Integrating One Health into High School teaching: A Practical Guide for Teachers

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Acknowledgement and Disclaimer

Financial and technical support to the development of this document is supported by 'Capacitating One Health in Eastern and Southern Africa' (COHESA) which is co-funded by the OACPS Research and Innovation Program, a program implemented by the Organization of African, Caribbean and Pacific states (OACPS) with the financial support of the European Union. However, the funder doesn't take responsibility for opinions reflected in the document which remains solely to the authors.

Suggested citation: Korma,B., Tesfaye,B., Wondim, E., Abuna, F., Kebede,Y., Tadesse,Y., Siobhan Mor, S., Mutua, F., Shauna Richards, S., Mirgissa Kaba, M. 2024 Integrating One Health into High School teaching: A Practical Guide for Teachers. Addis Ababa, Ethiopia.

Preamble

In recent years, the world has faced unprecedented challenges. The emergence of zoonotic diseases, increasing food insecurity, growing antimicrobial resistance, and the threat of global pandemics have underscored the fragility of ecosystem health at large and the wellbeing of humankind. These issues are further compounded by climate change, globalization, intensive agricultural practices, population growth, and widespread antimicrobial use in food production. Against this backdrop, the One Health approach stands out as a critical strategy, aiming to address health challenges at the intersection of human, animal, and environmental health.

This manual, "Integrating One Health into High School Curricula: A Practical Guide for Teachers," developed with the support of Capacitating One Health in Eastern and Southern Africa (COHESA), seeks to weave One Health principles into the fabric of secondary education. It highlights the critical interconnectedness of the wellbeing of human, animal, and the environmental on the one hand and provide educators with the tools to imbue their teaching with a holistic understanding of global health challenges.

Designed as both a comprehensive instructional resource and a source of inspiration, this manual is outlines learning objectives, case studies, teaching strategies, assessment tools, and hands-on activities. These resources aim to empower teachers to adopt an interdisciplinary approach to teaching different courses at high school level, thereby preparing students to become ambassadors of One Health who will proactively tackle complex health challenges. By fostering an educational environment that encourages cross-sectoral collaboration and interdisciplinary learning, this initiative is expected to cultivate a generation of informed thinkers, planners and implementors who can contribute to sustainable development and enhance health outcomes for humans, animals and the environment.

The manual is developed for secondary school teachers to explicitly frame and enhance the integration of One Health principles into the existing curriculum. While the current curriculum encompasses various One Health components, it does not comprehensively cover One Health as an approach. This guide aims to bridge that gap by providing a structured approach to explicitly incorporate and highlight these interdisciplinary connections.

Purpose of the Manual: The purpose of this manual is to:

- Identify and outline the existing curriculum components that inherently reflect One Health principles.
- Enhance teachers' ability to deliver lessons that foster an understanding of the interdependencies among human, animal, and environmental health.

Intended users: This manual is designed for:

- **Secondary school teachers** across various disciplines who are interested in refining and enhancing their curriculum with One Health principles.

Curriculum Progression Overview

The curriculum is outlined to progressively integrate and highlight One Health principles explicitly through grades 9 to 12:

- **Grade 9:** Currently focuses on environmental ethics and human-environment interactions, providing a foundation to introduce discussions on how these topics are integral to One Health.
- **Grade 10:** Deals with global issues and public health, which will be enhanced by explicitly connecting these issues to the One Health approach, emphasizing the linkage between human activities and global health dynamics.
- **Grade 11:** Covers environmental hazards and sustainable development, areas ripe for demonstrating how One Health strategies can lead to more sustainable and effective solutions.
- **Grade 12:** Discusses disease prevention, where the focus will be sharpened to include zoonotic diseases and the importance of cross-species disease management.

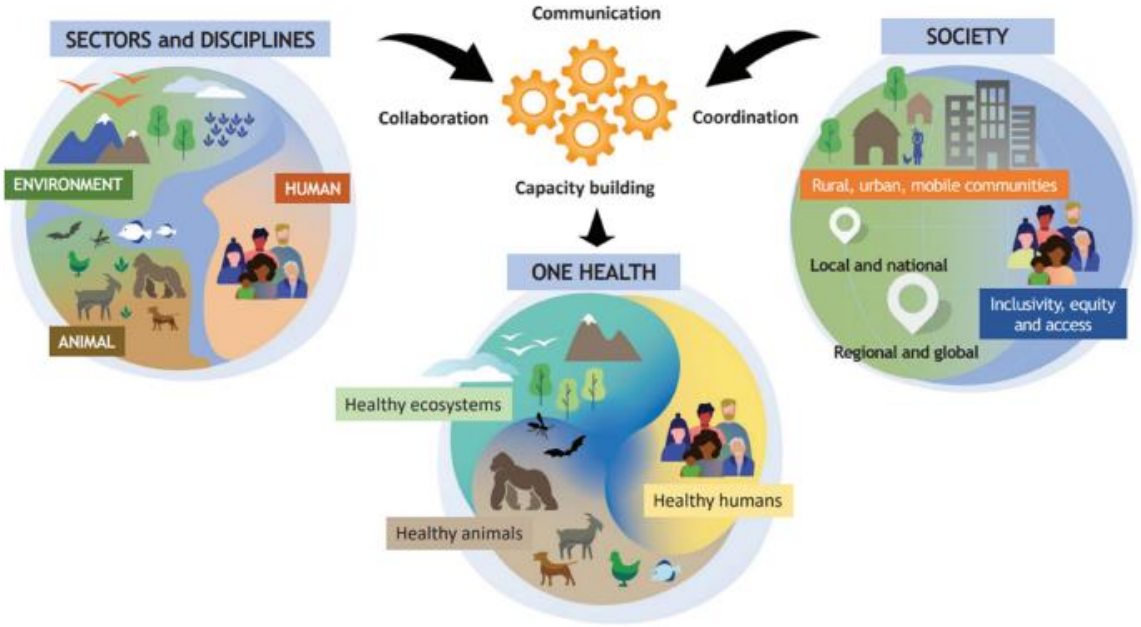
By the end of this manual, Teachers will be equipped not only to recognize where One Health principles are already embedded in the curriculum but also to make these connections more explicit, thereby enriching the educational experience and preparing students to think critically about complex, interconnected health issues.

Introduction

1.1 What is One Health?

The One Health High-Level Expert Panel (OHHLEP) defines One Health as "an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems." It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent. The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious as shown in Figure 1.

Figure 1: Definition of One Health



Source: Mettenleiter, T.C., Markotter, W., Charron, D.F. *et al.* The One Health High-Level Expert Panel (OHHLEP). *One Health Outlook* **5**, 18 (2023). https://doi.org/10.1186/s42522-023-00085-2

One Health is a comprehensive approach that recognizes the intricate connections between human, animal, and environmental health. This perspective advocates for collaborative efforts among various sectors, such as medicine, veterinary science, environmental science, and public health. By fostering cooperation at local, national, and global levels, One Health aims to achieve optimal health outcomes for people, animals, and the environment. It has emerged from the understanding that the well-being of humans, animals, and ecosystems is mutually dependent, necessitating a more

coordinated and cross-sectoral approach to address global public health challenges and health threats at the human-animal-environment interface.

One Health is a global strategy aimed at expanding interdisciplinary collaborations to improve outcomes across all areas of health and environmental conservation. It promotes synergy that can result into accelerated research, improved public health, and a more extensive scientific knowledge base, ultimately enhancing human, animal and environmental health. By implementing One Health principles effectively, we can safeguard and enhance the lives of humans, animals and the environment for generations to come.

Historically, health interventions often targeted specific diseases or regions. In contrast, One Health advocates for a holistic approach to health systems, focusing on proactive prevention rather than merely reacting to crises. It aligns with the World Health Organization's broad definition of health, addressing the social, environmental, cultural, and physical determinants that influence human and animal health.

Recent collaborations, such as those between the OIE-FAO-WHO tripartite and UNEP, have highlighted the potential of One Health to integrate into global health and sustainability efforts. However, despite widespread endorsement, the implementation of One Health has often been limited to non-binding agreements and guidelines, underscoring the need for more concrete actions in pandemic prevention and preparedness.

1.2 Importance of One Health

The One Health concept is vital because it addresses the complex and interrelated health challenges our world faces. With the increase in global travel, urbanization, and environmental changes, zoonotic diseases and conditions such as antimicrobial resistance and challenges to food safety can quickly spread among humans, animals, and ecosystems, leading to new and potentially devastating health threats. The One Health approach helps to prevent, detect, and respond to these health threats more effectively by considering all the factors involved. This approach leads to better health for people, animals, and the environment, mitigates the impact of diseases, and contributes to sustainable development.

One Health approaches plays important role in the following key areas

1. Disease control: Many infectious diseases can be transmitted between animals and humans (zoonoses), highlighting the need for holistic approaches to disease control that considers both animal and human health.

2. Environmental conservation: Human activities, such as deforestation and pollution, can impact both animal and human health. By considering environmental factors, the One Health approach aims to promote sustainable practices that benefit all species.
3. Antimicrobial Resistance: The misuse of antibiotics in both human medicine and animal agriculture contributes to the emergence of antimicrobial resistance. One Health initiatives aim to address this global health threat by promoting responsible antibiotic use in both humans and animals.
4. Emerging infectious diseases: Rapid urbanization, globalization, and climate change can contribute to the emergence of new infectious diseases. One Health approaches facilitate early detection, surveillance, and response to such emerging threats.
5. Climate change and Health: Climate change affects the spread of diseases and the health of ecosystems. Integrating climate science into the One Health approach allows for a better understanding of how changing weather patterns influence zoonotic disease dynamics and environmental health, leading to more effective adaptation and mitigation strategies.
6. Food safety: Ensuring food safety involves managing risks from farm to table. One Health approaches recognize the interconnections between the health of soil, plants, animals, and people, addressing factors like pesticide use, microbial contamination, and food handling practices to prevent foodborne illnesses and promote public health.

Cases Studies

The following case studies illustrate the One Health concept; showing how human, animal, and environmental health are interconnected and require integrated approaches to address complex health challenges effectively.

1.3 Case Study 1: Combating Rabies in Ethiopia

Situation: In rural Ethiopia, dogs often roam unsupervised and are frequent carriers of rabies, a deadly virus. This poses a significant public health risk as these dogs can interact with both domestic animals and humans. A child was bitten by a rabid dog in a rural village of Bensa, Sidama region in 2022 which created a community wide concern and subsequent demand for rabies control measures.

Response: The local health bureau, in collaboration with an animal welfare organization and Animal health extension, responded promptly by capturing and safely euthanizing the rabid dog to prevent further spread of the virus. This incident triggered a comprehensive response that included a large-scale vaccination campaign for all dogs in the area. Simultaneously, educational

campaigns were conducted to raise awareness among the local population about rabies prevention', the importance of supervising domestic animals, and the need for immediate treatment following any animal bite.

1.4 Case Study 2: Tackling Antimicrobial Resistance

Situation: The misuse of antibiotics in healthcare and animal husbandry has led to antimicrobial resistance (AMR), where bacteria and fungi evolve to resist the effects of medications, making infections harder to treat.

Response: To combat AMR, joint teams of healthcare providers for animal, human and environment and those responsible for global health security collaborate on prevention of antimicrobial resistance and agree on control mechanisms.

1.5 Case Study 3: Managing Anthrax outbreaks

Situation:

In Ethiopia, anthrax poses a recurrent risk to livestock and human health. An outbreak threatened extensive damage to the agricultural communities of Sawula district in the Southern region in 2021. Anthrax is a serious bacterial disease that can devastate livestock populations and pose severe health risks to humans.

Response:

Leveraging Ethiopia's experience with coordinated health responses, the Ethiopian Public Health Institute, supported by international health organizations, spearheaded a community-based surveillance program. This initiative empowered local community members to identify and report early signs of anthrax, facilitating prompt action. As part of the response the following were implemented:

- Vaccination Campaigns were rapidly deployed, inoculating over 24,000 livestock across the affected regions.
- Educational programs and community engagement sessions were conducted. Community members were educated about the risks associated with anthrax and effective prevention strategies including proper handling of livestock, safe disposal of carcasses, and reporting suspicious animal deaths.
- Collaborative efforts involving various stakeholders, including veterinary services, local government units, and health workers, ensuring a comprehensive approach to disease control.

1.6 Case Study 4: Environmental changes and health risks

Situation: The degradation of natural environments due to human activity, such as deforestation and increasing pollution, is leading to climate change, loss of biodiversity, and an increased spread of diseases.

Response: Highlighting the environmental determinants of health, this case emphasizes the importance of preserving natural habitats and biodiversity to prevent disease spread. Sustainable environmental practices are promoted to mitigate climate change impacts, reduce habitat loss, and control disease vectors like mosquitoes, which transmit diseases to humans. Efforts include global and local initiatives to monitor and manage environmental health risks, promote conservation, and implement sustainable practices in agriculture and urban development.

Opportunities for Integrating One Health into Secondary School Curriculum

2.1 Rationale of integrating One Health into Secondary education system

Incorporating One Health concepts into the secondary education curriculum is crucial for nurturing a deep understanding of the global health challenges that intertwine human, animal, and environmental well-being. Children of school going age are particularly vulnerable to the impacts of natural and man-made emergencies like droughts, conflicts, disease outbreaks, and natural disasters, which can impede their educational progress and overall development.

The Ministry of Education (MoE) advocates for embedding health issues within the curriculum and teacher training materials. This strategy aims to enhance health literacy among learners by integrating One Health principles into the educational framework, from design and implementation to monitoring and evaluation. The curriculum addresses critical environmental issues, such as climate change, through comprehensive instructional strategies and learning activities, preparing students in grades 9-12 to understand and engage with these complex topics.

Despite these efforts, the integration of One Health within the existing curriculum remains fragmented and lacks sustainability. The traditional compartmentalization of One Health subjects and disciplines hinders the development of a cohesive and impactful educational approach. A fragmented view of health ignores the essential interconnectedness of human, animal, and environmental health, leading to inadequate problem-solving strategies and missed opportunities for cross-disciplinary collaboration. This can increase the risk of disease transmission and exacerbate environmental degradation due to a lack of awareness of human activities' impacts on health ecosystems.

One Health education fosters critical thinking, interdisciplinary learning, and systems' thinking, essential for addressing real-world challenges. By focusing beyond human health alone and considering broader ecological and societal contexts, One Health education can help bridge health disparities. A One Health training manual for high school teachers is vital for integrating these concepts into the curriculum, thereby enhancing educational quality and relevance. It supports teachers in fostering collaboration, critical thinking, and comprehensive problem-solving among students, preparing them to face global health challenges with a well-rounded understanding of the interplay between health, animals, and the environment.

2.2 Curriculum Linkages

Integrating One Health principles into secondary education across various subjects such as biology, environmental science, social studies, geography, citizenship education, and agriculture enriches the curriculum. It fosters a thorough understanding of the interconnectedness between human,

animal, and environmental health. This integration encourages students to examine the complex biological, ecological, and societal factors in global health challenges, promoting interdisciplinary learning and critical thinking.

The curriculum progression from grades 9 to 12, as it exists now, is designed to provide students with a holistic view of these interdependencies:

- **Grade 9:** Focuses on environmental ethics, the relationship between humans and the environment, climate change, and environmental well-being.
- **Grade 10:** Explores global issues, population growth, and communicable disease prevention.
- **Grade 11:** Addresses environmental hazards, natural resource management, sustainable development, and green economies.
- **Grade 12:** Covers disease transmission and prevention methods, focusing on common infectious and zoonotic diseases.

This comprehensive educational approach equips students with the knowledge, attitudes, and skills to navigate and contribute to solving the pressing health and environmental issues of our time. By integrating One Health principles in the secondary school curriculum, educators can cultivate informed, multidisciplinary thinkers capable of contributing to sustainable health practices and policies globally.

Here are some potential domains of focus based on common subject areas:

2.2.1 A. Grade 9- Citizenship education

The Chapter on environmental ethics refers to the moral obligations expected from human beings to protect and maintain the well-being of their environment. There is a direct relationship between the life of human beings and the environment. When the environment is safe and healthy, we leadgood and healthy lives. However, when the environment is damaged, human lives are directly affected. Currently the world is under a serious threat of climate change and environmental degradation. Consequently, focusing our attention on the well-being of the environment is not a matter of choice, but rather of survival. This is because our lives fully depend on the environment and the earth's resources that are finite. Therefore, are responsible for maintaining and protecting the well-being of our environment.

In the chapter on indigenous environmental conservation mechanisms, environmental conservation and preservation is a major contemporary global issue that seeks the attention of everyone. This is because the life of both human beings and animals depend on the well conserved and preserved environment. Indigenous knowledge plays a significant role in promoting environmental conservation.

2.2.2 B. Grade 10 textbooks

In Citizen's education, chapters address:

- ✓ major global issues
- ✓ climate change: human activities are remarkably considered responsible for climate change. Among them are the followings:
- ✓ massive industrialization
- ✓ rapid population growth and urbanization

In English education, chapters address:

- ✓ population growth
- ✓ preventing communicable diseases using traditional medicine
- ✓ a traditional medicine, moringa olifera

2.2.3 C. Grade 11 Textbooks

Chapters in different subjects address the following:

- ✓ environmental hazards/EHs
- ✓ civilization
- ✓ road traffic accidents
- ✓ people and natural resources
- ✓ irrigation
- ✓ global warming
- ✓ patriotism
- ✓ efficiency of health services
- ✓ indigenous conflict resolution
- ✓ artificial intelligence
- ✓ sustainable development
- ✓ time management
- ✓ evidence on traffic accident
- ✓ natural resource management
- ✓ mechanized agriculture
- ✓ green economies
- ✓ national pride
- ✓ telemedicine
- ✓ conflict management
- ✓ robotic

2.2.4 D. Grade 11 subject textbooks

Grade 11 Agriculture addresses:

Natural resource management and animal feed production, specifically:

- ✓ animal genetics and breeding
- ✓ farm animal housing and environmental conservation
- ✓ biodiversity concepts and applications
- ✓ food diversification and nature conservation

Grade 11 Biology addresses:

- ✓ impact of human activity on the environment

2.2.5 E. Grade 12 Textbooks

Grade 12 Biology addresses:

- ✓ modes of diseases transmission and ways of prevention
- ✓ common infectious diseases and zoonotic diseases

Note: Refer to the Text books of Grade 9 -12 of the different subjects

Objectives of this manual

The One Health teacher's manual explains the concept of interdisciplinary collaboration and the importance of addressing health challenges through a holistic approach. It emphasizes prevention, preparedness, research integration, policy integration, public awareness, and teaching strategies. The manual also suggests ways to integrate One Health principles into existing curriculum areas, including science, health education, social studies, and environmental studies. It provides resources and references for teachers and students to explore One Health concepts further. The manual aims to promote a healthier, more sustainable world.

Upon reading this manual, teachers will be able to understand One Health integration and clearly articulate how One Health concepts are incorporated across various subjects, aligning with its overarching principles and approach. Teachers will achieve the following objectives:

1. Recognize the One Health interface: understand the interactions and synergies among humans, animals, and the environment.
2. Develop One Health competencies: acquire the necessary knowledge, skills, and attitudes in One Health to enhance the educational sector's readiness for global health challenges.
3. Assess One Health relevance: evaluate the significance of One Health principles in general education (grades 9-12) and their application in everyday life.
4. Implement One Health in teaching: apply One Health concepts within the curriculum as a transformative approach for addressing contemporary and emerging health threats. This includes utilizing innovative methods to incorporate One Health principles across different subjects, offering specific lesson plans, activities, and resources. Teachers will adapt the manual to accommodate diverse teaching styles, classroom environments, and educational frameworks, ensuring broad applicability.
5. Foster interdisciplinary learning: promote learning experiences that bridge gaps between disciplines within One Health, enhancing critical thinking and problem-solving abilities.
6. Engage in community-based learning: equip teachers with the tools to involve students in One Health-related community projects, fostering local awareness and engagement.
7. Evaluate learning outcomes: guide teachers in assessing students' comprehension of One Health concepts and the impact of these teachings on their learning.
8. Support professional growth: provide continuous professional development opportunities for teachers to share and exchange insights, experiences, and strategies for embedding One Health in education.
9. Discuss ethical implications: address ethical issues in One Health, including responsible use of antibiotics, animal welfare, environmental conservation, and equity.
10. Sustain One Health education: advocate for long-term integration of One Health in the curriculum, supporting it through networks and partnerships with educators, healthcare professionals, and environmental specialists.

3.1 Module One: Fundamentals of One Health Concept

3.1.1 Learning objectives

Upon completing this module, teachers will:

- ✓ Define the concept of One Health and understand its global significance
- ✓ Recognize the importance of One Health in addressing complex health challenges

3.1.2 Teaching strategies

- ✓ Interactive discussions: kickstart the module with a thought-provoking discussion on recent health crises that highlight the interconnectedness of human, animal, and environmental health.
- ✓ Case study analysis: dive into real-world examples where a One Health approach led to successful health outcomes, such as the control of zoonotic diseases like rabies or the management of antimicrobial resistance.
- ✓ Problem-solving activities: encourage students to apply One Health principles to hypothetical scenarios, fostering critical thinking and innovative solutions.

3.1.3 Activities

- ✓ Zoonotic disease role-play: students take on roles as doctors, veterinarians, environmental scientists, and policymakers to tackle a mock outbreak of a zoonotic disease.
- ✓ One Health debate: organize a debate on the use of antibiotics in animal agriculture and its impact on human health, encouraging students to explore multiple viewpoints.
- ✓ Community mapping project: students map their community to identify potential health risks at the intersection of human, animal, and environmental health, proposing One Health-informed solutions.

Overview: The One Health concept emerges from the understanding that the health of humans, animals, and the environment are inextricably linked. This module introduces teachers to the fundamentals of One Health, preparing them to impart this crucial interdisciplinary perspective to their students. Through engaging discussions, case studies, and interactive activities, educators will explore the significance of One Health and its role in addressing global health challenges.

The One Health concept emerges from the recognition that the health of humans, animals, and the environment is deeply intertwined. Global trends such as population growth, urbanization, and international travel have led to a dynamic and interconnected world, presenting new challenges for health systems.

One Health is the approach that the health of people, animals, and our environment are all connected. This concept has become more important as the world has grown more interconnected through travel, trade, and technology. Diseases can now spread faster and more unpredictably than ever

before, confirming that human, animal, or environmental health cannot be handled in isolation. For instance, a disease affecting wildlife can impact human health and vice versa, reflecting the interconnected nature of our ecosystems. The concept advocates for a collaborative, cross-sectoral approach to health, recognizing that human health is contingent upon the health of animals and the environment.

What One Health involves:

- **Connection:** people's health is linked to animal health and the environment we all share.
- **Collaboration:** doctors, veterinarians, environmental scientists, and other experts must work together to solve health problems.
- **Comprehensive approach:** health issues should be tackled by looking at the whole picture, not just one part of it.
- **Proactive measures:** it's better to prevent health problems before they start than to deal with them after they've happened.

For example, the COVID-19 pandemic showed how a virus in animals can impact human health and change the way everyone lives, highlighting the need for a One Health approach in addressing such challenges. Everything in the world is inter-connected and affects health - from the food we eat, the animals we live with, to where we live and work.

Historically, health interventions have primarily focused on human-centric treatments and emergency responses. The urgency of adopting a One Health approach has been underscored by recent global health emergencies, such as the COVID-19 pandemic, which revealed the vulnerabilities in our health systems and the need for integrated health solutions. The One Health framework facilitates a better understanding of how environmental changes, wildlife management, and human activities contribute to health outcomes, enabling proactive management of health risks and promoting sustainable practices.

3.2 Module Two: Basic principles of One Health

3.2.1 Learning Outcomes

- Teachers will understand the core principles of One Health.
- Teachers will be able to explain the multidisciplinary nature of One Health.
- Teachers will identify the roles of different sectors in implementing One Health.

3.2.2 Teaching Material/Content

- Definitions and history of One Health
- Case studies illustrating the impact of One Health on global health initiatives.
- Detailed explanation of One Health principles: interconnectedness, collaboration, prevention, sustainability.
- Examples of One Health in action across various sectors.

3.2.3 Activities

- Interactive discussions on the importance of One Health.
- Analysis of One Health principles using case study- analysis

Overview

This module delves into the foundational principles of One Health, equipping teachers with a comprehensive understanding and practical applications. Through a mixture of discussions, case analyses, and project-based learning, educators will be prepared to teach these concepts, enhancing students' awareness of the importance of a collaborative approach to health.

3.3 One Health principles

One Health is a multi-disciplinary approach focusing on optimizing health for people, animals, and the environment, particularly in response to global health threats like COVID-19, addressing food safety, nutrition, and antimicrobial resistance. Here, the One Health principles are presented as follows:

1. Interconnectedness: it acknowledges that the health of humans, animals, and the environment are closely linked. Diseases can pass between species (zoonoses), and environmental changes can affect health outcomes for both humans and animals. Showcasing how diseases can traverse across these boundaries and the impact of environmental shifts on health dynamics. Understanding that the health of one directly impacts the others. The goal is to foster a holistic understanding of health.
2. Collaboration: promoting cooperation and communication amongst experts in environmental science, animal health, veterinary science, human health, and other relevant domains in order to address health challenges in a comprehensive manner.
3. Prevention: emphasizing the importance of preventive measures to control and mitigate health risks at the interface of humans, animals, and the environment, reducing the likelihood of disease outbreaks.
4. Sustainability: promoting sustainable practices that consider the long-term health implications for humans, animals, and the environment, aiming to preserve ecological balance.
5. Research and education: supporting research, education, and public awareness programs to better understand and address health challenges through One Health lens.
6. Holistic Approach: it recognizes the interconnectedness of health in humans, animals, and the environment. Health issues cannot effectively be addressed in isolation; instead, a holistic approach that considers all three sectors is necessary.

Activities:

3.3.1 Interconnectedness:

- Disease detectives: divide the class into groups and assign each group a different zoonotic disease (e.g., rabies, brucellosis, anthrax, Rift Valley fever, avian influenza e.t.c.). Have each group research their disease and prepare a presentation that explores:
    - How it is transmitted between humans and animals.
    - How environmental factors affect the spread of the disease.

- The impact of the disease on both human and animal health.
- After presentations, lead a class discussion about the interconnectedness of human, animal, and environmental health.

- Mapping zoonoses: provide trainees with a world map and markers. Ask them to research and mark locations where different zoonotic diseases are prevalent. Encourage them to identify patterns and discuss the role of factors like climate and geography in disease transmission.

3.3.2 Collaboration:

- One Health Case studies: present trainees with real-world examples of One Health collaborations in action (e.g., tackling antimicrobial resistance, controlling zoonotic outbreaks). Have them discuss the benefits of collaboration, the challenges encountered, and the lessons learned.
- Role-playing: divide the class into groups representing different disciplines involved in One Health (e.g., biology, agriculture, environmental scientist). Present a fictional scenario like a disease outbreak and have each group discuss their role in addressing the challenge and collaborating with other stakeholders.
- One Health forum: organize a mock forum where trainees represent different sectors and discuss a current One Health issue. Encourage respectful debate, collaboration, and the formation of consensual solutions.

3.3.3 Prevention:

- One Health posters: challenge trainees to create posters promoting One Health principles and preventive measures, like hand washing, proper waste disposal, and responsible antibiotic use.
- Hygiene Olympics: hold a fun competition where trainees demonstrate their knowledge of good hygiene practices through activities like hand washing relay races and germ-busting quizzes.
- Community outreach: partner with a local organization focusing on One Health, and have trainees develop and implement a preventive awareness campaign in the community. This could involve distributing infographics, organizing workshops, or creating educational materials.

3.3.4 Sustainability:

- Sustainable farming debate: organize a debate on the merits of different sustainable farming practices like organic farming and agroforestry, considering their impact on animal health, food safety, and environmental sustainability.
- Design a One Health city: challenge trainees to design a model city that incorporates One Health principles, considering factors like food security, green spaces, animal welfare, and waste management.
- School eco-audit: have trainees conduct an environmental audit of their school, identifying areas where they can implement sustainable practices that benefit both human and environmental health.

3.4 Module three: concepts of One Health

3.4.1 Learning Outcomes

- Teachers will understand the scope of One Health, including zoonotic diseases and environmental impacts.
- Teachers will learn how to apply One Health concepts to local and global health issues.

3.4.2 Teaching Materials/Content

- Overview of zoonotic diseases, antimicrobial resistance, and the One Health approach to these issues.
- The role of environmental factors in health.

3.4.3 Activities

- Case study analysis of zoonotic disease outbreaks.
- Planning a One Health lesson or project for students

3.4.3.1 Overview

Zoonotic diseases are infections that are naturally transmitted between animals and humans. They can spread through various means, including direct contact with infected animals, consuming contaminated food or water, or via vectors like mosquitoes and ticks. The impact of these diseases on public health can be significant, ranging from mild symptoms to severe illnesses and even pandemics.

3.4.3.2 Transmission and impact

- **Direct contact:** diseases like rabies can spread through bites or scratches from infected animals, often wildlife or unvaccinated pets.
- **Contaminated food and water:** illnesses such as salmonellosis are transmitted through consuming contaminated meat, eggs, or water.
- **Vectors:** diseases like Lyme disease are spread by ticks that have fed on infected animals, such as deer or mice.

3.4.3.3 Examples of Zoonotic diseases

- **Rabies:** a viral disease affecting the central nervous system, primarily spread through bites from infected animals such as dogs and cats. It is almost always fatal once symptoms appear, but preventable through vaccination of pets and post-exposure prophylaxis in humans.

- **Avian influenza:** Also known as bird flu, this virus primarily affects birds but can infect humans who have close contact with infected poultry. Some strains have caused severe respiratory illness in humans.

- **Lyme disease:** caused by bacteria transmitted through tick bites, it leads to symptoms ranging from rash and fever to severe joint pain and neurological problems. Early treatment with antibiotics is effective.

Understanding zoonotic diseases and their transmission pathways is crucial for developing effective prevention and control strategies. Public health measures, such as vaccination programs, safe food practices, and vector control, are essential in managing the risk and impact of these diseases on human populations.

3.4.3.3.1 Case Studies

Rabies: Rabies is commonly recognized because of the emphasis on vaccinating pets like dogs and cats, which has helped eliminate rabies transmitted by dogs in some regions. However, globally, rabies remains a significant threat, causing around 59,000 deaths annually, with many victims being children. This situation exemplifies the need for widespread One Health strategies to combat preventable diseases like rabies.

Healthy Pets, Healthy People: The relationship between pet ownership and human health is well-established, with pets often contributing positively to their owners' wellbeing. However, the risk of pets transmitting diseases to humans exists. Young children, older adults, and immune compromised individuals are particularly vulnerable. Key preventive measures include maintaining hygiene, keeping pets' living areas clean, and ensuring regular veterinary check-ups.

Toxoplasmosis is an example where cats can transmit the parasite toxoplasma to humans, potentially causing serious health issues, such as birth defects if contracted by pregnant women.

Antimicrobial Resistance (AMR)

Antimicrobial Resistance (AMR) occurs when microorganisms such as bacteria, viruses, fungi, and parasites change over time and no longer respond to medicines, making infections harder to treat and increasing the risk of disease spread, severe illness, and death. The development of AMR is primarily driven by the overuse and misuse of antibiotics in human medicine and animal husbandry. When antibiotics are used excessively or inappropriately, they provide selective pressure that leads to the survival and proliferation of resistant strains of microorganisms.

Consequences of AMR The rise of AMR poses significant threats to human and animal health. For humans, it means that common infections, which were once easily treatable with antibiotics, are becoming more difficult to cure, leading to longer hospital stays, higher medical costs, and increased mortality. In the animal sector, AMR compromises the effectiveness of veterinary medicines, leading to poorer animal welfare, reduced productivity, and higher mortality in livestock and pets.

One Health approach to addressing AMR

The One Health approach to AMR integrates veterinary, medical, and environmental sciences to address the root causes of resistance and to devise effective interventions. This involves coordinated actions to monitor and control AMR across different sectors, reducing the unnecessary use of antimicrobials, and encouraging best practices in hygiene and sanitation to prevent infections.

Successful case studies

Examples of successful One Health interventions include the implementation of stewardship programs that optimize antibiotic use in hospitals and veterinary clinics, surveillance networks that track the spread of resistance across borders and species, and environmental controls that prevent the dissemination of resistant genes in water and soil.

The role of environmental factors in health

Environmental factors play a pivotal role in the health of humans, animals, and ecosystems. These factors include climate, pollution, habitat destruction, and land use changes, all of which can significantly influence the emergence and spread of diseases, as well as the overall well-being of living organisms.

Climate change and health

- Climate change affects the distribution and prevalence of many diseases, particularly those that are vector-borne, like malaria and dengue fever. Warmer temperatures and altered rainfall patterns can expand the habitats of mosquitoes and other vectors, leading to the spread of these diseases to new areas.
- Extreme weather events, such as floods and droughts, can lead to water scarcity or contamination, impacting both human and animal health by increasing the risk of waterborne diseases.

Habitat destruction and health

- Deforestation and urbanization lead to the loss of natural habitats for many species, pushing wildlife closer to human settlements and increasing the chances of zoonotic disease transmission.

- The disruption of natural ecosystems can also affect the prevalence and spread of infectious diseases. For example, clearing forests for agriculture can increase the risk of malaria by creating ideal breeding grounds for mosquitoes.

Land use changes and health

- Changes in land use, such as agricultural expansion and urban development, can alter the dynamics of ecosystems and the health of their inhabitants. For instance, intensive farming practices can contribute to the spread of antimicrobial resistance by promoting the excessive use of antibiotics in livestock.

- Urbanization can lead to health challenges like increased pollution, higher densities of people and animals, and the proliferation of disease vectors, such as rats and mosquitoes, in cities.

Addressing these environmental factors through a One Health approach involves creating sustainable strategies that consider the health of the environment in conjunction with human and animal health. This can include policies and practices that reduce pollution, conserve natural habitats, manage urban development sustainably, and mitigate the impacts of climate change; all aimed at fostering a healthier planet for all its inhabitants.

Grade-Specific Activities

Grade 9

Citizenship education:

- ✓ Environmental ethics debate: organize a debate on a current environmental issue (e.g., deforestation, plastic pollution) where students argue from the perspectives of humans, animals, and the environment.
- ✓ Community garden project: have students plan and plant a community garden, exploring the benefits for human health, food security, and local ecosystems.
- ✓ Indigenous knowledge fair: invite elders from local communities to share their traditional environmental conservation practices and discuss their connection to human and animal well-being.

Grade 10

Citizen's education:

- ✓ Climate change simulation: use a game or simulation to explore the interconnected impacts of climate change on human health, food security, and animal migration.
- ✓ One Health case studies: analyze real-world examples of zoonotic diseases (e.g., rabies, avian influenza) to understand the link between animal health and human health.

English:

- ✓ Write a story from the perspective of a plant or animal impacted by rapid population growth.
- ✓ Research and present on a traditional medicine practice used to prevent or treat a specific disease.
- ✓ Create a public awareness campaign promoting the use of Moringa Olifera for its nutritional and health benefits.

Grade 11

Environmental hazards

- ✓ Road traffic accidents and wildlife impact: research the impact of road traffic accidents on wildlife populations and discuss potential mitigation strategies.
- ✓ Waterborne diseases and sanitation: investigate the relationship between poor sanitation and waterborne diseases in both humans and animals.
- ✓ Global warming and food security: explore how climate change affects food production and discuss its consequences for human and animal nutrition.

- ✓ **Other Subjects**
- ✓ Indigenous conflict resolution and resource management: analyze how traditional conflict resolution practices can contribute to sustainable resource management and One Health objectives.
- ✓ Telemedicine for rural communities: discuss the potential of telemedicine to improve access to healthcare for both humans and animals in remote areas.

Grade 12

Agriculture

- ✓ Animal breeding for disease resistance: research how selective breeding can help reduce the spread of certain diseases in livestock populations, benefiting both animal health and human food safety.
- ✓ Farm design for waste reduction and environmental sustainability: Design a model farm incorporating waste management practices that minimize environmental pollution and protect public health.

- ✓ Biodiversity Conservation and Food Diversity: Explore the link between biodiversity loss and the decrease in traditional food crops, discussing the importance of preserving both for OH

Biology

- ✓ One Health disease outbreaks: investigate a historical or current disease outbreak (e.g., Ebola, Lyme disease) and analyze the interconnected factors contributing to its emergence and spread.
- ✓ One Health research project: encourage students to research and propose a One Health intervention or solution to address a local environmental or health challenge.

3.5 Module Four: Common One Health issues

3.5.1 Learning outcomes

- ✓ Teachers will identify common One Health issues and their implications for public health.
- ✓ Teachers will analyze the causes and effects of these issues from a One Health perspective.

3.5.2 Teaching Material/Content

- ✓ Emerging and re-emerging diseases, antimicrobial resistance, food safety, and climate change.
- ✓ Impact of these issues on human, animal, and environmental health.

3.5.3 Activities

- ✓ Research and presentation on a chosen One Health issue.
- ✓ Analysis and discussion of current One Health News articles or research findings.
- ✓ Development of an interdisciplinary teaching plan that addresses a specific One Health issue.

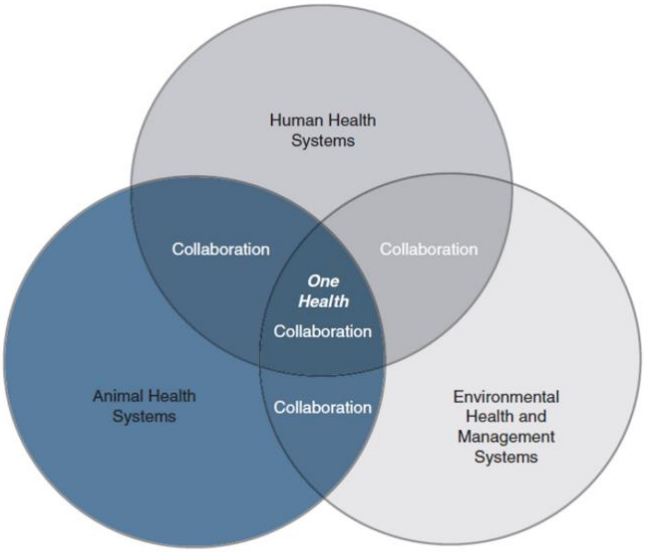
One Health issues include emerging, re-emerging, and endemic zoonotic diseases, neglected tropical diseases, vector-borne diseases, antimicrobial resistance, food safety and food security, environmental contamination, climate change and other health threats shared by people, animals, and the environment. For example:

- Antimicrobial-resistant germs can spread through communities, food supply, healthcare facilities, and the environment (soil, water), making it harder to treat certain infections in animals and people.
- Vector-borne diseases are on the rise with warmer temperatures and expanded mosquito and tick habitats.

- Diseases in food animals can threaten supplies, livelihoods, and economies.
- The human-animal bond can help improve mental well-being.
- Contamination of water used for drinking, recreation etc. can make people and animals sick.

3.5.3.1 One Health Collaboration in action

Figure 2: One Health collaboration



Source: https://www.cdc.gov/onehealth/index.html

3.5.3.2 Highly Pathogenic Avian Influenza (HPAI)

In 2014-2015, HPAI, a virus that infects wild birds, gained an entry point that impacted U.S. food production. According to the United States Department of Agriculture (USDA), over 200 Midwest commercial producer sites had infected turkeys and egg-laying chickens. When HPAI first emerged, the initial reaction was to cull the wild birds and destroy wetland habitat around farms —which helps poultry farms yet doesn't help the wildlife or the environment. But together, the CDC, the USDA, the Department of Interior (DOI), and state agencies worked on the problem, including concerns about how further spread would impact human health as well as the food supply. Stakeholders, like the poultry producers, hunters, environmentalists, and wildlife interest groups worked jointly.

Because of the steering committee leadership, there was an eventual win-win-win: for people, for animals, and for the environment.

3.5.3.3 One Health and the National Park service

The National Park Service (NPS)'s activities range from disease surveillance to providing their managers and staff with "holistic, ecologically based science guidance for ecosystem, wildlife and visitor health," to visitor education in order to prevent acquiring diseases transmitted from either the environment or wildlife vectors.

One Health is a holistic approach that emphasizes the interconnectedness of human, animal, and environmental health. It advocates for interdisciplinary efforts to address global health challenges, involving professionals from various fields. The approach is rooted in pandemics and environmental crises, emphasizing the need for a unified approach. It emphasizes the importance of sustainable practices and ecosystem preservation for overall health. One Health requires a shift in perspective, educating future generations, fostering interdisciplinary collaborations, advocating for policy changes, and promoting sustainable practices to create a healthier, more resilient global community.

Activity

- ✓ Define and discuss Emerging and Re-emerging Zoonotic Diseases
- ✓ Disease bingo: create bingo cards with squares containing names of zoonotic diseases. As trainees learn about different examples, they mark off squares. The first trainee to complete a row or column wins
- ✓ Zoonotic disease trading cards: Have trainees research specific zoonotic diseases and create trading cards with information about the disease, transmission methods, and prevention strategies
- ✓ One Health risk analysis: divide the class into groups and assign each group a different zoonotic disease. Have them research and present on the potential risks of the disease for human, animal, and environmental health
- ✓ Neglected Tropical Diseases and vector-borne diseases:
- ✓ Map it out: provide students with world maps and markers. Ask them to research the distribution of different neglected tropical diseases and vector-borne diseases, marking locations and connecting them to potential factors like climate and geography.
- ✓ Life cycle challenge: have trainees research the life cycle of a specific neglected tropical disease or vector-borne disease and create visual representations (drawings, diagrams, animations) to explain it.
- ✓ Antimicrobial Resistance, food safety, and environmental contamination

- ✓ Antibiotic dilemma debate: organize a debate on the issue of antibiotic use in livestock, considering the potential benefits for animal health and the risks of contributing to antimicrobial resistance.
- ✓ Foodborne frenzy: create a game show format where trainees answer questions about food safety, contamination risks, and proper handling practices. Award points for correct answers and crown the ultimate food safety champion.
- ✓ Water woes Simulation: divide the class into groups representing different stakeholders (farmers, residents, environmental agencies). Create a scenario of water contamination and have each group discuss the potential impacts and propose solutions based on their perspectives.
- ✓ Human-animal bond and climate change:
- ✓ Pet therapy project: partner with a local animal shelter or therapy organization for trainees to volunteer with therapy animals and learn about the positive impact of the human-animal bond on mental well-being.
- ✓ Climate change consequences brainstorm: Hold a brainstorming session where trainees identify potential health impacts of climate change on humans, animals, and the environment. Discuss possible mitigation and adaptation strategies.
- ✓ On Health photo essay: Challenge trainees to create a photo essay that tells a story about a specific One Health issue in their community, highlighting the interconnectedness of human, animal, and environmental health.

Activity

One Health is a rapidly evolving field, with new challenges and opportunities emerging all the time. Here are some activities to help you explore the latest trends:

One Health News investigation:

- Divide trainees into groups and assign each group a recent news article about a One Health issue.
- Have them research the topic further, analyzing the article's claims, identifying relevant scientific evidence, and considering different perspectives.
- Each group can then present their findings to the class, leading a discussion about the current state of the issue and potential One Health solutions.

One Health technology showcase:

Ask trainees to research and present on emerging technologies that are being used to address One Health challenges. This could include:

- Biosensors for rapid disease detection in animals and humans
- Artificial intelligence for predicting and preventing outbreaks
- Drone technology for environmental monitoring and disease control
- Telemedicine for providing healthcare in remote areas
- Encourage trainees to think critically about the potential benefits and limitations of these technologies in a One Health context.

✓ **One Health policy debate:**

Choose a current One Health policy issue, such as:

- Mandatory vaccination programs for animals
- Antibiotic use regulations in agriculture
- International collaboration on pandemic preparedness

Divide the class into two teams representing opposing viewpoints on the issue.

- Have each team research their position and prepare arguments based on scientific evidence, ethical considerations, and economic factors.
- Organize a debate where trainees present their arguments and engage in respectful dialogue.

One Health future design challenge:

Present trainees with a hypothetical One Health challenge set in the future, such as:

- A new zoonotic disease outbreak in a rapidly urbanizing area
- The impact of climate change on food security and water quality
- The emergence of antibiotic-resistant superbugs in both humans and animals

- Challenge trainees to design innovative and sustainable solutions to address the challenge, considering the interconnectedness of human, animal, and environmental health.

Encourage them to think creatively and use their knowledge of One Health principles to develop comprehensive solutions.

3.6 Module Five: Teaching strategies of One Health in secondary schools

3.6.1 Learning objectives

Upon completion of these teachers will be able to:

- Understand and utilize various active learning tools to effectively teach One Health concepts.
- Determine the most appropriate active learning tool for different One Health content areas.
- Explain diverse approaches for teaching One Health, highlighting the integration of human, animal, and environmental health.

3.6.2 Teaching materials/contents

- Interactive discussions on the tools
- Apply various tools in teaching
- Case studies and discussions: analyze and discuss real-life cases that highlight the interconnectedness of human, animal, and environmental health. Encourage members to present and share their insights.
- Simulation methods (role play, drama, simulated legislative, legislative hearing, mock election, and mock trail): simulation with its techniques for One Health lessons can be preferable to having students in a classroom to learn on their own or lecturing them.
    - Role-playing: is a method of teaching which attempts to clarify the concepts and facts of One Health through dramatization.
    - Discussion: this is one of the most valuable techniques in the teaching of history. It aims at finding the solution of a One Health related problem through the establishment of agreement or consensus. Each group can summarize their views of One Health in written form, or even pictorially.
- Cooperative learning method or collaborative teaching (Group, Team based). "Cooperative learning" is a type of active learning that involves groups of three or more students working together on a task. Itis the instructional use of small groups that allows students to work together to maximize their own and each other's learning.
- Independent work (project work or individual work)- Individualized learning, or individualized instruction, is a method of teaching in which content, instructional technology, and pace of learning are based upon the abilities and interest of each learner.
- Research teaching method: this can be an extended project that takes several weeks of teaching time. For shorter projects different groups of students can find out about different aspects of One Health and present information to the others. For example, different groups of students might research the interconnectedness of human, animal and environment.

- Problem solving: this is the process of closing the gap between the existing (current) stage of One Health and desired state. Problem solving is a type of teaching in which students use facts, concepts, principles & generalization in the process of solving problems & making decision regarding a subject matter. It enables the students to develop problem solving & decision-making skills.
- Demonstrations: students are expecting to observe and demonstrate the interconnectedness of human, animal and environment.
- Debate: debating is a process that involves formal discussion on issues. In a debate, opposing arguments are put forward to argue for opposing viewpoints.
- Observation: invite the students to observe how the community implements One Health in their day-to-day life. Learning happens whenever a student watches or listens to someone else ''doing'' something that is related to what they are learning about.
- Inquiry learning: invite the students to identify, investigating and clarifying issues and drawing of conclusion.
- Inviting guests: invite experts to deliver guest lectures or conduct workshops on specific One Health topics.
- Jigsaw: The class is divided into groups who are given different but related tasks about One Health- for example to analyze the interconnectedness of One Health issues. Each group research about human, animal and environment. After a suitable time, the groups are reformed, so they contain one person from each of the previous groups. In the new groups members who had researched different components of One Health take turns to share their learnings.
- Field trip/community-based methods: out of school visits give students first-hand experiences of One Health. Students should be encouraged to take as much responsibility as appropriate for all stages of the visit. Visits need to have a clear focus relevant to the content of course/s. All visits need careful planning and preparation. Field trips allow students to investigate One Health issues through observation & interview.
- Brainstorming: teachers are expected to brainstorm with the students about One Health issues before proceeding to the actual presentation of the lesson based on the content of the subject.

3.6.3 Activities and Exercises of OH in secondary schools

- Educational workshops and seminars: host workshops and seminars on One Health topics, inviting experts from academia, healthcare, veterinary medicine, and environmental science to share insights.
- Awareness campaigns: develop awareness campaigns on One Health issues using posters, pamphlets, and social media. Organize events during World One Health Day or other relevant occasions.
- Field trips and excursions: visit relevant facilities like research laboratories, wildlife conservation centers, public health agencies, and veterinary clinics to gain practical exposure and firsthand experiences related to One Health.
- Community outreaches: engage in community outreach activities, such as health screenings, vaccination drives, or environmental clean-up projects.
- Conferences and symposia: Organize/participate in One Health conferences, symposia, or panel discussions. These events provide opportunities to network with professionals and experts in the field.
- Community service: engage in volunteer work that directly relates to One Health principles, such as assisting at animal shelters or participating in community health programs.
- Advocacy and policy engagement: advocate for One Health principles' integration into health, agriculture, and environmental policies, raising awareness about policy issues affecting One Health.
- Interdisciplinary collaboration: foster collaboration among members from various academic disciplines, encouraging them to teach together on topics.
- Competitions and challenges: organize competitions, related to One Health problem-solving.
- Publication and advocacy materials: create publications, blogs, or videos that educate the broader community about One Health concepts and issues.
- Question & answer and discussion: Allocate time for a question & answer session regularly allowing attendees to ask questions and engage in discussions.

3.6.4 Structuring the exercise

- Problem-based – present real-world One Health problems for analysis and resolution, encouraging students to consider perspectives of all stakeholders, including humans, animals, and the environment. Focus should not only be on humans, but on other One Health components such as animals and the environment. Some students should represent animals (domestic and wild) while others represent the broader environment. Have each group research the problem from their stakeholder perspective – this can be done in stages. The groups then come together and present their findings. Then have each group modify

their findings based on what they have learned from the other groups OR (if a small group) have students develop one or more solutions or answers that take the perspectives of all stakeholders into account.

- Problem-based, cross disciplinary – Develop units that integrate One Health themes across subjects like Geography, Biology, and Agriculture, promoting a comprehensive understanding of One Health.

Research-based activities – encourage students to investigate One Health topics, culminating in presentations or discussions that incorporate diverse viewpoints.

- Project based activities – implement activities like recycling competitions or environmental monitoring, linking practical tasks to One Health learning objectives

Activities

One Health, a multifaceted concept involving human, animal, and environmental health, requires engaging activities and strategies for effective teaching in secondary schools. Students can be engaged in One Health education through activities and strategies, fostering curiosity, collaboration, and critical thinking about human, animal, and environmental health. This can be through the following approaches:

- Real-world case studies: analyze outbreaks of zoonotic diseases like rabies or Ebola, environmental contamination from industrial waste, or food-borne illnesses like salmonella poisoning. discuss how human actions, animal health, and environmental factors all played a role.
- Interactive simulations: use online simulations like "Outbreak: Epidemic Edition" or role- playing to model disease outbreaks or environmental challenges. Trainees can experience the interconnectedness firsthand and explore collaborative solutions.
- Interdisciplinary projects: combine subjects like biology, geography, and social studies to tackle One Health challenges. Trainees can research topics like antibiotic use in agriculture, the economic impact of deforestation, or public policy responses to climate change.

Promoting collaboration and active learning:

- Problem-based learning: present real-world One Health problems like antibiotic resistance or water pollution. Challenge trainees to work in teams to find solutions, considering different perspectives and stakeholders.

- Expert guest speakers: invite veterinarians, public health officials, or environmental scientists to share their expertise and career experiences. This can spark trainee interest and showcase the diverse applications of One Health principles.
- Community partnerships: partner with local organizations working on One Health issues like animal shelters, environmental conservation groups, or public health departments. Trainees can volunteer, participate in projects, and learn from practical experiences.

Developing Critical Thinking and Action-Oriented Skills

This can be supported through the following activities

- Debates and discussions: encourage respectful debate on controversial One Health topics like mandatory vaccination for pets or the ethics of genetically modified organisms. This helps students develop critical thinking skills and consider multiple perspectives.
- Media analysis: analyze News articles, documentaries, or social media posts about One Health issues. Identify biases, evaluate evidence, and discuss the impact on public perception. Encourage trainees to create their own media content to raise awareness and advocate for solutions.
- Action planning and advocacy: after exploring a One Health issue, empower trainees to act. They can develop campaigns to promote healthy hygiene practices, write letters to policymakers advocating for policy changes, or organize fundraisers for relevant organizations.

3.6.5 Additional Tips:

- Utilize technology: online simulations, interactive maps, data visualization tools, and virtual field trips can enhance learning and make abstract concepts more concrete.
- Focus on local relevance: connect One Health topics to local issues and communities. This makes learning more meaningful and relevant for trainees and allows them to see the practical applications in their own lives.
- Promote active learning: move beyond traditional lectures and incorporate activities, games, group work, and discussions to keep students engaged and stimulated.

3.6.6 Ideas for Community Engagement

Engaging students in community projects related to One Health can be incredibly enriching. Here are some ideas for teachers to involve students in such initiatives:

1. Health awareness campaigns: organize campaigns within the community to raise awareness about zoonotic diseases, environmental health, or the importance of vaccination for domesticated animal. Students can create posters, pamphlets, or even short educational videos to disseminate information.

2. Community clean-up and environmental projects: partner with local environmental groups or authorities to organize clean-up drives in areas affecting both human and animal habitats. Discuss the impact of pollution on health and ecosystems.

3. School gardens or green spaces: create a school garden or green space that demonstrates the interdependence of humans, animals, and plants. This could involve planting vegetables, herbs, or flowers while discussing the ecosystem benefits and connections to health.

4. Collaboration with animal shelters or wildlife rehabilitation centers through student volunteers. This provides students opportunities to learn about animal health, care, and the impact of environmental factors on animals.

5. Health surveys and data collection: conduct surveys or gather data in the community regarding health concerns or environmental issues. Analyze the data collected to understand correlations and present findings to the community.

6. Organize workshops or talks- invite professionals from various fields (veterinarians, environmentalists, public health officials) for talks or workshops. These sessions can educate students and the community about various One Health topics.

7. Media engagement: task students with creating and presenting for local radio stations, mini media, community centers, or social media platforms. This could cover topics like responsible domestic animal ownership, preventing disease transmission, or promoting healthy ecosystems.

8. Partnerships with local health authorities: collaborate with local health authorities to organize health screening camps or vaccination drives. This could involve educating the community about the importance of regular health check-ups for both humans and tame animal.

9. Fundraising events: organize events or fundraisers to support organizations working towards One Health. This could include raising funds for wildlife conservation, supporting animal shelters, or promoting initiatives related to clean water and sanitation.

10. Community workshops on sustainable practices: teach community members about sustainable practices that benefit both human and environmental health, such as composting, reducing plastic use, or water conservation.

Activities

Engaging students in community One Health projects:

Connecting One Health concepts to real-world experiences through community projects allows students to see the practical applications of their learning and make a positive impact. Here are some ideas to get you started:

Animal welfare and zoonotic disease prevention:

- Pet adoption/vaccination campaigns: partner with local shelters to organize adoption events or volunteer time to socialize animals. Students can also assist with vaccination clinics, raising awareness about the importance of preventing zoonotic diseases.
- Animal hygiene and care workshops: conduct workshops for community members on responsible pet ownership, proper animal hygiene practices, and recognizing signs of diseases that can be transmitted to humans.
- Public awareness campaigns: create and distribute informational pamphlets, posters, or short videos about zoonotic diseases and preventive measures like hand washing and safe handling of animals.

Environmental Health and Sustainability

- Clean-up drives: organize local clean-up projects in parks, community gardens, or neighborhoods. This can help improve environmental health and reduce pollution, potentially impacting the spread of vector-borne diseases.
- Community gardens and sustainable agriculture: partner with local organizations to establish community gardens where students can learn and teach sustainable farming practices, promoting healthy food consumption and reducing environmental impact.
- Water quality monitoring: train students to test local water sources for contamination and educate the community about water safety and its importance for both human and animal health.

Public Health promotion and education

- Hygiene and sanitation workshops: conduct workshops for students or community members on proper hygiene practices like hand washing, safe food handling, and waste management and disposal, emphasizing their role in disease prevention.
- One Health awareness campaigns: organize health fairs or presentations to educate the community about One Health principles, showcasing the interconnectedness of human, animal, and environmental health.
- School health initiatives: implement projects within the school itself, like promoting healthy lunches, establishing hand washing stations, or creating murals depicting One Health concepts.

Remember:

- Collaborate: partner with local organizations, with animal shelters, public health departments, environmental agencies, or NGOs to leverage their expertise and resources.
- Project feasibility: choose projects that are manageable within the timeframe and resources available.
- Focus on student needs and interests: Consider students' age, skillset, and preferred activities when choosing projects.
- Evaluate and reflect: monitor the projects' impact, adjust as needed, and encourage students to reflect on their experiences and their contribution to improving community health.

4.1 Module Six: Assessment tools

4.1.1 Learning objectives

Upon completion of these objectives, teachers will be able to:

- ✓ Utilize a variety of active learning and assessment tools to evaluate One Health (OH) concepts.
- ✓ Select appropriate assessment tools for different One Health content areas.
- ✓ Describe diverse approaches for teaching and assessing One Health topics.

4.1.2 Teaching materials/contents

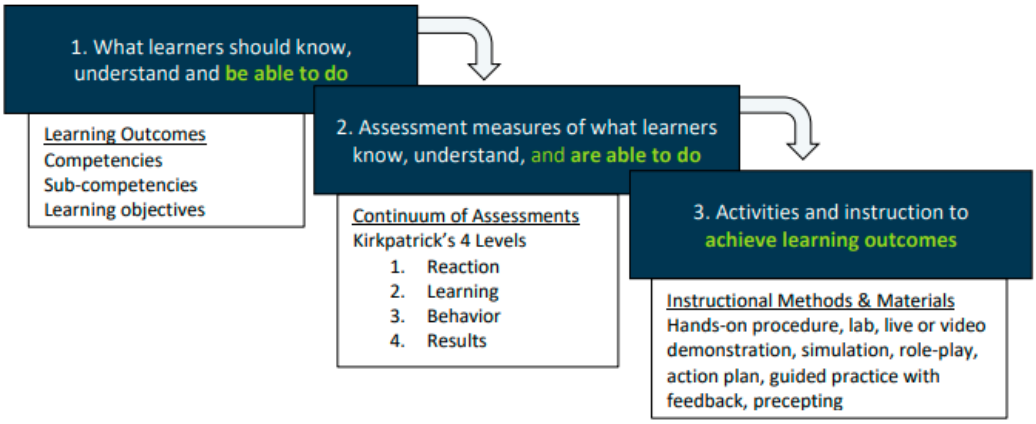
- ✓ Engage in interactive discussions to explore various assessment tools.
- ✓ Apply different assessment tools in teaching to determine their effectiveness in assessing student understanding of One Health concepts.

To have an outstanding school One Health guideline it is important to design a valid, reliable, and fair assessment toolkit.

- Valid assessment allows students to display that they have achieved the learning outcomes that are being assessed.
- Reliable assessment produces results that are accurate and consistent across a cohort and over time.
- Fair assessments give students a reasonable prospect of achieving results.

During development and implementation of assessment toolkits, it is necessary to ensure inclusive and effective assessment design, anticipated challenges and affordability studies related to that specific school are addressed and important approaches are attained in relation to marking results.

Figure 3: Backward educational planning approach



Adapted from Wiggins et al 2005(Source: One Health Workforce Competency Framework and Evaluation Toolkit | August 2022)

After successful information sharing, students are expected to develop a competency of critical thinking, making judgments, problem solving, and developing plans in implementation of One Health. Students are also expected to demonstrate knowledge and understanding. This manual consists of the following tools to assess the understanding of students with regards to perceptions towards One Health at school level:

1.Computer-based assessments: these tools are short descriptive questions which can be accessed through mobile devices, tablets and personal computers. They mainly take the form of surveys or different types of quizzes. These tools have the following advantages:

- Enable students to work at their own pace and flexibly depending on the other demands on their time.
- Enable students on large courses to do homework on a weekly basis.
- Encourage students to work progressively to acquire key One Health concepts.
- Create an interactive learning environment which may be particularly attractive for students on distance learning programs.
- Students get immediate feedback on their work.
- Improve reliability for kinds of assessment.
- Ensure impartiality and provide equal opportunity.
- Enable the tutor to monitor the development and performance of students.
- Enable the tutor to identify potentially challenging aspects of the learning process and provide general feedback and thus removes the need for individual feedback.

- Can be adapted to test basic knowledge and practice basic skills or to more sophisticated manipulations.

2. Essays: these can be designed in written time-constrained closed book exam conditions or constructed in open conditions. These methods will provide qualitative knowledge status of students and produce the following results:

- Encourage students to develop their own critical voice.
- Enable students to develop skills and good practice of One Health.
- Encourage students to link theoretical perspectives from the academic literature.

3.Oral presentations: this can be a group or individual level activity related to storytelling assignment given to students to display One Health related narrative to classmates or community. This can be done via face to face or virtual platforms through support by teachers or club members.

4.Posters and display materials: Posters present text and graphical information on a single page. They offer students a way of working with academic material that emphasizes visual and spatial meaning making and requires a close consideration of audience. Additionally, a poster is an authentic form of assessment, with applications to a range of real-life practice.

These assessment toolkit processes consisted of three phases:

1) **Phase I** consisted of self-reporting by students in the One Health clubs.
2) **Phase II** is a process of review that assesses whether students are putting into place the necessary time, attention, and procedures to implement One Health principles.
3) **Phase III** is created to review and provide feedback the One Health platform.

4.1.3 Assessment Tools for One Health in Secondary Schools

Evaluating student learning in One Health requires tools that go beyond traditional tests and quizzes. Here are some ideas for diverse and engaging assessment methods:

4.1.3.1 Formative Assessment

- Concept maps and diagrams: have students visually present their understanding of complex One Health concepts like zoonotic disease transmission pathways, environmental factors impacting health, or the links between food safety and human health.
- Exit tickets: use short, reflective questions at the end of lessons to gauge student understanding and identify areas needing further clarification.
- Debates and discussions: observe student participation in class discussions and debates on One Health issues, assessing their critical thinking skills, ability to defend arguments, and understanding of different perspectives.

- Peer review and self-reflection: encourage peer review of projects, presentations, or written work, allowing students to give and receive feedback constructively. Self-reflection activities like journals or exit tickets can also provide valuable insights into their learning process.

4.1.3.2 Summative Assessment

- Interdisciplinary projects: assess students' ability to apply One Health principles in projects that combine knowledge from different subjects. This could involve designing a sustainable agricultural system, planning a response to a simulated disease outbreak, or creating a multimedia presentation on a local One Health challenge.
- Portfolios and presentations: encourage students to compile evidence of their learning throughout a unit or semester in a portfolio. This could include research papers, creative writing pieces, project documentation, or recordings of presentations.
- Research essays or reports: assign research tasks for students to delve deeper into specific One Health topics. Assess their ability to gather and analyze information, draw conclusions, and communicate their findings effectively.
- Action plan and advocacy project: evaluate students' understanding and commitment to acting by assessing their development of a plan to address a specific One Health issue in their community, school, or local environment.

Additional Tips

- Align assessment tools with learning objectives: choose assessment methods that directly measure the specific skills and knowledge you want students to gain.
- Use a variety of tools: employ a combination of different assessment methods to cater to different learning styles and gather a comprehensive picture of student understanding.
- Provide clear criteria: ensure students understand the expectations for each assessment and the rubrics used for evaluation.
- Offer feedback and reflection opportunities: use assessment results to provide constructive feedback and guide students in their learning journey. Encourage them to reflect on their strengths and weaknesses and set goals for further improvement.

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