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The importance of teaching microbiology in environmental education

Abstract

The teaching of sciences acquires an important role in the training of students in any educational system, since scientific literacy for all people becomes a necessity for equal opportunities in the 21st century. The disciplines they include are responsible for developing the necessary skills for responsible interaction with the environment that surrounds all the individuals who inhabit the planet. Microbiology is the study of microorganisms, their biology and ecology. Microbiology today is a specialized and exact science that over time has become indispensable for industry and for the quality of our life. The objective of this work is to explain the study of the teaching of microbiology in the care and conservation of the environment.

Keywords: education, microbiology, environmental education

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Lilianne Dominguez Céspedes,[1] Alvaro David Fonseca Céspedes,[2] Marilin Zaragoza Pérez[3]

[1]Microbiology Department, Military Hospital Dr. Fermín Valdés Domínguez, Cuba

[2]Agricultural Engineering, Holguín University, Cuba

[3]Biology Department, Holguín University, Cuba

Correspondence: Lilianne Dominguez Céspedes, Doctor Specialist in Microbiology, Master in Teaching Natural Sciences Assistant professor, Laboratory of Microbiology, Military Hospital Dr. Fermín Valdés Domínguez, Holguín, Cuba, Tel +53 52065002, Email lilianne40@gmail.com

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Introduction

From ancient times to the Renaissance, science constitutes a knowledge that is based on the contemplation of nature. It is through observation and reasoning that it is possible to access the essence of nature.[1]

The teaching of sciences acquires an important role in the training of students in any educational system, since scientific literacy for all people becomes a necessity for equal opportunities in the 21st century. For its part, UNESCO in 1998 declared the importance of teaching them as a means to encourage and develop critical thinking that allows for solutions to different problems in different areas. On the other hand, the disciplines they include are responsible for developing the necessary skills for responsible interaction with the environment that surrounds all the individuals who inhabit the planet.[2,3]

In this way, science teaching encompasses many problems, such as the continuous description of only phenomena and experiments that maintain a traditional pedagogy. However, it is possible to advance in this field when teaching is seen as a problematic situation, promoting scientific interest in students, and bringing them closer to their own interests, which leads to questioning their everyday life and implicit assumptions accepted as evident or indisputable. Is That is, when you assume a critical role in teaching-learning, you are directed towards new models that present difficulties in integrating entrenched and innovative ideas.[4]

The knowledge of microbiology belongs to Natural Sciences, this type of scientific knowledge is propositional knowledge, which is methodical because it has a method to justify the results it achieves. Scientific theories originate from the results of experiences; this way of presenting the results of science is what is known as its systematic nature. The explanatory nature implies the fact that a law or a set of laws can explain the occurrence of a phenomenon through deductive procedures. Therefore, it can be stated that the explanatory nature implies systematization.[5]

Microbiology is the study of microorganisms, their biology and ecology. Microbiology today is a specialized and exact science that over time has become indispensable for industry and for the quality of our life. It is important to note that this discipline has had a place in various sciences such as: molecular genetics, environmental, physiology, medicine, food and metabolic biochemistry among others. Without a doubt, microbiology and microorganisms are of central importance in reference to the main aspects of our society. For this reason, the objective of this work is to explain the study of the teaching of microbiology in the care and conservation of the environment.

Importance of microbiology in the environment

From an evolutionary point of view, environmental changes represent both a challenge and an opportunity for life forms: the challenge to adapt to the new situation and survive, and the opportunity to occupy the ecological gap left by those who were not able to do so. From that perspective, global climate change is putting life—including human life-under fast, and accelerating, selective pressure. Environmental microbiology is necessarily one of the key disciplines to understand, predict and eventually try to cope with, the effects of climate change on the biosphere. Aspects such as the adaptation of microbiomes to global change, or how to exploit the full potential of beneficial microorganisms to sustain productive agriculture under the concomitant stress conditions (drought, salinity, high temperatures), are gaining interest and certainly deserve greater attention. All these types of studies are, and will keep providing relevant biological information, as well as new biotechnological tools in the form of environmentally relevant enzymatic activities and the characterization of microorganisms with beneficial traits, such as plant growth promotion and/or protection against stress.[6]

The study of microbiology is of utmost importance since microorganisms are part of our nature. Microorganisms have been useful to man even before the knowledge of their existence. The study of microorganisms and knowledge about them has been applied in the medical, industrial, economic and environmental fields. Knowledge of microorganisms has served to avoid economic losses in crops of agricultural products, by knowing the pathogenic microorganisms that infect and damage crops.[7]

It is also possible to formulate vaccines, with which people and animals are protected from certain microorganisms, thus preventing them from contracting the diseases caused by them. From the industrial point of view we can also mention a wide variety of applications that microorganisms and the metabolites produced by themselves have. The first example is in the manufacture of alcoholic beverages such as beer, wine and pulque.[8]

Currently, the production of biopolymers produced by microorganisms is being studied, with capacities similar to synthetic polymers, but which are completely biodegradable. We must mention the importance of microorganisms from an environmental point of view. These have been the natural degraders of waste substances and compounds, producing non-toxic compounds that are easily assimilated by plants and other animals. However, the great industrial activity and the current way of life of man, as well as due to the number of inhabitants throughout the world, the quantity and variety of waste compounds, both natural and xenobiotic and often toxic, has far exceeded the capacity of microorganisms to transform them naturally. This has caused the accumulation of these compounds in aquifers and soils and therefore the breakdown of the balance of ecosystems, coupled with the fact that many of these compounds are toxic, which has affected to a greater extent the life of the beings that develop in these ecosystems. The way to eliminate or degrade these compounds from the environment through chemical, physical and biological processes has been studied. Within the biological, the role of microorganisms is important, since due to their metabolism and/or through their enzymatic systems they are capable of modifying, degrading and in the best of cases mineralizing, taking it to its simplest form as CO2, N2 and H2O to these toxic compounds.[9]

Pedagogical aspects of environmental education and microbiology

The educational processes that include the teaching of environmental education aim to raise awareness of the individual and society. In the same way, training forms a process that allows human beings and societies to fully develop the capacity for knowledge of the world and reality, interpreting and explaining them and live their circumstances. Environmental education promotes development and increases the population's possibilities to undertake their development. Although basic education serves as the foundation for education in environmental and development matters, the latter must be incorporated as a fundamental part of learning. Environmental education is a driving force to modify people's attitudes so that they are able to evaluate sustainable or sustainable development problems and address them. Environmental education is a process that recognizes values and clarify concepts focused on promoting the attitudes, skills, abilities and aptitudes necessary to understand and appreciate the interrelationships between human beings, their culture and the interrelationship with nature. Education is essential to acquire ecological and ethical awareness, values, techniques and behaviors in line with sustainable development and that favor effective community participation in decisions. This is stated by the decision-making conference.[10] Environmental education should take into account the natural and artificial environment in its entirety: ecological, political, technological, social, legislative, cultural and aesthetic; It should be a continuous and permanent process in school and outside of it; should have an interdisciplinary approach; should emphasize active participation in the prevention and solution of environmental problems from a global point of view, taking into account regional differences; should focus on current and future environmental issues; should consider development and growth in an environmental perspective; Education should promote the value and need for local, national and international cooperation in solving environmental problems.

The Moscow Congress (1987) states that: environmental education is conceived as a permanent process in which individuals and the community become aware of their environment and acquire the knowledge, values, skills, experience and will capable of make them act individually and collectively to solve current and future environmental problems.[11]

Knowing the impact of environmental education on the development of human society and as an important pillar in higher education, we must insert these contents into the subject of microbiology, so that our students maintain the link with the future of the environment in our country.

The teaching of microbiology is based on both theory and practice, where the student develops conceptual, procedural and attitudinal skills. In the case of teaching and learning this science, it is assumed that the essential thing is not to provide students with true or absolute knowledge, but to promote learning situations in which they are able to contrast and analyze various models, in addition to promoting and change certain attitudes.[12]

The teaching contents always represent a cultural selection in the form of systems of knowledge, skills, habits, convictions and values, structured so that when assimilated by the student, the proposed objectives are achieved, in their instructive and educational dimension.[13]

That is why, through problematic teaching methods, we consider it important to introduce the following contents:

- introduce brief aspects of basic microbiology
- review some aspects of human health, from an epidemiological point of view;
- aspects of microbiology applied to agronomy
- basic ecology
- fundamentals of biological process design
- review the various philosophical theories that collect the historical background of the relationship that humanity has established with the planet and its nature, to explain and react to the environmental era.[14]

Through problematic teaching, a new relationship can be established between the reproductive and creative assimilation of new content, by focusing attention on its contradictory aspects, as a way to develop creative thinking in students; whose formation goes through successive stages of motivation, recognition, search, contrast, application and creation. This implies a strategy that guides them in solving problems that are new to them, that forces them to acquire knowledge independently.[13]

Conclusion

The teaching of Microbiology constitutes a reference for the study of Natural Sciences, due to its relevance, its constant discoveries and its various applications in different aspects of society. The constant deterioration of the environment drives us to look for scientific alternatives that are globally acceptable and sustainable. It is in the Education of the individual as the main protagonist of the educational and scientific process, where we will be able to form the knowledge and values necessary to face the environmental crisis.

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Conflicts of interest

There are no conflicts of interest between the authors.

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