

A Didactic Approach to the Teaching-Learning of Zoonoses in Veterinary Public Health

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ABSTRACT

A relevant topic in medicine, essential for the training of professionals in the medical field, is public health. And under the context of One Health, the concept of zoonosis is particularly important. Thus, its approach must be based on a distinctive didactic, with a constructivist approach, which allows the student to comprehensively develop cognitive skills needed to reason about any situation in the environment, and to find solutions to needs and problems in it. It is imperative to apply student-centered educational strategies, without an excessive use of technology and always based on pedagogical principles. Therefore, it is essential to apply learning theories that guide these processes, such as the Theory of Meaningful Learning, based on the link between the student's previous and new knowledge; Connectivism, which considers elements for building learning and knowledge in technology-mediated environments; and Constructionism, which highlights the value of ICTs as mental construction tools that empower students and give them a leading and active role, providing them with the necessary resources, including tools such as ICTs. This should be supported by available resources such as repositories, books, videos, and blogs, as well as official or educational institution websites with related topics on education and communication platforms, which have grown in number in the wake of the pandemic and revolutionized the way such important topics as zoonoses are taught.

Keywords: Meaningful learning theory; Connectivism; Constructivism.

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CHAPTER HISTORY

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1. INTRODUCTION

1.1. PEDAGOGICAL MODELS: CONSTRUCTIVISM, CONNECTIVISM, AND CONSTRUCTIONISM

Teacher-centered teaching-learning methodologies have historically prevailed in all academic levels in the Mexican educational system. In these methodologies, the student is a passive entity, and his/her role is limited to the memorization and mechanical repetition of the information given by the teacher. In this model, priority is given to the contents to be “graded,” without considering the needs and desires of the learner. According to Ayala et al. (2013), it is urgent to develop critical thinking skills that enable the learner to “propose solutions, the ability to solve new problems, the competence to obtain and evaluate sources of information”. In this sense, it should be emphasized that the teacher is responsible for establishing a pedagogical relationship that encourages students to learn, that awakens their desire to know” (Barrón 2009).

Thus, teachers’ work requires continuous reflection, analysis, and evaluation of their praxis, seeking to evolve in the opposite direction to its current situation; that is, to guide students within paradigms that allow them to be especially active learners, where emphasis is placed on understanding rather than memorization, and knowledge is built from experience. This reasoning calls for adjustments in the pedagogical and didactic models and in the teaching-learning processes, incorporating pedagogical theories, Information and Communication Technologies (ICT), and strengthening teacher training in ICT. It is considered “possible and perhaps necessary to hybridize face-to-face and non-face-to-face education” (Buendía 2020).

Higher education in particular should be supported by a distinctive didactic, which enables students to learn “with previous knowledge and experiences, motivations and diverse expectations regarding their personal project” (Moreno 2011). Authors such as Gutiérrez and Rada (2012) deem it viable to apply a constructivist approach, because the chronological age of university students allows the comprehensive development of cognitive faculties, which will be useful to reason about any situation arising from the environment, finding solutions to its needs and problems.

In this context, it is crucial to implement student-centered educational strategies, avoiding an excessive use of technology that is not based on pedagogical principles. This, according to Camacho and Alias (2019), implies modifying the role of the teacher, from a transmitter figure to a mediator of learning processes.

The not-so-new scenarios brought about by ICT-mediated learning environments must face several challenges, among which the following stand out: limited funding and budget for institutions, access of the user population to ICTs, inclusion of different population sectors in education, as well as the elaboration and development of content on an ad hoc basis, It is, therefore, essential not to lose sight of the pedagogy-ICT binomial, which has historically prevailed and will allow, on the one hand, the use and innovation of technology and, on the other hand, provide a basis for educational processes and bring them closer to different sectors of the population (Freixas 2015).

Given this scenario, it is essential to make use of learning theories to guide the teaching-learning processes and to support the direction and management of the educational act. It is essential for the student to develop adequate strategies aimed at meaningful learning, which will allow him/her to increase his/her metacognitive competences through a useful and critical knowledge. Particularly in the field of zoonoses, the professional in Veterinary Medicine (or in any health area) should not only fully understand the pathological interaction between animals and humans, either directly or indirectly, through the consumption of by-products, especially food, but should also interpret, evaluate, contrast, and even combine different criteria to classify zoonoses and, based on this, argue and, if appropriate, apply pertinent prevention, control, and eradication measures. This would enable the student to acquire, deploy, and apply the necessary competences for a better adaptation to a ever-changing context, in which public health, animal health, and environmental health interact.

1.2. THEORY OF MEANINGFUL LEARNING

A pillar of modern constructivism, proposed by David P. Ausubel and authors such as Joseph Novak and Helen Hanesian, the Theory of Meaningful Knowledge is based on the work of Vygotsky (Yepez 2011). This theory involves linking new knowledge with the student's previous knowledge, which requires the student to have a cognitive scaffolding based on skills, concepts, and experiences. According to Romero (2013), it is essential that the knowledge makes sense to the student, so the teacher must implement didactic strategies to show the information and contents in a congruent manner, incorporating and connecting the integrating concepts, thus facilitating their transfer and retention. Román and Diez (2000), cited by Osses and Jaramillo (2008), point out that, in meaningful learning, an individual assumes a favorable attitude that allows him/her to construct their own knowledge and gives it meaning based on the conceptual structure he/she already possesses. All this implies that the achievement of meaningful learning will depend on the fact that the proposed contents and materials are potentially significant and can be “anchored” in previous knowledge.

1.3. CONNECTIVISM

Developed by George Siemens, among its principles, Connectivism includes elements to construct learning and knowledge that occur in technology-mediated environments, and this construction has a strong implication in the design and management of such learning environments. This is consistent with what Garduño (2020) has expressed, arguing that learning processes in environments favored by technology face the challenge of giving meaning to the constructions, relationships, and patterns of information generated by both the teacher and the learner. Additionally, the theory establishes that teachers and students connect with each other to constitute “learning networks and communities, and these connections are generated through mixed environments, as well as the management of techno-pedagogical environments”.

1.4. CONSTRUCTIONISM

A final paradigm of support for this section is Seymour Papert’s Theory of Constructionism, which proposes that learning is constructed when the learner himself solves problems using previous knowledge as a tool for the foundation of new knowledge. And for this process to be effective, both the construction and the final product must be shared and explained (Papert 1982). Constructionism also highlights the value of ICT as “powerful tools for mental construction, for the development of complex thinking in students” (Vicario 2009), which empowers students and assigns them a leading and active role, making the necessary resources available to them, including tools like ICT.

The approaches described above make constructivism an ideal starting point for the teaching-learning processes, where the guiding and mediating function will be assumed by the teacher, working with the underlying elements of cooperative work of the learners.

2. INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS) AND THEIR APPLICATION IN DISTANCE LEARNING AND IN HYBRID MODELS

A major problem that health professionals face when trying to communicate their knowledge is a lack of pedagogical tools that allow them not only to convey information, but also to engage learners in the generation of their own knowledge. To achieve this, the health professional must have instruments in line with technological advances that allow him/her to propose new ideas.

ZOONOSIS

According to Calandra et al. (2009), the practice of recording ideas to be consulted by others dates back to prehistoric times; perhaps the oldest examples could be found in cave paintings, the earliest evidence of Information and Communication Technologies (ICTs). In this need to transmit knowledge, many different supports have been used, such as constructions themselves with engravings, ideograms, and pictograms, or on portable or storable materials such as papyrus, parchment, or clay tablets.

Paper was a great invention, and its use spread throughout the world due to its ease of manufacture and practicality. The invention of the printing press allowed the systematic reproduction of documents, which made it possible to carry information to different places at the same time (Calandra et al. 2009).

Technological progress continued in the modern era, from the invention of the telegraph for sending short and punctual messages, with a very limited use in education. Subsequently, radio and television emerged, mass media for transmitting messages to a large population, which favored their massification and worldwide dissemination, especially after the design and launching of artificial satellites (Calandra et al. 2009). The first transmission was made on May 3, 1965, and worldwide on June 25, 1967, that is, just 56 years ago. Since then, the advance of ICTs has been impressive, particularly with the progress and massification of personal computers and the Internet, thanks to which we can now speak of an information society (IS).

ISs are groups of people characterized by communicating by means of digital media optimized to produce, store, and disseminate information. This paradigm has modified interpersonal relationships, production, education, and entertainment systems (Crovi 2002; Crovi 2005).

Any physical or virtual medium that stores data and codes in a transportable form and allows communication between human beings can be considered an ICT (Calandra 2009). Both concepts are relevant in higher education, and obviously in the subject of zoonoses, because integrating ICTs should be an additional resource for learning with an innovative approach, to implement Learning and Knowledge Technologies (LKTs) as a didactic means for learning and knowledge appropriation. This will make it possible to learn effectively through dynamics and practices supported by digital technology and will provide health professionals with a panorama that stimulates and promotes their ability to restructure reality and deliver innovative solutions to multiple problems (Valarezo and Santos 2019).

ICTs have enabled the development of social networks; groups with common interests are formed in these networks, which use them to keep abreast of new aspects or update information, taking an active stance to promote changes in their goals or paradigms. Thus, these platforms make it possible to address issues of common interest such as zoonoses or other public health aspects; this is known as Technologies for Empowerment and Participation (TEPs) (Valarezo and Santos 2019).

LKTs and TEPs should be integrated into innovative education approaches because they are not limited to a physical space, but it can be received anywhere (Valarezo and Santos 2019, Zambrano and Balladares 2017). The current technological development allows the dissemination of contents by using various educational resources in a individualized way, either through face-to-face, online, or distance learning. According to García (1999), distance learning is a reality that can offer good results thanks to the “evolution” of the means through which knowledge is transmitted. This began as a printed and unidirectional medium and evolved into teaching by correspondence, with greater interaction and a more creative use of the didactic materials available. The use of television programs in remote access areas was very common, and distance learning is now in an audiovisual stage, supported by information technology.

The COVID-19 pandemic forced many institutions to implement distance learning as a more flexible way of carrying out educational processes without the need to crowd people in closed spaces. Its great advantage is that it is supported by methodological and technological strategies that make possible to deliver content without the need to coincide in time and space, thus facilitating learning, while the educator remains present to address doubts and questions, either in real time or asynchronously. As a possible drawback,

although this modality innovates positively with respect to the traditional models of knowledge sharing and learning, the learner must show greater independence and self-regulation, which does not always happen, as there is no prior training for it. In short, a great advantage is that a communication network can be established, in which everyone involved in the educational act enters into contact with the appropriate sector, from wherever and in an almost immediate and agile manner (Juca 2016).

To achieve this, it is necessary to implement “virtual campuses,” spaces that offer the tools, services, and resources needed to work online. These resources include virtual classes, webinars, manuals and tutorials, digital library, and exercise sessions.

In short, education can and should change with the rise of ICTs, since the virtual environment becomes a bridge that connects with new educational approaches, to make information sharing better and more efficient. This makes it possible to raise a didactic proposal where the educator facilitates access to knowledge, and whoever receives the information can self-regulate their learning and develop academic skills (Juca 2016).

Not everything has to be black and white, and thus one option is to implement education in a hybrid model, combining elements of face-to-face and non-face-to-face education. It is possible to carry it out remotely and at different times (asynchronous), controlling the pace of the activities, in addition to carrying out face-to-face activities at the same time and space, with the support of the educator (synchronous). In this model, face-to-face and distance learning tools are used as required. For the results to be satisfactory, distance and face-to-face activities must be related to each other, thus reinforcing learning. Technology places learners at the center of the process.

It can be concluded that the hybrid model is a window that has expanded the space and time for learning, promoting cooperation and improving efficiency in the acquisition of knowledge, since it encourages active and meaningful learning. This model could be applied in courses or workshops with varied subjects, where a face-to-face event could receive distance support, with activities and reference materials for later review and analysis, or even feedback from the attendees to the rest of the group. Therefore, its application requires the participation of a teacher, who must be a good communicator and motivator, as well as a dynamic pedagogical designer, in order to incorporate ICTs appropriately.

3. ZOONOSSES AND THEIR PROGRAMMATIC CONTENT IN VETERINARY EDUCATION

3.1. SELF-EDUCATION IS, I FIRMLY BELIEVE, THE ONLY KIND OF EDUCATION THERE IS. —I. ASIMOV

In general, the objectives of studying zoonoses in veterinary education are to analyze their global status by identifying the main risk factors, to discuss national and international morbidity statistics, and to understand international guidelines and standards. The teaching of zoonoses in the veterinary medicine and zootechnics program varies greatly: in some institutions it is dealt with in the last semesters, and the number of hours devoted to it can also vary from 1 to 4.

Zoonoses are not only discussed with an epidemiological approach but also those related to the host and the environment. Since epidemiology is the basis of preventive and social medicine, the student must be aware of the role he/she will play as a health professional. It is important that the integrative approach to include zoonoses that the bases of pathology, clinical medicine, statistics, microbiology, administration, planning, and other sciences. Therefore, the student must understand that the study of zoonoses is not a separate science, without practical application, but encompasses all diseases, communicable or not.

Understanding this can be easier if specific tools based on LKTs are available. To this end, we would like to propose some resources on the subject that can be applied, considering what we discussed above.

ZOONOSIS

3.1. WEB RESOURCES ON ZOOSES

3.1.1. BLOGS ON ZOONOSIS

According to Montilla (2015), this type of resources brings great benefits in the teaching and learning process. Among such benefits, the following stand out:

- They promote collaborative and autonomous learning.
- They favor a continuous evaluation and self-evaluation of the training and learning process.
- They provide evidence of student progress and feedback on the learning process.
- They allow the teacher to implement attractive and innovative methodological approaches.
- They develop literacy and communication skills.
- They facilitate access, assimilation, apprehension, and construction of knowledge.
- They are a suitable means of coordinating networked research projects, as they allow documentation to be organized.

An example of a blog on zoonosis can be found at the following link:

<http://www.blogsanidadanimal.com/tag/zoonosis/>

3.2. DISCUSSION FORUMS ON ZOOSES

This type of tool can be very valuable in the debate and resolution of cases in the fields of epidemiology and preventive medicine, since they are spaces that allow the generation of reasoning around assertions (Veerman et al. 2000). In addition, they enable an equitable participation of students, while encouraging the analysis of different positions regarding a fact or a situation to resolve differences of opinion arising from a questioning.

The main characteristics of a virtual discussion forum are the following:

- Members can express themselves freely, which encourages plural and diverse participation.
- They allow recording, organizing, and labeling of contributions.
- They are informal spaces, but they are managed by a mediator.
- The subject is clear from the outset.
- They are asynchronous, which allows to rethink ideas without immediate pressure.
- They can be accessed at any time.

An example of a discussion forum on zoonoses where different institutions participate can be the following Instituto de Investigaciones Juridicas UNAM

Discussion forums, whether synchronous or asynchronous, are valuable resources that involve the application of different stages of critical thinking, from the construction and production of information, a continuous feedback between students and specialists in zoonosis, the resolution of doubts, and the application of exercises or practical problems that promote a proactive attitude in the participants for their analysis, resolution and argumentation, ultimately favoring the generation of knowledge.

3.3. WEBSITES WITH OFFICIAL INFORMATION ON ZOOSES

The official national websites of each country, as well as some supranational ones (WHO/PAHO, OIRSA), provide updated information on different aspects of zoonoses. The teacher can obtain real-time information on the zoosanitary or public health situation.

ZOONOSIS

3.3.1. WORLD ORGANIZATION FOR ANIMAL HEALTH (WHAO)

Formerly the Office International des Epizooties, is an organization whose mission is to ensure transparency of the animal health situation in the world. Thus, it provides up-to-date information on animal health and welfare (OIE, 2022). On its page one can find scientific information in the veterinary field, consult standards and various related publications. On the same page there is a link to the World Animal Health Information System (OIE-WAHIS). The page can be consulted at the following link: <https://www.woah.org/en/home/>

3.3.2. INTER-AMERICAN INSTITUTE FOR COOPERATION ON AGRICULTURE (IICA)

The site provides regional agricultural information, particularly on North and Central America and the Antilles. IICA consists of 34 member States and, according to its page, its mission is to “Stimulate, promote and support the efforts of the Member States to achieve their agricultural development and rural well-being through international technical cooperation of excellence” (IICA, 2018). The page shows the rural regions of interest and the changes they present over time, including any diseases that occur. In general, the site shows us the organization's work to prevent future diseases and report current ones: <https://www.iica.int/es>

3.3.3. CENTER FOR DISEASE CONTROL (CDC)

This U.S. institution provides information on human diseases and zoonoses and bioterrorism, among many other relevant topics. <https://www.cdc.gov>. Having resources where students can access updated information on zoonoses promotes the interpretation, analysis, evaluation and inference of such information, an essential skill in research. Therefore, the teacher-student binomial should have tools such as web pages with official information on important aspects of the subject, such as the description of zoonotic diseases of interest, for a better understanding of them, as well as quantitative data to evaluate their presentation and practice decision making.

4. THE CHALLENGES OF RAISING AWARENESS OF ZOONOSES IN A RURAL SETTING

Most zoonotic diseases are little known in the general population, who are usually unaware of their transmission mechanisms and their effects on humans and animals. This is a matter of concern especially in rural areas, where the risk of transmission of many zoonoses increases due mainly to poor personal hygiene caused by lack of services such as drinking water, lack of latrines or drainage, as well as certain habits, such as walking barefoot (particularly in children) and keeping a close contact with dogs, cats, or other pet species without deworming or vaccination, among other factors (Flores 2010).

Additional risk factors that contribute to the incidence and prevalence of these diseases have been reported in rural Mexico. These include environmental alterations, such as the clearing or burning of forests, with the consequent effect on ecological degradation; the movement of domestic animals and keeping wild animals as pets; settlements in jungle areas with the construction of houses with materials that favor the reproduction or habitat of vectors that can transmit diseases to humans; and the use of pesticides to eliminate these vectors, which favors their resistance (Margeli and Zulya 2020).

For this reason, it is essential that public health institutions responsible for the study and dissemination of information on these diseases adopt a comprehensive approach, considering the mechanisms of transmission, signs, and symptoms, as well as prevention and control measures. Nowadays there are

many electronic means of information: academic sites and repositories, social networks, video transmission channels (such as Zoom, Skype and WebEx Meeting), in addition to the tools already mentioned (blogs, collaborative wikis, videos, podcasts, applications, and discussion forums). While it becomes difficult to use them in a rural environment, there is increasing access to them (Sánchez and Pinochet 2017), so it is important not to dismiss them.

It should also be considered that the economic conditions of the rural population often make it impossible to apply the information provided by the media or health professionals, either because of a lack of resources for its application or because people have other priorities, and animals tend to be put on the back burner. It has been reported that there is little interest among rural dwellers in informative meetings at health centers. However, health education for rural and urban populations should continue to be encouraged because of ongoing changes that alter the dynamics of both environments, including higher birth rates in rural areas, environmental conditions altered by climate change, growth of the global economy, industrialization, and increased interaction between people and animals, both for marketing and companionship purposes (Margeli and Zulay 2020).

It is essential to continue with the implementation of training plans and programs targeted at health personnel, with a “ONE HEALTH” approach, where the veterinarian is part of the multidisciplinary team in an institutional manner. The presence of a veterinarian would help to increase knowledge about zoonoses, especially for responsible pet and food animal ownership, the maintenance of an information and epidemiological surveillance system with laboratory diagnosis, and the participation of the community in the control of zoonoses, which have led to a large number of diseases and deaths (Dabanch 2003).

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