COMMENTARY

One Health Outlook



Harnessing the power of One Health education to tackle Emerging Infectious Diseases (EIDs) and other global health challenges



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Abstract

One Health is an approach that focuses on balancing and optimizing the health of humans, animals, and ecosystems sustainably. It recognizes that the health and well-being of these three components are interconnected and interdependent. The recent COVID-19 pandemic and other emerging infectious diseases like Monkeypox, Avian Influenza, and Dengue, have highlighted the need to strengthen the health workforce's emergency preparedness, given the close link between human, animal, and environmental health. One Health education lays a strong foundation for a global workforce capable of enhancing synergies across various sectors in addressing the complex global health challenges like emerging infectious diseases in the twenty-first century. One Health education is crucial in promoting an interdisciplinary, holistic understanding of the interconnectedness of our planet, as well as transdisciplinary thinking and collaborations. It also encourages responsible citizenship, and global-mindedness, and equips students with problem-based scenarios that foster effective evidence-based decision-making. Significant progress has been made to promote and implement One Health education over the past decade, although some challenges tend to hinder its comprehensiveness. Most of the delivered courses are more theoretical rather than the required practical or field-based sessions. Institutions especially academia play an essential role in providing an enabling environment for the advancement of One Health education. The implementation of One Health education should continuously be prioritized to equip students and health practitioners with the skills and knowledge necessary to navigate complex health challenges.

Keywords One Health education, Interdisciplinary collaboration, Transdisciplinary thinking, Global Health, Emerging Infectious Diseases, Institutions

Background

The recent COVID-19 pandemic, the rising incidences, and expansions of Monkeypox, Avian Influenza, West Nile virus, Lyme disease, Ebola, Dengue, Zika virus, Rift Valley fever, and Chikungunya, highlight that the health

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¹ College of Veterinary Medicine, Animal Resources and Biosecurity, Makerere University, Kampala, Uganda of humans, animals, and the environment are closely linked and that there is a need to strengthen the health workforce in regards to emergency preparedness [10, 21]. COVID-19 outbreak caught most of our health institutions inadequately prepared despite explicit warnings from scientists and forecasters that a global pandemic would likely strike in the near future [9]. Numerous countries found themselves compelled to embrace a fairly novel framework that emphasizes a cross-sectoral, collaborative approach that integrates the health of humans,



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animals, and the ecosystem as a single, interconnected whole [15]. This so-called One Health approach has the potential to bring together multiple sectors at global, national, and local levels to address a diversity of interconnected crises that the world faces, including the prevention of future pandemics [18].

However, disciplinary and cultural silo thinking and a lack of trained personnel to think interdisciplinary and transdisciplinary are some factors that can hamper the implementation of One Health initiatives [20]. Current medical school curricula devote relatively little time to emerging infectious diseases, especially those that are zoonotic [22]. Additionally, most training in One Health occurs within medical and veterinary programs after at least 3 years or more of prerequisite study, which itself tends to encourage and reward discipline-specific thinking [20]. Furthermore, the serendipity of the One Health concept is undeniable. Most graduate and/or undergraduate students come across One Health while grappling with complex issues for a school project or may discover One Health for the first time in a class lecture as a unifying principle that aligns diverse academic interests [11].

There is a strong need to reduce the serendipity of One Health education by introducing One Health concepts early in schools, especially in high school as well as the primary/elementary level where subjects have not yet been divided into separate silos and embracing the inherent complexity of interdisciplinary learning [8, 11]. The jointly developed One Health concept should be integrated into the curriculum of each related discipline in their initial training and the training must be widely accessible, based on teaching modules involving multidisciplinary expertise and combining public health, social sciences, population health, territories, the environment as well as research [13].

Why One Health Education?

Structured education in One Health provides a holistic inherent understanding of the interconnectedness of health amongst professionals. One Health concept integrates knowledge from diverse disciplines, such as human medicine, veterinary science, ecology, social science, public health among others. Through this conceptual learning, individuals gain insights into the complex interactions between humans, animals, and the environment, enhancing their understanding of complex topics and engagements in active learning experiences, thereby building an interdisciplinary foundation [10].

One Health education promotes transdisciplinary thinking and collaboration. A 2010 WHO report stated that "addressing health risks at the human-animal-ecosystems interfaces requires strong partnerships among players who may have different perspectives on some issues and different levels of resources" [6]. This can be achieved by utilizing the systems thinking of students in their early stages of studies. Bringing students from diverse cohorts, inclusive of science, technology, mathematics, medicine, humanities, arts, and social sciences, together is where disciplinary thinking, world views, life experiences, cultural backgrounds, and knowledge can be shared [20].

In my experience taking an online One Health course, *One Health Core Competencies* by the Center for International Health (CIH^{LMU}) at Ludwig-Maximilians Universität München, I witnessed firsthand the power of interdisciplinary collaboration. Initially, we were grouped into multidisciplinary teams to tackle case-study problems based on our respective fields of expertise. Later, we were reorganized into interdisciplinary teams, where insights from animal health, human health, social sciences and environmental science were combined to develop holistic, comprehensive solutions. This experience deepened my understanding of how transdisciplinary thinking is essential for addressing complex global health challenges and reinforced my commitment to the One Health approach.

One Health education also encourages cross-curricular connections. One Health education in global health issues including EIDs not only engages students across disciplines but also requires faculty and senior leaders across various health-related fields to share knowledge and balanced perspectives throughout curriculum development and implementation [10], therefore, One Health serves as an ideal framework for developing problembased scenarios that promote inter-professional teamwork [22].

One Health education encourages students to develop responsible citizenship and global-mindedness [17]. By learning how diseases can spread between humans, animals, and the environment, individuals can understand their roles in preventing and controlling outbreaks. This understanding promotes responsible, healthy behaviours, such as vaccination, proper hygiene, and sanitation, as well as sustainable environmental stewardship, which are essential for mitigating EIDs. Additionally, fostering a global mindset encourages collaboration and communication across borders to address health challenges collectively, recognizing that disease knows no boundaries and requires a unified effort to combat effectively [19].

Through One Health education, learners/professionals are equipped with evidence-based scenarios and topics that explain the interlinkages between human, animal, and environmental health [10]. These can serve as powerful tools to shape decision-making procedures in the fight against EIDs. By presenting real-world situations where health intersects across species and ecosystems, collaboration and innovative solutions can be inspired and initiated across disciplines. This interdisciplinary team can draw from this shared knowledge to craft policies and practices that safeguard the health and wellbeing of all living beings and generations to come [7].

All in all, One Health education plays a vital role in ensuring Education for Sustainable Development (ESD) by fostering a comprehensive understanding of the interconnectedness between human, animal, and environmental health. It promotes systems thinking and transdisciplinary collaboration, equipping learners with the skills needed to address complex global challenges such as EIDs, climate change, and biodiversity loss. By integrating concepts of health, sustainability, and social responsibility, One Health education encourages learners to adopt behaviours and practices that align with sustainable development principles, such as environmental stewardship, public health advocacy, and ethical decision-making. Furthermore, it provides a platform for global, regional and local collaborations and innovation, empowering individuals to work across disciplines and borders to create sustainable solutions for the health and well-being of all species and ecosystems. By embedding these principles early in education and fostering lifelong learning, One Health education becomes a cornerstone of ESD, shaping informed citizens capable of driving transformative change for a sustainable future.

Implementation of One Health Education

Significant strides have been made to implement One Health education over the past decade. Academic institutions present excellent opportunities to provide enabling environments for the advancement of One Health education [3]. Many institutions/universities have introduced One Health education to their students by incorporating the concept into their existing modules and curriculum for both undergraduate and graduate levels [1].

However, the One Health trainings are more theoretical than the required practical and field-based and most are short-term [12]. The integration of One Health education should be significantly accomplished through strategic curriculum planning and execution, encompassing both mandatory and optional courses [19] with more emphasis on delivering practical sessions and its sustainability to enable students and professionals to fully appreciate the concept. The practical implementation strategies should focus on actionable measures that bridge theoretical knowledge with real-world applications. Case-based learning modules, offer a dynamic approach by immersing students in realistic scenarios involving EIDs and global health challenges, fostering critical thinking and inter-professional collaboration. Additionally, teacher training programs can equip educators with the skills to deliver integrated curricula effectively, ensuring a balanced representation of diverse health-related fields. For example, interdisciplinary projects could involve veterinary, medical, and environmental science students collaborating on community health initiatives, such as zoonotic disease prevention campaigns or environmental conservation programs. By incorporating these practical measures, One Health education can cultivate a workforce adept at addressing complex health challenges through innovative, collaborative approaches.

The longevity of One Health education can be achieved by ensuring it becomes a core part of global health and extends beyond formal education through continuous learning opportunities such as workshops, online courses, and certifications. Consistent One Health education across professions would consequentially improve collaboration between professionals [13].

Furthermore, ensuring educational equity in the implementation of One Health education in resource-limited settings requires a nuanced understanding of the challenges like limited access to resources, infrastructure deficits, and insufficient training opportunities for educators and students as well as the adoption of innovative solutions. Solutions such as leveraging online platforms provide a cost-effective way to deliver tailored educational content, promote interdisciplinary learning, and connect students and professionals across diverse geographical locations. International collaborations and partnerships can support capacity building through resource sharing, mentorship programs, and the development of standardized, context-specific educational materials [5]. Combining technological innovations with collaborative efforts makes it possible to enhance the inclusivity and accessibility of One Health education, empowering students in low- and middle-income countries to address pressing health and environmental challenges effectively within their communities.

Institutions are leveraging the power of technology to deliver One Health education to a wider audience worldwide. Many of the courses are freely accessible via online learning platforms, such as Coursera, edX and utilizing online video conferencing tools such as Zoom to deliver the One Health concept and its related topics. For example, Bats, Ducks and Pandemics: An Introduction to One Health Policy, a course by Dr. Laura Kahn under Princeton University, available on Coursera, AFROHUN academy is offering various One Health topics via Zoom such as Transboundary Disease Risk Communication and Community Engagement Using One Health approach (TD-RCCE) [2].

Additionally, many One Health organizations have been established and are promoting One Health education in various communities around the world. For instance, One Health Lessons, an educational charity non-profit organization, through its program Certified Lesson Leader, trains volunteers to offer One Health education to different age groups in their various communities on different One Health-related topics Lessons One Health [14]. Also, most of these organizations are leveraging the power of social media to educate the public about One Health and its related topics such as EIDs, Zoonotic diseases, Antimicrobial Resistance, Climate Change, Plastic pollution, Food Security and Safety among others.

Collaborative student and professional programs by institutions and organizations such as national and international internships, exchange programs, fellowships, and mentorship programs that would link individuals from different faculties and disciplines together [4] are being pursued. These not only cultivate a rich tapestry of perspectives but also empower students to apply their knowledge in real-world settings, igniting a passion for interdisciplinary collaboration and driving meaningful change in communities worldwide. For instance, the College of Veterinary Medicine, Animal Resources and Biosecurity (COVAB), Makerere University in collaboration with Mississippi State University developed and implemented the COVAB-Mississippi State University Tropical Veterinary Medicine and One Health Study Abroad program that focuses on animal production and health management, conservation medicine, aquatic health, wildlife health, public health, food safety and security as well as instilling One Health principles while suffusing multicultural experiences [16].

This Study Abroad program underscores the transformative potential of One Health education by illustrating how interdisciplinary and international collaborations can address complex health challenges at the intersection of human, animal, and environmental health, integrating diverse fields, to provide students with practical, handson experiences that transcend traditional academic silos. By embedding One Health principles and fostering multicultural exchanges, such initiatives prepare participants to navigate global health issues with cultural sensitivity and a collaborative mindset. The adaptability of this model lies in its ability to address specific regional health priorities while leveraging local resources and expertise. To scale and replicate this approach, similar partnerships could be developed across institutions in different regions, tailoring programs to address context-specific challenges such as zoonotic disease control, climate resilience, or sustainable agriculture. These initiatives not only enhance educational outcomes but also contribute to building a global workforce equipped to tackle pressing health and environmental challenges through integrated and cooperative strategies.

Conclusion

In conclusion, as the world continues to grapple with the ongoing threat of emerging infectious diseases and other global health challenges, One Health education emerges as a powerful tool for empowering future health workforces to embrace interdisciplinary and/or transdisciplinary collaborations across different disciplines since human health is intrinsically interconnected with animal and environmental health. By fostering interdisciplinary understanding, collaborative response, preventive strategies, and informed policymaking, One Health education lays the foundation for a global workforce capable of enhancing synergies across various sectors in addressing the complex challenges of global health issues. Institutions must continue to promote One Health education for students starting from earlier stages of their educational lives and consistently for health professions that would subsequently improve collaboration among them thereby strengthening the health workforce.

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