researchers and leading figures in their respective fields—played a pivotal role by sharing their knowledge and experience. Through lectures, interactive workshops, and direct exchanges with delegates, they anchored the debates in rigorous scientific and professional perspectives. Their contribution not only enriched the negotiation process but also provided students with a rare opportunity to engage with recognized specialists and to link their academic learning to real-world challenges. During the simulation, the experts delivered concise presentations highlighting the findings of their

research, followed by Q&A sessions that encouraged direct dialogue and critical questioning. This expert involvement equipped participants with additional evidence-based insights, thereby deepening their understanding of the complex intersections between health, climate change and social equity.

Methods

This study relies on a quantitative approach, using anonymous online pre- and post-simulation questionnaires to assess the impact of the LiègeWHO simulation on students' knowledge acquisition, skills development and overall learning experience. The use of time-sensitive instruments, such as those administered before and after the event, is recognized as an effective method for assessing self-reported learning outcomes and has been applied in similar studies (Schnurr et al., 2014). The pre-questionnaire was shared a few days before the event to allow participants time to complete it, while the post-event questionnaire made available immediately after the event. In total, 24 students completed the pre-event questionnaire, and 19 participants filled out the post-event questionnaire.

Both questionnaires combined multiple-choice and Likert-scale items to measure changes in participants' perceptions and competencies. Descriptive statistics, such as frequencies and percentages, were used to summarize the results and identify trends in learning outcomes.

The pre-simulation questionnaire gathered baseline data on participants' existing knowledge and skills across several key areas relevant to the simulation's themes. This initial assessment serves as a reference point for evaluating the learning gains. Specifically, it explored participants' familiarity with topics such as climate change adaptation and mitigation, the health impacts of climate change, global health, health diplomacy, health equity, international climate agreements, negotiation processes, and global health governance. In addition to knowledge, the pre-simulation questionnaire assessed participants' self-reported competencies in public speaking, teamwork, critical argumentation, and policy writing. These skill assessments enabled a comprehensive evaluation of how the simulation influenced both knowledge acquisition and skill development.

The post-simulation questionnaire, administered immediately after the last plenary session, aimed to measure the extent of learning and development resulting from the simulation. By comparing post-simulation responses with pre-simulation data, the study assessed changes in both content knowledge and perceived skill proficiency. Special attention was given to shifts in familiarity with the key concepts assessed in the pre-simulation questionnaire.

The analysis covered participant demographics, initial interest and expectations, baseline knowledge and skills, post-simulation outcomes, reported skill development, and overall participant satisfaction.

Results

Participant Characteristics

A total of 24 students participated in the first edition of LiegeWHO, with 15 (62.5%) female participants and 9 (37.5%) male participants (Table 1). Participants were primarily aged between 25 and 34 years (50.0%), with equal representation from the 18–24 and 35 + age groups (25.0% each). Most attendees were students at the University of Liège (83.3%). In terms of faculty affiliation, participants were predominantly from the Faculty of Medicine (79.2%), with smaller numbers from the Faculties of Science (4.2%), Law, Political Science and Criminology (8.4%), and other faculties (8.4%). Regarding the educational level, two-thirds of participants (66.7%) were Master's students. The remainder were distributed across Bachelor's programs (4.2%), Doctoral studies (16.7%), and certificates and other programs (12.5%).

Table 1
Characteristics of Participants in the First Edition of LiègeWHO
(N = 24)

Gender, *n* (%)	
Male	9 (37.5%)
Female	15 (62.5%)
Age, n (%)	
18–24 years	6 (25.0%)
25–34 years	12 (50.0%)
35 and over	6 (25.5%)
Affiliation to ULiège, n (%)	
ULiège student	20 (83.3%)
Non-ULiège student	4 (16.7%)
Faculty affiliation, n (%)	
Faculty of Medicine	19 (79.2%)
Faculty of Science	1 (4.2%)
Faculty of Law, Political Science and Criminology	2 (8.3%)
Other	2 (8.3%)
Current Level of Study, n (%)	
Undergraduate (Bachelor's)	1 (4.2%)
Graduate (Master's)	16 (66.7%)
Doctoral (PhD)	4 (16.7%)
Other (Certificates, etc.)	3 (12.5%)

Pre-Simulation Interest and Expectations

As shown in Table 2, participants entered the simulation with strong interest in global health and climate-related challenges. The most frequently cited topics of interest reflected broad concern for the systemic and social dimensions of planetary health. Specifically, 79.2% of participants indicated a keen interest in the interconnectedness between climate change and public health. Social equity and access to care were also major areas of focus, with 62.5% of participants highlighting this theme, followed by health systems resilience (50.0%), suggesting that participants were attuned not only to environmental determinants but also to structural and social vulnerabilities within health systems.

Expectations for the event reflected a desire for both knowledge acquisition and experience learning. A significant majority (75.0%) expressed a specific interest in exploring the role of health diplomacy in the context of climate change —pointing to participants' curiosity about the political and strategic dimensions of global health governance. Additionally, 70.8% hoped to deepen their understanding of the links between climate change and health, while 62.5% aimed to learn about concrete strategies to mitigate climate-related health risks.

Beyond thematic content, many participants anticipated a dynamic and engaging learning experience. Two-thirds (66.7%) expected an immersive environment, while 50.0% looked forward to in-depth exploration of the topics addressed by guest speakers. Furthermore, over half (54.2%) hoped to use the event as an opportunity to network with professionals and peers, underscoring the importance of networking as a perceived added value of participation.

When asked about the anticipated impact of the simulation, 66.7% of participants expected it would significantly enhance their understanding of health diplomacy. Similarly, 62.5% foresaw strong gains in their knowledge of health issues linked to climate change. These responses suggest that participants entered the simulation with clear expectations for both cognitive development and skill-building in policy-relevant areas.

Table 2

Interest in LiègeWHO and expectations related to participation (N = 24)

Interest in topics related to the subthemes of the « One Planet, One Health » simulation theme, *n* (%)	
Climate change and public health	19 (79.2%)
Eco-health	10 (41.7%)
Livestock and antibiotic resistance in animals	5 (20.8%)
Social equity and access to care	15 (62.5%)
Nutrition and agriculture in the context of climate change	9 (37.5%)
Health systems resilience	12 (50.0%)
Zoonoses and epidemics	9 (37.5%)
Main expectations related to participation in LiègeWHO, n (%)	
A better understanding of the links between climate change and health	17 (70.8%)
Greater knowledge of strategies for mitigating health risks related to climate change	15 (62.5%)
Exploration of the role of health diplomacy in combating the effects of climate change	18 (75.0%)
Exploration of one or more themes addressed by the speakers	12 (50.0%)
An immersive experience	16 (66.7%)
Networking with professionals/students in fields related	13 (54.2%)
Expectations regarding the effect of participation in Liège WHO on understanding health diplomacy, n (%)	
Strong	16 (66.7%)
Moderate	5 (20.8%)
Slight	2 (8.3%)
NA	1 (4.2%)
Expectations regarding the effect of participation in Liège WHO on understanding health issues in the context of climate change, n (%)	
Strong	15 (62.5%)
Moderate	8 (33.3%)
Slight	1 (4.2%)

Pre-Simulation Familiarity with key concepts

Prior to participating in LiègeWHO, participants demonstrated varying levels of familiarity with key concepts related to climate change and global health (Table 3). Most respondents reported a general awareness of foundational topics such as climate change adaptation (54.2%), mitigation (62.5%), and the health consequences of climate change (58.3%). However, relatively few participants described themselves as very familiar with these topics—only 16.7% for adaptation, 4.2% for mitigation, and 25.0% for climate-related health impacts. This indicates that although these core topics were widely recognized, in-depth expertise or advanced understanding remained limited among most participants. Similarly, while global health as a general theme was familiar to half of the group (50.0%), only 16.7% considered themselves very familiar with the field.

In contrast, familiarity with more specialized and policy-oriented concepts was notably lower. For instance, only 25.0% of participants reported being familiar with health diplomacy, while a majority (58.3%) were only slightly familiar, and 16.7% had no prior exposure to the concept. The concept of global health governance was similarly under-recognized, with just 12.5% of participants describing themselves as very familiar and 29.2% as familiar. One-third (33.3%) were only slightly familiar, and 20.8% reported no familiarity at all.

Knowledge of social equity was somewhat stronger: 20.8% were very familiar and 58.3% familiar, suggesting that participants were relatively more exposed to the ethical dimensions of health, even if the policy implications were less well understood.

When asked about international mechanisms and political processes, such as International Climate Agreements and Treaties, 41.7% of participants reported being familiar, while a significant proportion (33.3%) were only slightly familiar and 25.0% had no familiarity. Similarly, familiarity with international negotiations was limited, with only 8.3% indicating very familiar, and 25.0% reporting no exposure to these processes at all.

Table 3
Initial Familiarity (Prior to Participation in LiègeWHO) (N = 24)

	Very familiar	Familiar	Slightly familiar	Not familiar	NA
Initial familiarity with, n (%)					
Climate change adaptation	4 (16.7%)	13 (54.2%)	7 (29.2%)	0 (0.0%)	-
Climate change mitigation	1 (4.2%)	15 (62.5%)	7 (29.2%)	1 (4.2%)	-
The health consequences of climate change	6 (25.0%)	14 (58.3%)	4 (16.7%)	0 (0.0%)	-
Global health	4 (16.7%)	12 (50.0%)	7 (29.2%)	1 (4.2%)	-
Health diplomacy	0 (0.0%)	6 (25.0%)	14 (58.3%)	4 (16.7%)	-
Social equity	5 (20.8%)	14 (58.3%)	5 (20.8%)	0 (0.0%)	-
International Climate Agreements and Treaties	0 (0.0%)	10 (41.7%)	8 (33.3%)	6 (25.0%)	-
International negotiations	2 (8.3%)	9 (37.5%)	6 (25.0%)	6 (25.0%)	1 (4.2%)
Global health governance	3 (12.5%)	7 (29.2%)	8 (33.3%)	5 (20.8%)	1 (4.2%)

Pre-Simulation Knowledge and Capacities

As illustrated in Table 4, participants entered the LiègeWHO simulation with diverse levels of prior knowledge and competencies related to global health diplomacy, climate change, and core advocacy skills. These differences highlight both the potential and the learning needs within the group.

Knowledge of Climate-Health Linkages and Health Diplomacy

Participants' self-assessed knowledge of the links between climate change and health showed a wide distribution. While 41.7% rated their knowledge as medium, indicating a moderate understanding of the topic, one-third of the participants reported high (25.0%) or very high (8.3%) knowledge levels—suggesting a more advanced grasp for some. However, 25.0% rated their knowledge as either low (16.7%) or very low (8.3%), highlighting a significant knowledge gap for roughly a quarter of participants prior to the event.

Familiarity with the concept of health diplomacy in the context of climate change was even more uneven. Half of the participants (50.0%) described their understanding as medium, while only 16.7% and 4.2% rated it as high or very high, respectively. On the other hand, 16.7% of participants indicated low knowledge, 8.3% very low, and 4.2% reported no knowledge at all—revealing that for a substantial portion of attendees, health diplomacy was a relatively unfamiliar and abstract concept at the outset.

Capacities in Policy, Negotiation, and Advocacy

Participants' self-perceived prior abilities in essential simulation tasks such as policy writing, negotiation, and communication also varied significantly. In policy position paper writing, 25.0% of participants rated their capacity as low, while 20.8% reported having no experience. A small proportion (4.2%) rated their ability as very high. This indicates a significant gap in skills in this crucial area of policymaking.

Prior negotiation and debate skills also showed variation among attendees. While 25.0% of participants assessed their capacity as high, 29.2% rated their skills as low, highlighting a mixed level of proficiency in these areas. Similarly, public speaking abilities were distributed across the spectrum, with 29.2% of participants rating themselves as having medium skills, while an equal percentage (29.2%) felt their abilities were low. This suggests that while some participants possessed moderate speaking skills, others faced challenges in public communication.

Collaboration and Critical Thinking

In contrast to the gaps noted above, participants demonstrated stronger capacities in teamwork and reasoning. relatively strong capacities in teamwork and critical reasoning. Collaborative skills were particularly well-developed, with 33.3% rating themselves very high and 37.5% high, while only 4.2% (one respondent) reported low collaborative capacity. None indicated very low or no ability in this domain, suggesting that most participants were comfortable working in teams.

Critical thinking and the ability to construct reasoned arguments were somewhat less advanced but still notable: 41.7% reported medium ability, and 29.1% rated themselves high or very high, while 20.8% indicated low capacity and 8.4% very low or no experience.

The ability to write and draft health policy resolutions appeared to be one of the less developed skills among participants. Only one-third (33.3%) reported medium ability, another third assessed their skills as low, and 16.6% reported very low or no experience. This clearly identifies a key area for skill-building, particularly in formal health policy development.

Table 4
Initial Knowledge and Capacities (Prior to Participation in LiègeWHO) (N = 24)

	Very high	High	Medium	Low	Very low	None
Initial knowledge of, n (%)						
The link between climate change and health	2 (8.3%)	6 (25.0%)	10 (41.7%)	4 (16.7%)	2 (8.3%)	0 (0.0%)
The importance of health diplomacy in response to climate change	1 (4.2%)	4 (16.7%)	12 (50.0%)	4 (16.7%)	2 (8.3%)	1 (4.2%)
Initial capacity to, n (%)						
Write policy position paper	1 (4.2%)	4 (16.7%)	4 (16.7%)	6 (25.0%)	4 (16.7%)	5 (20.8%)
Conduct negotiations and participate in debates	0 (0.0%)	6 (25.0%)	5 (20.8%)	7 (29.2%)	4 (16.7%)	2 (8.3%)
Public speaking	1 (4.2%)	6 (25.0%)	7 (29.2%)	7 (29.2%)	3 (12.5%)	0 (0.0%)
Work collaboratively	8 (33.3%)	9 (37.5%)	6 (25.0%)	1 (4.2%)	0 (0.0%)	0 (0.0%)
Build a critical argument	2 (8.3%)	5 (20.8%)	10 (41.7%)	5 (20.8%)	1 (4.2%)	1 (4.2%)
Write and/or draft health policy resolution	0 (0.0%)	4 (16.7%)	8 (33.3%)	8 (33.3%)	2 (8.3%)	2 (8.3%)

Post-Simulation Takeaways

The LiègeWHO simulation produced highly positive outcomes, as reflected in both participant satisfaction and self-reported learning gains across a range of domains. Overall, the event was widely perceived as a valuable learning experience that supported the acquisition of knowledge, skill development, and professional insight.

Participant Satisfaction and Event Quality

Participants expressed strong satisfaction with the simulation. The overall satisfaction score averaged 8.2 out of 10 (± 1.2), indicating a very positive experience. Satisfaction with speakers and presentations was even higher, with a mean rating of 8.9 (± 1.0), underscoring the perceived quality, relevance, and expertise of the contributors. In comparison, satisfaction with event organization and logistics, while still favorable, was slightly lower at 7.8 (± 1.5). This suggests that while the content and format were highly appreciated, there may be opportunities for improvement in logistical aspects such as scheduling, venue setup, or materials distribution. (Table 5).

Alignment with Expectations

The simulation effectively met participant expectations. A substantial majority of respondents (15 out of 19, or 78.9%) indicated that LiègeWHO met their expectations strongly, while the remaining 21.1% expressed moderate alignment. This high level of satisfaction points to the simulation's effectiveness in achieving its stated educational objectives and delivering an engaging and meaningful experience.

Knowledge Gains and Conceptual Understanding

Participants reported substantial knowledge gains in several core areas related to the simulation's theme—climate change and health diplomacy. A large proportion of attendees (14 out of 19, or 73.7%) reported a better understanding of the links between climate change and health. Similarly, 13 participants (68.4%) noted they had acquired greater knowledge of health risk mitigation strategies in the context of climate change.

The concept of health diplomacy—a central theme of the simulation—also resonated strongly with participants. Fifteen respondents (78.9%) cited this as a key takeaway, indicating the effectiveness of the simulation in demystifying the role of diplomacy in global health negotiations. Additionally, 89.4% of participants identified one or more of the topics covered by speakers as particularly engaging or impactful.

Immersion, Engagement, and Networking Opportunities

The simulation's immersive and social dimensions were also positively rated. 68.4% of participants described the event as immersive, while 57.9% appreciated the opportunity to network with other students and professionals. These results affirm that the LiègeWHO experience goes beyond knowledge acquisition, fostering engagement, collaboration, and the development of interpersonal competencies essential for global health practice.

Effects on Thematic Understanding

Regarding specific learning impacts, the simulation strongly enhanced participants' understanding of key themes. 68.4% of participants reported that the simulation had a strong effect on their understanding of health diplomacy, with an additional 15.8% reporting a moderate effect. The perceived impact on understanding health issues in the context of climate change was also high: 63.1% of participants described a strong effect, while 31.6% cited a moderate effect. Only one participant indicated no impact in this area. These results demonstrate that the simulation effectively raised awareness, deepened understanding, and helped participants connect conceptual knowledge with practical applications in global health.

Table 5
Satisfaction and Responses to Expectations Related to Participation in LiègeWHO (N = 19)

Overall satisfaction with the event (/10), mean (SD)	
8.2 ± 1.2	
Overall satisfaction with speakers and presentations (/10), mean (SD)	
8.9 ± 1	
Overall satisfaction with organization and logistics (/10) mean (SD)	
7.8 ± 1.5	
Perception that LiègeWHO met participants' expectations, n (%)	
Strongly	15 (78.9%)
Moderately	4 (21.1%)
Main takeaways from the event for students, n (%)	
A better understanding of the links between climate change and health	14 (73.7%)
Greater knowledge of health risk mitigation strategies related to climate change	13 (68.4%)
Exploration of the role of health diplomacy in addressing the effects of climate change	15 (78.9%)
Exploration of one or more topics covered by the speakers	17 (89.4%)
An immersive experience	13 (68.4%)
Networking with professionals/students in related fields	11 (57.9%)
Effect of participation in LiègeWHO on understanding health diplomacy, n (%)	
Strong	13 (68.4%)
Moderate	3 (15.8%)
Slight	3 (15.8%)
Effect of participation in LiègeWHO on understanding health issues in the context of climate change, n (%)	
Strong	12 (63.1%)
Moderate	6 (31.6%)
Slight	0 (0.0%)
None	1 (5.3%)

Post-Simulation Familiarity with key concepts

Participation in the LiègeWHO simulation was associated with notable improvements in participants' familiarity with core concepts at the intersection of climate change and health (Table 6). Overall, the data indicate that the simulation effectively conveyed foundational knowledge while also highlighting areas for further emphasis in future editions.

Table 6
Final Familiarity (Post-Participation in LiègeWHO) (N = 24)*

	Very familiar	Familiar	Slightly familiar	Not familiar	NA
Final familiarity with, n (%)					
Climate change adaptation	**6 (31.5%)**	**12 (63.2%)**	1 (5.3%)	0 (0.0%)	-
Climate change mitigation	**5 (26.3%)**	14 (73.7%)	0 (0.0%)	0 (0.0%)	-
The health consequences of climate change	**9 (47.4%)**	10 (52.6%)	0 (0.0%)	0 (0.0%)	-
Global health	**8 (42.1%)**	**11 (57.9%)**	0 (0.0%)	0 (0.0%)	-
Health diplomacy	**2 (10.5%)**	**15 (78.9%)**	2 (10.5%)	0 (0.0%)	-
Social equity	**6 (31.6%)**	**11 (57.9%)**	2 (10.5%)	0 (0.0%)	-
International Climate Agreements and Treaties	**1 (5.3%)**	**12 (63.2%)**	5 (23.6%)	1 (5.3%)	-
International negotiations	**3 (15.8%)**	**12 (63.2%)**	4 (21.0%)	0 (0.0%)	0 (0.0%)
Global health governance	**3 (15.8%)**	**11 (57.9%)**	4 (21.0%)	1 (5.3%)	0 (0.0%)

*For presentation purposes, data that increased between the pre-questionnaire and post-questionnaire are highlighted in bold, while data that decreased are underlined.

By the end of the simulation, participants demonstrated particularly strong familiarity with climate change adaptation. Overall, 94.7% indicated they were either very familiar (31.5%) or familiar (63.2%) with the concept, underscoring the effectiveness of the simulation in conveying both the importance and the operational mechanisms of adaptive responses within health systems. Knowledge of climate change mitigation was similarly robust. While a smaller proportion (26.3%) rated themselves as very familiar, the remaining 73.7% reported being familiar, reflecting a consistent baseline understanding of measures aimed at reducing emissions and slowing global warming.

Participants also demonstrated substantial knowledge of the health consequences of climate change, which constituted a central focus of the simulation. Nearly half (47.4%) reported being very familiar with this issue, while the remainder (52.6%) indicated they were familiar. This unanimous level of familiarity highlights the simulation's success in emphasizing the critical links between climate and public health. Global health was also well understood, with 42.1% of participants rating themselves as very familiar and 57.9% as familiar, suggesting that this concept was effectively communicated and well retained.

Although health diplomacy was initially less well known, the simulation appears to have significantly enhanced participants' awareness. By the end of the event, 78.9% reported being familiar with the concept and 10.5% very familiar, indicating that the simulation provided a valuable introduction to this increasingly important domain of global health governance.

Other related topics, such as social equity and international climate agreements, also showed encouraging levels of familiarity, though with more variability. Regarding social equity, 31.6% of participants described themselves as very familiar, 57.9% as familiar, and 10.5% as slightly familiar, suggesting that while the theme resonated with most participants, it may benefit from greater emphasis in future editions. Familiarity with international climate agreements and treaties was somewhat less developed: only one participant (5.3%) reported being very familiar, 63.2% familiar, 23.6% slightly familiar, and one participant not familiar. These findings suggest that, although the simulation introduced participants to institutional mechanisms for climate action, deeper engagement would be necessary to ensure a stronger grasp of these complex frameworks.

Comparable patterns were observed in participants' familiarity with international negotiations and global health governance. The majority reported being familiar with both topics (63.2% and 57.9%, respectively), while smaller proportions considered themselves very familiar (15.8% for both). Several respondents indicated being only slightly familiar or not familiar. These results suggest that, while the simulation successfully raised awareness of institutional and procedural dynamics, additional preparatory materials or targeted activities may help strengthen participants' understanding of the diplomatic dimensions of global health policy.

Post-Simulation Knowledge and Capacities

As summarized in Table 7, the LiègeWHO simulation had a positive effect on participants' knowledge and capacities, particularly in relation to climate-health linkages, health diplomacy, and key professional skills.

Knowledge of Climate-Health Linkages and Health Diplomacy

The simulation strongly enhanced participants' understanding of the intersection between climate change and public health. Following the event, 94.7% reported their knowledge of climate–health linkages as either high (73.7%) or very high (21.0%). These results confirm the simulation's effectiveness in raising awareness of the health consequences of environmental change and promoting a systems-level understanding of this complex relationship.

Participants also reported a meaningful increase in their understanding of the role of health diplomacy in addressing climate-related health challenges. Although only 10.5% rated their knowledge as very high, the majority indicated high (68.4%) or medium (15.8%) levels. Only one participant selected low. These outcomes suggest that, while health diplomacy may have been less familiar prior to the simulation, it was effectively introduced and contextualized during the event.

Capacities in Policy, Negotiation, and Advocacy

Beyond knowledge, the simulation also strengthened participants' practical skills in areas central to global health governance. Regarding policy position paper writing, 10.5% of participants rated their ability as very high, 36.9% as high, and 42.1% as medium. Only two participants reported low confidence, suggesting that most gained sufficient tools and experience to draft policy-oriented texts effectively.

In terms of negotiation and debate, 10.5% rated themselves as very highly capable, 47.4% as high, and 31.6% as medium. Two participants (10.5%) reported low capacity. These findings indicate that the simulation provided a conducive environment for developing key diplomatic skills, including persuasive communication, strategic thinking, and compromise-building.

Public speaking also emerged as an area of growth. Over half of participants (52.7%) rated their confidence as high or very high, while 42.1% reported medium levels. Only one participant indicated low ability, underscoring the simulation's supportive atmosphere for practicing presentation and speaking skills in front of peers.

Writing health policy resolutions—a central element of the simulation—was rated high by 63.2% of participants and very high by 5.3%. A smaller share (15.8%) reported medium or low capacity, suggesting some variability in comfort with this more technical task. Overall, however, participants left with greater confidence in contributing to policy formulation processes.

Collaboration and Critical Thinking

Collaboration was consistently identified as one of the strongest skills developed. All participants rated their capacity as either high (68.4%) or very high (31.6%), confirming the simulation's effectiveness in fostering teamwork, collective problem-solving, and peer learning.

Critical thinking and argumentation also showed notable improvement. A combined 52.7% rated themselves as high or very high in this area, while 42.1% reported medium levels and only one participant indicated low. These results highlight the simulation's value in providing opportunities for analytical reasoning, structured debate, and evidence-based communication.

Taken together, these self-reported outcomes illustrate that the LiègeWHO simulation not only enhanced theoretical knowledge, but also significantly contributed to the development of real-world skills in policy writing, public speaking, negotiation, collaboration, and critical thinking. The experience appears to have empowered participants to engage more confidently with the challenges of global health diplomacy and climate-related decision-making.

Table 7
Final Knowledge and Capacities (Post-Participation in LiègeWHO) (N = 24)*

	Very high	High	Medium	Low	Very low	None
Final knowledge of, n (%)						
The link between climate change and health	**4 (21.0%)**	**14 (73.7%)**	1 (5.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
The importance of health diplomacy in response to climate change	**2 (10.5%)**	**13 (68.4%)**	3 (15.8%)	1 (5.3%)	0 (0.0%)	0 (0.0%)
Final capacity to, n (%)						
Write policy position paper	**2 (10.5%)**	**7 (36.9%)**	**8 (42.1%)**	1 (5.3%)	1 (5.3%)	0 (0.0%)
Conduct negotiations and participate in debates	**2 (10.5%)**	**9 (47.4%)**	**6 (31.6%)**	2 (10.5%)	0 (0.0%)	0 (0.0%)
Public speaking	**3 (15.8%)**	**7 (36.9%)**	**8 (42.1%)**	1 (5.3%)	0 (0.0%)	0 (0.0%)
Work collaboratively	6 (31.6%)	**13 (68.4%)**	0.0 (0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Build a critical argument	**1 (5.3%)**	**9 (47.4%)**	**8 (42.1%)**	1 (5.3%)	0 (0.0%)	0 (0.0%)
Write and/or draft health policy resolution	**1 (5.3%)**	**12 (63.2%)**	3 (15.8%)	3 (15.8%)	0 (0.0%)	0 (0.0%)

*For presentation purposes, data that increased between the pre-questionnaire and post-questionnaire are highlighted in bold, while data that decreased are underlined.

Comparison of Pre-Simulation Expectations and Post-Simulation Takeaways

Participants entered the LiègeWHO simulation with clear expectations and strong interest in global health and climate-related challenges. As shown in Table 2, the majority were particularly focused on the interconnectedness between climate change and public health (79.2%), with additional interest in themes such as social equity (62.5%), health systems resilience (50.0%), and health diplomacy (75.0%). These expectations suggested a desire not only for knowledge acquisition but also for experiential learning, with a significant proportion hoping for an immersive environment (66.7%) and opportunities for networking (54.2%).

Post-simulation feedback, as reflected in Table 5, reveals that these expectations were largely met. The event was rated highly, with a satisfaction score of 8.2 out of 10, and 78.9% of participants felt that their expectations were strongly met. Specifically, participants reported significant knowledge gains in the areas of climate change and health diplomacy. A large majority (73.7%) noted a better understanding of the links between climate change and health, while 68.4% gained a greater knowledge of health risk mitigation strategies. Notably, health diplomacy, a central theme of the simulation, resonated strongly with participants, with 78.9% citing it as a key takeaway.

The simulation's immersive format and networking opportunities were also well-received, with 68.4% describing the experience as immersive, and 57.9% appreciating the chance to connect with peers and professionals. These results suggest that the event succeeded in offering both intellectual and social engagement, fulfilling participants' expectations for a dynamic learning environment.

In terms of thematic understanding, the simulation had a strong impact. Participants reported a significant increase in their comprehension of health diplomacy (68.4%) and health issues in the context of climate change (63.1%). These outcomes indicate that the simulation not only met participants' knowledge expectations but also enhanced their understanding of complex, interdisciplinary topics, highlighting its success as a pedagogical tool.

Overall, the LiègeWHO simulation effectively aligned with pre-simulation expectations, providing participants with both the knowledge and skills they anticipated, while also fostering engagement and networking opportunities crucial for professional development in global health.

Comparison of Pre- and Post-Simulation Familiarity with Key Concepts

The comparison between pre- and post-simulation familiarity with key concepts highlights substantial improvements across various topics related to climate change and global health (see Table 3 and Table 6).

Before the simulation, participants demonstrated varying levels of familiarity with key concepts. For example, while a majority were familiar with the general ideas of climate change adaptation (54.2%) and mitigation (62.5%), only a small proportion considered themselves "very familiar" with these concepts

(16.7% for adaptation, 4.2% for mitigation). In contrast, after the simulation, the familiarity with these topics increased significantly. By the end of the event, 94.7% of participants reported being either “very familiar” (31.5%) or “familiar” (63.2%) with climate change adaptation, and 100% were either “very familiar” (26.3%) or “familiar” (73.7%) with mitigation. This suggests that the simulation was particularly effective in enhancing understanding of these critical concepts.

Similarly, familiarity with the health consequences of climate change also showed considerable improvement, with 47.4% of participants indicating they were "very familiar" with the topic post-simulation, compared to only 25.0% pre-simulation. The understanding of global health, another central theme of the simulation, also increased, with 42.1% of participants rating themselves as “very familiar” post-simulation, up from 16.7% beforehand.

Familiarity with more specialized concepts like health diplomacy, social equity, international climate agreements, and international negotiations also saw notable improvements. Health diplomacy, which only 25.0% of participants were familiar with before the simulation, saw a significant jump, with 78.9% reporting being “familiar” and 10.5% “very familiar” after the event. While participants were somewhat familiar with social equity (58.3%), 31.6% rated themselves as “very familiar” post-simulation, indicating a stronger understanding of this important aspect of global health.

Familiarity with international climate agreements and negotiations also improved, though with more variability. While the proportion of participants reporting familiarity with international climate agreements increased from 41.7% to 63.2%, fewer participants felt “very familiar” (5.3%), suggesting that deeper engagement may be needed for a more comprehensive understanding. Similarly, familiarity with international negotiations rose, with 63.2% of participants considering themselves “familiar” post-simulation.

Overall, the results demonstrate that LiègeWHO significantly increased participants' understanding of key concepts related to climate change and global health. While improvements were especially notable in core topics such as adaptation, mitigation, and health consequences of climate change, specialized areas like health diplomacy and global health governance also showed meaningful growth in familiarity, although these topics may benefit from further focus in future simulations.

Comparison of Pre- and Post-Simulation Knowledge and Capacities

Participants entered the LiègeWHO simulation with broad expectations of deepening their knowledge and enhancing their skills in global health, particularly regarding the intersection of climate change and health. They sought to understand the role of health diplomacy in mitigating climate-related health risks and to explore the complexities of climate-health linkages. Prior to the simulation, most participants rated their knowledge of these topics as moderate, with a significant portion expressing a desire to build a stronger understanding of the subject matter and refine key professional skills. For instance, 75% of participants anticipated gaining insights into health diplomacy's role in addressing climate change, and 70.8% hoped to better grasp the links between climate change and health.

By the end of the simulation, these expectations were largely met. A remarkable 94.7% of participants reported a high or very high understanding of the connection between climate change and health, a dramatic increase from the initial ratings, where only one-third of participants felt similarly confident. Similarly, 78.9% now recognized the critical role of health diplomacy in climate-related health challenges, showcasing the effectiveness of the simulation in promoting both theoretical understanding and practical application.

Participants also reported substantial improvements in their skills. The ability to write policy position papers saw a significant increase, with 47.4% rating their capacity as high or very high, compared to just 20.8% prior to the event. In negotiations, 57.9% of participants felt they had enhanced their abilities, while in public speaking, 52.7% reported gaining confidence. Furthermore, the simulation helped participants develop greater competency in writing health policy resolutions, with 68.4% indicating they now felt highly capable in this area. Collaboration also emerged as a major strength, with all participants reporting high or very high confidence in their teamwork abilities.

In conclusion, the LiègeWHO simulation not only met but exceeded participants’ expectations, providing them with a robust understanding of climate-health linkages and health diplomacy while equipping them with essential skills in policy-making, negotiation, public speaking, and collaboration. The experience significantly enhanced their preparedness for future challenges in global health governance and diplomacy, leaving them more confident and ready to contribute meaningfully to the field.

Discussion

Pedagogical Value of Simulation-Based Learning

The first edition of LiègeWHO underscores the pedagogical potential of simulation-based learning in global health education, particularly for addressing complex, interdisciplinary issues such as climate change and health diplomacy. Consistent with prior research, the simulation demonstrated that experiential approaches not only enhance theoretical knowledge but also cultivate essential practical skills, making them a valuable complement to traditional teaching methods (Hammond & Albert, 2020; Kabdesov, 2022; Khalid et al., 2023; Lateef, 2010).

By immersing participants in realistic problem-solving scenarios, LiègeWHO fostered the development of both cognitive and applied competencies that are crucial for navigating the challenges of global health governance. On the cognitive level, participants strengthened their capacity for critical thinking, data analysis, and evidence-based decision-making. At the same time, the simulation promoted applied competencies—including communication, negotiation, and leadership—needed to translate knowledge into action and implement effective health policies.

This dual focus on knowledge acquisition and skill development underscores the distinctive contribution of simulation-based learning to global health education as also observed by Khalid and colleagues (2023). By creating an interactive environment that bridges theory and practice, LiègeWHO prepares future global health leaders to engage with multifaceted problems and to develop innovative, context-sensitive solutions to pressing health challenges.

Alignment with Expectations and Thematic Relevance

The LiègeWHO simulation attracted participants who already exhibited a strong interest in global health issues, particularly climate change, health equity, and health systems resilience. This pre-existing commitment suggests that simulations serve as valuable platforms for channeling participant motivation and deepening engagement with these topics. Indeed, the majority of participants reported that their expectations were strongly met (78.9%), especially in relation to climate change–health linkages and health diplomacy. These results echo findings by Katz et al. (2011) and Lee & Smith (2011), who emphasized the importance of providing immersive experiences that allow students to deepen their understanding of global health challenges. This alignment between participant expectations and the simulation's content also underscores the importance of carefully designing educational experiences that cater to the specific interests and needs of the target audience. When participants feel that their expectations are being met, they are more likely to be engaged, motivated, and receptive to learning, leading to more effective and impactful educational outcomes.

The effective integration of thematic areas such as climate change and diplomacy also illustrates the capacity of simulations to foster interdisciplinary learning. Global health challenges rarely fall within the boundaries of a single discipline; rather, they demand holistic approaches that draw on insights from medicine, public health, political science, law, economics, and environmental science. Simulations, by their very nature, provide an interactive platform where these connections become visible, allowing participants to appreciate how diverse perspectives converge to address complex health issues.

Knowledge Gains and Familiarity with Key Concepts

The study highlights substantial improvements in participants' familiarity with concepts such as climate change adaptation, mitigation, and health diplomacy. By actively engaging in the simulation, participants moved beyond passive knowledge acquisition toward a more enduring, applied understanding of global health issues. These findings are consistent with other studies demonstrating the effectiveness of simulations in promoting comprehension of multifaceted topics (Giovanello et al., 2013; Shellman & Kürşad, 2006). The versatility of simulations in improving understanding across diverse subject areas reinforces their role as an effective and adaptable tool for global health education.

A particularly striking outcome was the increase in participants' familiarity with climate change adaptation and mitigation strategies: 94.7% reported high or very high familiarity post-simulation, compared with only 16.7% before the event. Similarly, health diplomacy—initially less familiar to most participants—saw substantial gains, with nearly 80% reporting increased understanding by the conclusion of the exercise. This is especially noteworthy given that health diplomacy remains underrepresented in most global health curricula (Lee & Smith, 2011).

Together, these findings highlight the power of experiential learning to enhance both familiarity and deeper knowledge of complex, interdisciplinary issues that are often difficult to convey through traditional teaching methods.

Skill Development and Applied Competencies

Beyond knowledge acquisition, the LiègeWHO simulation significantly strengthened participants' skills in policy writing, negotiation, public speaking, and collaboration, echoing findings from other studies on UN-style simulations (Hammond & Albert, 2020; Kabdesov, 2022; Obendorf & Randerson, 2013). These competencies are crucial for preparing future leaders who must advocate for and implement policies that address complex global health challenges. Importantly, such skills are also transferable to broader professional contexts, including advocacy, community organizing, and program management.

A key outcome was the marked improvement in participants' self-reported confidence in policy writing: prior to the simulation, only 20.8% felt confident in drafting health policy resolutions, compared to 68.4% afterward. This aligns with Kolb's experiential learning theory (1984), which posits that effective learning occurs through a cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation. The simulation facilitated each of these stages by combining real-time problem-solving with opportunities for reflection and feedback.

Addressing Challenges in Policy Writing and Global Governance

Despite significant gains, participants' confidence in policy writing remained comparatively lower than in other skill domains, highlighting the challenge of acquiring technical competencies through simulations alone. Policy writing is a complex skill requiring not only an understanding of policy processes but also the ability to communicate persuasively and with precision. While the simulation offered opportunities for practice, it may not have provided sufficient instruction and feedback for all participants to achieve mastery.

Plus, as showed by Lewis, participating in the role-play simulation helped students gain a better understanding of the difficulty and complexity of negotiating MEAs by decreasing their (arguably overconfident) assessment of their ability to persuade other stakeholders to share their position.

This limitation underscores the need for complementary pedagogical approaches. Future editions could integrate targeted workshops, expert facilitation, and mentorship to strengthen technical skills in policy analysis and drafting, such as policy analysis, legislative processes, and effective communication strategies.

Similarly, while the simulation increased familiarity with global health governance and international climate agreements, these domains remained less well understood. Global health governance requires an understanding of international law, institutional structures, and political dynamics—areas not easily conveyed within the time constraints of a short simulation. Given their inherent complexity, simulations may be most effective for cultivating applied competencies (e.g., negotiation, collaboration), whereas deeper engagement with governance structures and treaties may require complementary approaches, such as lectures, case studies, or guided readings. Integrating these methods in future editions would enable participants to critically engage with the institutional and political dimensions of global health.

Long-Term Impact and Future Directions

While the short-term benefits of LiègeWHO are evident, future research should investigate its long-term impact on participants' academic trajectories and professional engagement. Longitudinal studies could assess whether simulations foster sustained involvement in global health governance, participation in international fora, or contributions to policy development. Such evidence would be invaluable in refining simulation design and demonstrating their broader influence on workforce development in global health.

Finally, expanding the scope of future simulations to incorporate a wider range of disciplinary perspectives could deepen their pedagogical impact. Integrating expertise from law, economics, and environmental sciences, alongside medicine and public health, would enhance participants' appreciation of the multifaceted nature of global health challenges. Structured mentorship, expert input, and thematic workshops could further support both technical skill acquisition and interdisciplinary learning.

Sample Size and Generalizability

A primary limitation of this study is its small sample size (n = 24), which restricts the generalizability of the findings. While the results suggest that simulation-based learning offers significant benefits for global health education, it remains unclear whether these outcomes are representative of a broader population of students and professionals. Future iterations should therefore aim to recruit larger and more diverse participant groups to enhance both statistical power and external validity.

The robustness of the data was further constrained by attrition and the inability to match pre- and post-simulation questionnaires. Not all participants completed both surveys, which introduces the risk of selection bias, as those who remained engaged may differ systematically from those who did not. Moreover, the inability to link individual responses prevented direct assessment of participant-level progress in knowledge, skills, and attitudes. To address these issues, future studies should employ unique identifiers to link responses across time points and implement strategies to reduce attrition—such as offering incentives or reminders—to ensure more complete and reliable data collection.

Potential Biases in Self-Reported Data

Another limitation concerns the reliance on self-reported data, which is vulnerable to social desirability and recall biases. Social desirability bias may lead participants to overstate perceived learning gains in order to present themselves favourably (Van de Mortel, 2008), while recall bias can result in inaccuracies when participants are asked to report on prior knowledge or experiences (Sedgwick, 2012). Although the short interval between the simulation and the post-survey likely reduced recall bias, both forms of bias may have influenced the accuracy of responses.

To strengthen future evaluations, self-reported measures should be complemented with more objective assessments of knowledge and skill acquisition, such as standardized tests, structured performance evaluations, or direct observation. This mixed-methods approach would provide a more robust measure of participant outcomes. Longitudinal studies are also warranted to assess the enduring effects of participation, particularly with respect to professional development, involvement in global health governance, and contributions to policy processes. This would provide valuable insights into the enduring effects of simulation-based learning on participants' careers and engagement with global health issues (Gosen & Washbush, 2004).

Additional Considerations

Beyond methodological refinements, future editions of LiègeWHO could expand the simulation's content and structure. Incorporating a broader range of disciplinary perspectives would deepen participants' understanding of the multifaceted nature of global health challenges, in line with Kolb's (1984) experiential learning theory, which emphasizes cross-disciplinary engagement. In addition, targeted workshops on policy writing, coupled with deeper engagement in international treaties and global health governance, could help participants acquire technical competencies that are more difficult to develop within the constraints of a single simulation exercise.

Conclusion

This study highlights the pedagogical value of the LiègeWHO simulation in advancing student learning and skill development within the field of global health. High levels of participant satisfaction, along with notable improvements in knowledge and competencies, suggest that this simulation-based learning event offers an effective and engaging approach to teaching complex global health issues. Notably, the simulation succeeded in deepening participants' understanding of the intricate relationship between climate change and health—an increasingly critical focus in global health discourse. The development of transferable skills such as collaboration, critical reasoning, negotiation, and policy writing further reinforces its relevance in preparing students for future roles in global health governance and diplomacy.

The LiègeWHO simulation stands as a promising model of experiential learning, offering students at the University of Liège a unique opportunity to actively engage with real-world challenges in a multidisciplinary setting. It contributes to a growing body of evidence supporting the integration of interactive,

practice-oriented methods into global health education. Given these benefits, it is strongly recommended that the University of Liège continue and expand this initiative, consolidating its position as a leader in innovative global health simulation pedagogy.

Nevertheless, there remains room for improvement. Expanding the simulation's thematic scope, diversifying participant backgrounds, and incorporating more rigorous and objective evaluation methods would enhance both the depth and breadth of its impact. Additionally, future research should explore the long-term effects of such pedagogical interventions, particularly in relation to participants' professional development, engagement in international health institutions, and sustained involvement in global health policy.

By addressing these avenues for improvement, and scaling up similar initiatives, simulation-based learning can play a vital role in equipping the next generation of global health professionals with the knowledge, skills, and critical perspectives needed to navigate an increasingly complex and interconnected world. The continuation and development of the LiègeWHO simulation at the University of Liège will ensure that students continue to benefit from immersive, transformative, and highly relevant learning experiences in global health.

Declarations

Author Contribution

OB led the conceptualization and methodological design of the study, coordinated the implementation of the LiègeWHO simulation, conducted the data analysis, and drafted the original manuscript. OB also contributed to manuscript revision and overall project coordination. CL contributed to the organization and implementation of the simulation, supported data collection and curation, and participated in the critical revision of the manuscript. AK contributed to data curation, assisted in the interpretation of the data, and participated in manuscript revision. FP contributed to the conceptualization of the LiègeWHO initiative and study design, supported project administration, and critically revised the manuscript for important intellectual content. AFD provided methodological and statistical guidance, contributed to the interpretation of the analyses, and critically revised the manuscript. All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

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Data Availability

The datasets generated and/or analysed during the current study are available from the corresponding author upon reasonable request.

Ethics and Consent to Participate

The study protocol was reviewed and approved by the Hospital-Faculty Ethics Committee of the University of Liège (707), which issued a favorable opinion on April 23, 2024 (Ref. 2024/134). Clinical trial number: not applicable. The research was conducted in accordance with the ethical standards of the institutional research committee and with the principles of the Declaration of Helsinki (1964) and its later amendments.

All participants were informed about the objectives, procedures, and voluntary nature of their participation, and provided informed consent to participate.

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