

Integration between environmental education, One Health, and the teaching-learning process in health technologies

Integración entre educación ambiental, Una Salud y proceso enseñanza aprendizaje en tecnologías de la salud

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ABSTRACT

Background: education must transform modes of action in correspondence with the environment and the relationship of society with nature, which is why it is necessary to reinforce knowledge in this regard.

Objective: to assess the integration between environmental education, One Health, and the teaching-learning process in health technologies at the University of Medical Sciences of Villa Clara.

Methods: an exploratory study was carried out at the Nursing-Health Technology Faculty of the University of Medical Sciences of Villa Clara, during the first semester of 2025.

Theoretical methods were applied: historical-logical; analytical-synthetic; inductive-deductive; system approach; transition from the abstract to the concrete and structural systemic; empirical: survey; and mathematical-statistical: descriptive statistics.

Results: a low level of knowledge was found about the effects of environmental pollution on the health of people, animals, and plants in students and teachers, as well as insufficient methodological preparation and didactic-methodological guidelines to achieve integration between environmental education, One Health, and the teaching-learning process in health technologies.

Conclusions: the assessment evidenced the need for methodological preparation of teachers to favor the comprehensive training of students, so that they are responsible for their environment and capable of protecting the environment due to its impact on the life of living beings.

MeSH: environmental health education; impact of pollution on health; health vulnerability; quality of life; health promotion; education, medical

RESUMEN

Fundamento: la educación debe transformar los modos de actuación en correspondencia con el ambiente y la relación de la sociedad con la naturaleza, por lo que es necesario reforzar los conocimientos al respecto.

Objetivo: valorar la integración entre la educación ambiental, Una Salud y el proceso enseñanza aprendizaje en las tecnologías de la salud en la Universidad de Ciencias Médicas de Villa Clara.

Métodos: se realizó un estudio exploratorio en la Facultad Enfermería-Tecnología de la Salud en la Universidad de Ciencias Médicas de Villa Clara, durante el primer semestre del año 2025. Se aplicaron métodos teóricos: histórico-lógico; analítico-sintético; inductivo

deductivo; enfoque de sistema; tránsito de lo abstracto a lo concreto y sistémico estructural, empírico: encuesta, y matemático-estadístico: estadística descriptiva.

Resultados: se constató escaso nivel de conocimientos sobre los efectos de la contaminación ambiental en la salud de personas, animales y plantas en estudiantes y profesores, así como insuficiente preparación metodológica y de orientaciones didáctico-metodológicas para lograr la integración entre la educación ambiental, Una Salud y el proceso enseñanza aprendizaje en las tecnologías de la salud.

Conclusiones: la valoración evidenció la necesidad de preparación metodológica en los profesores para favorecer la formación integral de los estudiantes, a fin de que sean responsables con el entorno y capaces de proteger el medio ambiente por su incidencia en la vida de los seres vivos.

DeSC: educación en salud ambiental, impactos de la polución en salud; vulnerabilidad en salud; calidad de vida; promoción de salud; educación médica

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INTRODUCTION

The analysis of the global environment is a topic of constant interest and concern for humanity due to the high levels of pollution affecting plants, animals, and people. The fact that the daily lives of billions of inhabitants were affected by the medical, social, and political aspects of the SARS-CoV-2 pandemic demonstrates the need to consolidate the understanding of One Health in society.

The concept of One Health is not new; it dates back at least two hundred years. There is no single internationally agreed definition, although several have been suggested. The most widely used, shared by the United States Centers for Disease Control and Prevention and the

One Health Commission: "... is defined as a collaborative, multisectoral, and transdisciplinary approach (working at the local, regional, national, and global levels) with the aim of achieving optimal health outcomes, recognizing the interconnection between people, animals, plants, and their shared environment".⁽¹⁾

Since the second half of the 20th century, the main effects of human activity on the environment and vice versa have been recognized. The greenhouse effect, the deterioration of the ozone layer, deforestation, drought, earthquakes, typhoons, and the pollution of oceans, seas, and coasts generated by human action stand out; in turn, cardiovascular, respiratory, and endocrine conditions, the risk of cancer, and new zoonoses produced by the modified environment on human health are increasing.

Freire Vinueza *et al.*⁽²⁾ assume in their research that the United Nations Global Environment Outlook report confirms that pollution kills around 7 million people each year and that by 2050, the global temperature will increase by 2°C; this increase will be responsible for the melting of Arctic waters and will have a negative impact on all regions of the world: it will force about one billion people to live in desert areas and will lead to an increase in the level of greenhouse gases.

The One Health approach mobilizes multiple sectors, disciplines, and communities at different levels of society in joint work to promote well-being and address threats to health and ecosystems.⁽¹⁾ In this sense, it is necessary to start by reinforcing this knowledge and citizen education.

According to Corbetta,⁽³⁾ education is a strategy for social change and an opportunity aimed at providing competencies to participate in the production of changes, where universities, in their objective of comprehensive student training, must teach them to learn to be, to live together, to change, and to be capable of participating in the processes of transforming reality. Thus, its objective is to transform modes of action in correspondence with the environment and the relationship of society with nature.

The inclusion of the science-society-environment approach in the teaching-learning process contributes to giving greater relevance to classes and stimulates research activity. This achieves a positive attitude towards scientific and technological development in students and prepares them comprehensively as professionals to evaluate and counteract the effects caused by environmental pollution on people, animals, and plants.

In medical science universities, the inclusion of these aspects in the curricula is of outstanding importance according to the occupational profile for the diagnosis, treatment, and rehabilitation of diseases. It is the teachers' responsibility to achieve this. To do so, they must have adequate scientific-methodological preparation that allows them to meet the educational needs of students in the search for an integrative vision of the world, characterized by a growing process of unification in all human activities.

Based on the above assumptions, the objective of this study is to assess the integration between environmental education, One Health, and the teaching-learning process of health technologies at the University of Medical Sciences of Villa Clara.

METHODS

An exploratory study was carried out at the Health Technology and Nursing Faculty belonging to the University of Medical Sciences of Villa Clara during the first semester of 2025. From the universe, consisting of 181 second-year students of the regular day course in technology careers and their 34 teachers, a random sample of 90 students and 15 teachers was selected.

Theoretical methods:

- Historical-logical: allowed the analysis of the integration between environmental education, One Health, and the teaching-learning process of health technologies at the University of Medical Sciences of Villa Clara.

- Analytical-synthetic: to delve into the phenomenon under study and its relationship with other objects; in addition, to understand the importance of the integration between environmental education, One Health, and the teaching-learning process.
- Inductive-deductive: used to understand how the cause-effect and content-form interrelation is expressed, to analyze the behavior of these categories at different stages of the teaching-learning process development, and then to understand how they are found in current conditions.
- System approach: provided the general orientation of the investigated object, as a reality integrated by components that fulfill certain functions and maintain relationships among them.
- Transition from the abstract to the concrete: facilitated deepening the interrelations between theory and practice that allowed establishing the problem to be studied, the objective, and the foundation of the results.
- Structural systemic: allowed understanding the nature of the phenomenon studied by addressing it multilaterally, considering the integration of the different pathways and components, their functions, and their interrelations, which determines, on the one hand, the structure of the object, and on the other, its dynamics during the development of the research work.

Empirical methods: two questionnaires were designed based on the study variables; one was applied to students to verify their level of knowledge about the relationship between environmental pollution and One Health; and the other was used to specify the teachers' criteria regarding methodological preparation to develop the relationship between environmental pollution and One Health in the teaching-learning process.

The data were recorded in a spreadsheet of the Microsoft Excel program and then evaluated using the statistical software SPSS version 23, which allowed the elaboration of statistical tables and figures to present the findings during the research process. The variables used were summarized through the determination of absolute and relative frequencies, which served for the analysis and presentation of the results.

The ethical principles set forth in the Declaration of Helsinki of the World Medical Association were taken into account.

RESULTS AND DISCUSSION

It is currently recognized that humanity faces a diversity of major health risks. The World Health Organization (WHO) has reported that 24% of all deaths are related to the environment (approximately 13.7 million deaths per year). To face this reality, one must possess knowledge about the influence of environmental pollution on the health of living beings.

Figure 1 shows the results of the student questionnaire, regarding the association they make between environmental pollution and alterations in human, animal, or plant health. It was evidenced that only 44.4% associated respiratory and cardiovascular diseases with air pollution; regarding gastrointestinal and renal diseases, 38.9% faithfully responded that the main cause is water pollution; 60% correctly linked poisonings, allergies, skin diseases, and the increased incidence of some types of cancer with soil pollution.

It was observed that less than half (40%) adequately associated hormonal disorders, developmental alterations, neurodegenerative diseases, and genetic affectations with exposure to chemical products; 47.6% related the decrease in cognitive capacity in animals and damage to air sacs and navigation problems in birds with air pollution; and only 33.3% stated that the main cause of reduced growth and photosynthesis in plants is soil pollution.

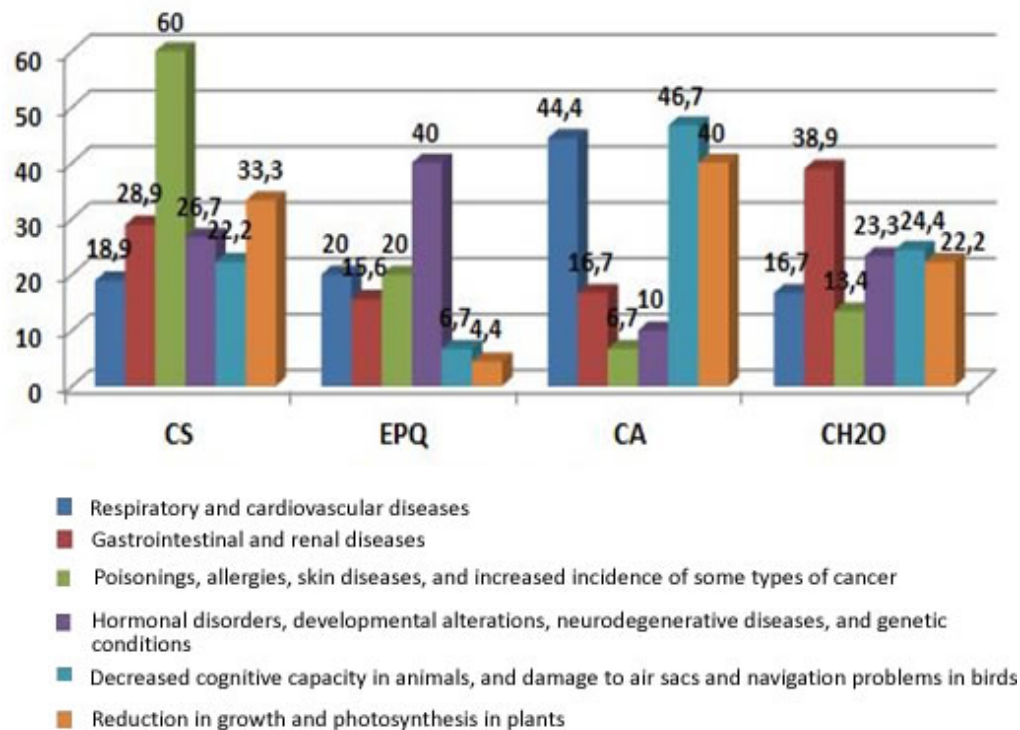


Fig. 1. Association between environmental pollution and alterations in human, animal, or plant health. Faculty of Health Technology and Nursing. 1st semester. 2025

Source: questionnaire

The relationship between One Health and environmental pollution is a crucial and complex issue that significantly impacts the world. Air, water, and soil pollution, as well as exposure to chemicals, have adverse effects on the health of living beings.

According to the WHO,⁽⁴⁾ ambient air pollution is responsible for the annual death of approximately 4.2 million individuals, and 2.8 million die from breathing polluted indoor air worldwide. Air quality problems range from urban smog to smoke from biomass combustion in rural areas. Mortality occurs mainly due to stroke, heart disease, chronic obstructive pulmonary disease, lung cancer, and acute respiratory infections.

The persistent effect of breathing polluted air is a silent process over years, which ultimately leads to the development of acute cardiovascular conditions, such as heart attack. It is

necessary to know about air quality in a given area, in the place where one resides or works, with what sources, with what substances, and to what extent a region is contaminated; this is a study of utmost importance today, where human activity increasingly influences the negative change of its environment and where a thoughtful and planned effort for the design of the protection of living beings and their habitat is imperative.

As Rahman *et al.*⁽⁵⁾ express, if sanitation and hygiene are unsafe or inadequate, they can cause a great diversity of diseases through various transmission routes. The ingestion of water contaminated with feces or chemical agents, inadequate personal hygiene related to supply problems, consumption or contact with water containing pathogens, proximity to water bodies where vectors proliferate, and increased exposure to microplastics constitute a potential for metabolic and neurological alterations.

Regarding chemical pollution, Moreno Sánchez⁽⁶⁾ states that it is estimated that there are more than 160 million chemical agents, and the United Nations Environment Programme expects them to almost double from 2017 to 2030, which will be directly proportional to the 1.6 million deaths due to poisonings, heart diseases, chronic respiratory diseases, and cancer. Chemical agents of concern for public health include air pollutants: asbestos, arsenic, cadmium, benzene, dioxins, inadequate or excess fluoride, mercury, lead, and pesticides, among others.

Air pollution is an environmental phenomenon present in the environment. The authors of this work agree with Muñoz Pérez *et al.*⁽⁷⁾ when they affirm that several studies show that in this type of pollution there is a presence of components such as nitrogen dioxide and carbon monoxide that affect, when breathing, people's health and cause problems in animals - similar to those in humans-; they affect indoor pets, cause stress in dogs, and increase the risk of lung cancer in both dogs and cats.

This situation, as expressed by Leal Esper,⁽⁸⁾ gradually affects the ecosystem, since it deteriorates the air breathed by all living beings, due to emissions and discharges of polluting fluids, which generates an increase in greenhouse gases, climate change, and contributes to ending the life of fauna and flora.

The Food and Agriculture Organization of the United Nations⁽⁹⁾ states that soil pollution causes a chain reaction. It alters soil biodiversity, reduces its organic matter content and its capacity to act as a filter. It also contaminates surface and groundwater, causing an imbalance in its nutrients.

This problem is very dangerous because when plants begin to become scarce due to the lack of suitable soil in which they can develop, animals will also begin to become extinct, and in this way the food chain will gradually deteriorate. Faced with this problem, human beings would have no food, which would cause their extinction for not caring for and protecting nature⁽⁸⁾.

The diagnosis showed that students have knowledge deficiencies about the effects of environmental pollution on the health of living beings. What is not known does not exist, so is there an incentive to influence the prevention and mitigation of environmental pollution?

The findings agree with Varer Akpınar *et al.*,⁽¹⁰⁾ who report a lack of knowledge about the One Health concept in 40.2% of the surveyed students. In their study, they reveal that although knowledge on the subject is limited, in general they showed a positive attitude towards the need for its acquisition for better professional performance. They also recognize the need to incorporate the topic into the curriculum of the different academic years.

It coincides with Mete *et al.*⁽¹¹⁾ when they report that only 30% of students stated they had information about the One Health concept, and of them, only 16.5% recognize medical training as the source of acquisition. The absence of significant differences between those who had received information about One Health through medical education and those who had never received it led them to consider the contribution of medical education to this approach very low and to raise the need for its integration into the curriculum of the different years of all medical sciences careers.

Academic medical institutions are called upon to adopt interdisciplinary One Health approaches, both in research and education. Hobusch *et al.*⁽¹²⁾ affirm that to achieve truly effective and widely accessible One Health education, it is essential to apply interdisciplinary educational frameworks and strategies. They advocate for the implementation of these

approaches in official curricular programs adapted to the learning context, mainly in the subjects.

The findings point to the need to strengthen environmental education content and integrate it with the teaching-learning process to contribute to comprehensive training for conscious, responsible citizens capable of protecting the environment. For this, it is necessary that teachers, fundamentally in universities, are aware and prepared to face this problem.

In this regard, a questionnaire was administered to health technology professors about the need for methodological preparation to develop the integration between environmental education, One Health, and the teaching-learning process. The results are shown in Figure 2.

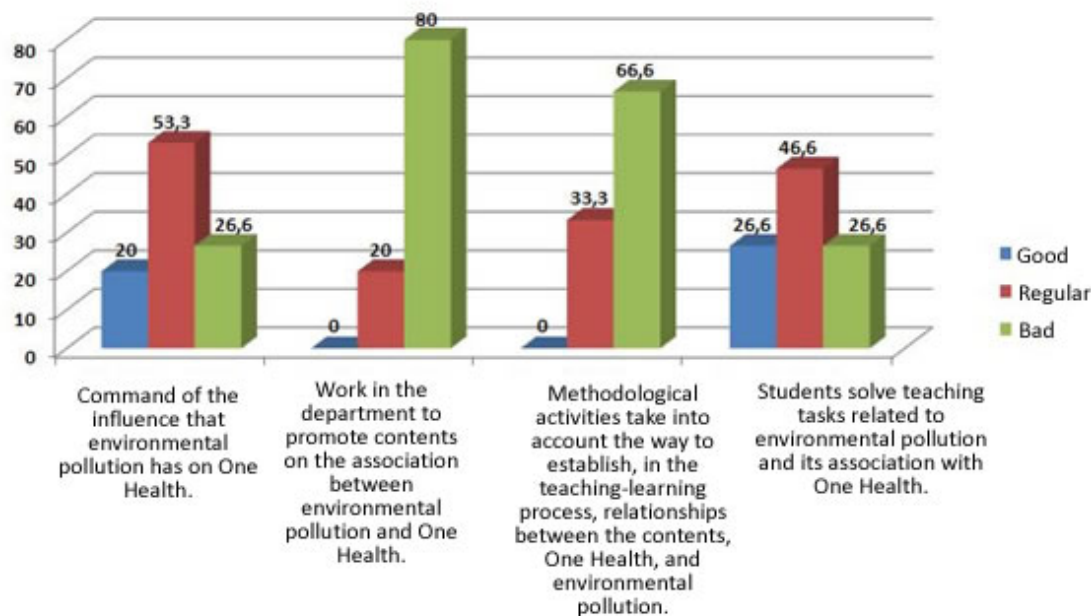


Fig. 2. Need for methodological preparation to develop in the teaching-learning process the relationship between environmental pollution and One Health. Faculty of Health Technology and Nursing. 1st semester. 2025

Source: questionnaire.

It was observed that regarding the mastery of the influence of environmental pollution on One Health, more than half of the professors (53%) rated themselves as "fair," and 26% placed themselves in the "poor" category.

This coincides with Cadavid *et al.*⁽¹³⁾ when they point out that to include the environmental element in university education, it is necessary to recognize the problems present in the physical reality that surrounds each person and their influence on the health of living beings; that each professor possesses the necessary knowledge to respond to the excessive use of natural resources, and contribute to raising society's awareness about the care and renewal of such resources so that future generations can enjoy them and take responsibility for their maintenance and proper use.

Regarding the work within the department to strengthen the contents on the association between environmental pollution and One Health, the majority (80%) rated it as "poor." When referring to whether methodological activities take into account the need to establish relationships between curricular contents, One Health, and environmental pollution in the teaching-learning process, none rated it as "good," and the majority considered it "poor" (66.6%). In this regard, Varer Akpinar *et al.*⁽¹⁰⁾ assert that integration at the level of methodological work of the subjects is necessary as a way to achieve better perception, sensitivity, and awareness in the face of the current environmental crisis.

Lumbo Dombaxe *et al.*⁽¹⁴⁾ affirm that methodological preparation is urgently needed to favor the improvement of the environmental training process in students. For this, it is imperative that professors take into account that the possibility of transforming the personality of the active environmental subject, in order to generate significant changes in their performance, depends to a great extent on this.

When responding to whether students solve teaching tasks related to environmental pollution and its association with One Health, 26% rated it as "poor" and 46.6% as "fair." This coincides with Pérez Agramonte *et al.*⁽¹⁵⁾ when they assert that one of the most important resources to achieve the integration of these contents is the teaching task, which

encourages in students the conscious use of different learning strategies; they constitute a didactic resource to plan, organize, regulate, and control student activity.

Cadavid *et al.*⁽¹³⁾ highlight that there are factors that directly affect the shortcomings in establishing the integration of environmentalist contents in the teaching-learning process, since there is scarce methodological preparation and didactic-methodological guidelines explaining how to achieve it, which limits the development of creativity in students and the development of their cognitive independence. This educational reality shows a gap between what is expected and what has been done regarding the achievement of environmental awareness.

Environmental education goes beyond seeing this problem as something isolated, which demands that it be considered an area of knowledge in which a high level of awareness must be assumed regarding how its own existence impacts that physical reality.

The environmental should not be understood as an additional subject, but as a curricular strategy in the study plans of all university careers as a result of the multidimensional scope of the problem. It coincides with Corbetta⁽³⁾ when he argues that resilient health systems should be promoted in the face of environmental changes, because it can not only improve the quality of care and its accessibility in services, but also reduce costs.

It is considered that environmental education from the curricular perspective contributes to a transformation of knowledge in universities, generates interdisciplinary training in professionals to encourage critical intelligence, understand the limits of ecosystems and environmental complexity, and develop innovative knowledge to intervene in environmental problems.

Scientific contribution

It offers the results of the diagnosis of the real state of integration between environmental education, One Health, and the teaching-learning process in health technologies at the aforementioned university. The study was conducted using the scientific method, making a quantitative and qualitative analysis of the problem that generates it; and established a

starting point for more complex analyses related to the need to improve the teaching-learning process in order to create environmental awareness.

CONCLUSIONS

The assessment evidenced shortcomings that demand the need for methodological preparation on the integration between environmental education, One Health, and the teaching-learning process in health technologies to favor the improvement of the comprehensive training of students, with better perception, sensitivity, and awareness in the face of the current environmental crisis, with the aim that they are responsible and capable of protecting the environment.

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Declaration of interests

The authors declare that they have no conflicts of interest.

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