

## A Methodology for Professional Education in Agriculture Based on a Study of the Professional Cycle

Humberto B. Sónora Revoredo <sup>1</sup>, Riselda Guzmán Méndez <sup>2</sup>, Ana María Godinez Do Val <sup>3</sup>, Mariuska Simón Foustén <sup>4</sup>, & Biofredis Castro Torres <sup>5</sup>

<sup>1</sup>ORCID <https://orcid.org/0000-0001-9624-2677>, Ignacio Agramonte Loynaz University of Camaguey, Department of Education in Agriculture, Camaguey, Cuba, <sup>2</sup>ORCID <https://orcid.org/0000-0003-0020-6706>, Ignacio Agramonte Loynaz University of Camaguey, Department of Education in Construction, Camaguey, Cuba, <sup>3</sup>ORCID <https://orcid.org/0000-0001-7176-4073>, Ignacio Agramonte Loynaz University of Camaguey, Department of Education in Agriculture, Camaguey, Cuba, <sup>4</sup>ORCID <https://orcid.org/0000-0001-5502-8770>, Ignacio Agramonte Loynaz University of Camaguey, Department of Education in Agriculture, Camaguey, Cuba, <sup>5</sup>ORCID <https://orcid.org/0000-0003-1087-8215>, Ignacio Agramonte Loynaz University of Camaguey, Department of Education in Agriculture, Camaguey, Cuba.

Citation: Sónora Revoredo, H., Guzmán Méndez, R., Godinez Do Val, A., Simón Foustén, M., & Castro Torres, B. (2020). A Methodology for Professional Education in Agriculture Based on a Study of the Professional Cycle. *Agrisost*, 26(1), 1-10. Recuperado a partir de <https://revistas.reduc.edu.cu/index.php/agrisost/article/view/e3361>

Received: November 4, 2019

Accepted: February 20, 2020

Published: March 12, 2020

Funding source: Not declared.

Conflicts of interest: Not declared.

Email: [humberto.sonora@reduc.edu.cu](mailto:humberto.sonora@reduc.edu.cu)

### Abstract

**Context:** The incorporation and stability of youth education in the agricultural sector ensures sustainability and preservation of the social system, but it has also generated new social needs in the country, and consequently, insufficiencies in the curricular process that limit the performance of the technical staff, so that they can play a role in the implementation and development of agricultural processes, in keeping with the need to boost this sector in Cuba.

**Aim:** To implement a methodology that enables positive changes in the professional performance of technicians, from the curricular design of the professional cycle of technicians.

**Methods:** Several theoretical, empirical, and statistical methods were implemented to assess the information found in the literature consulted, the study of regulations, and opinions of specialists, as well as its practical application to assess the outcome from implementation.

**Results:** The methodology used evidenced positive changes in the professional performance of technicians, with emphasis on professional problems, and in-depth characterization of the degree.

**Conclusions:** The results achieved were positive, evidenced in the changes observed in the performance of the technical professionals. The feasibility and pertinences of the results achieved at Martires de Pino Tres Polytechnic School, in the province of Camaguey, were corroborated.

**Key words:** curricular design, professional education, professional performance.

### Introduction

In the next decades of this century, the perspective development of the Cuban society will be determined by a set of requirements laid down in the Guidelines of the Economic and Social Policy of the Party and the Revolution, approved in the VI Congress of the Communist Party of Cuba. Accordingly, Guideline No. 124 (Communist Party of Cuba, 2017) expresses coherently and systematically, the need to provide quality education to skilled labor force in the mid and higher technical agricultural specialties. Additionally,

guideline 172 projects the formation of skilled labor force, in accordance with the current demands and the development of the country.

In Camagueyan agriculture, the implementation of these guidelines is translated in the need to train skilled labor force required by entities, companies or different organization forms adopted in agriculture, with the purpose of addressing farming production problems, guaranteeing food safety, and the preservation and care of ecosystems and natural resources. Through these premises, the State and

Government have given agriculture a high priority.

Despite the efforts made to ensure sufficient and necessary labor force, the results of this education in the last decade are sending signs of warning in relation to the lack of satisfaction of such needs. This adds to the limitations of some graduates from this educational subsystem in terms of technical-professional culture mastery to transform the object of this profession, which has been addressed through constant changes in the curriculum and syllabus implemented. (Barrios 2005, Portuondo, Verdecia & Díaz, 2009, Cruz & Barrios 2017)

Hence, increasing technical professional quality education has become the fundamental purpose of Technical and Professional Education (ETP in Spanish). To achieve that goal, it is important to determine the type of professional needed, and the ways of training.

In that sense, a diagnostic was performed to the specialty of Technician in Zootechnia-Veterinary, at Martires de Pino Tres Polytechnic School, which helped verify the existence of differences in the professional performance of the Zootechnical-Veterinary technician, resulting from shortages in technical content acquisition in relation to the scope of the profession. Accordingly, there was a need to examine and determine the causes that originated this. The curricular design was observed not to respond to the necessary relation that should characterize it depending on its origin: technical and professional problems, which has a negative effect on the possibility that graduates are able to address the most general and frequent problems of the profession, and, accordingly, the professional technical achievements desired. The above helps determine the research problem: insufficiencies in the curricular process of the Zootechnia-Veterinary specialty that hinder the performance of technicians in terms of competitiveness in production.

In that sense, the technical professional requirements stems from the study of the profession in that level; hence, in-depth characterization of the profession is needed, which includes a characterization of the profession to determine the scope of the profession, the scope of work, and the professional problems that the new technicians must confront.

According to Álvarez, cited by Cruz & Barrios (2017), the link between the profession and the curriculum is given by cycles that group disciplines and subjects, depending on the level of approximation to the scope of the professional. Then, it is important to design cycles in the curriculum, particularly the technical professional cycle, which is in charge of promoting professional education.

The aim of this paper is to design a methodology based on the technical professional cycle that can provide education to competent technical professionals, derived from a study of the profession to achieve coherence between technical professional performance and social development.

## Materials and Methods

The methods used during this research were in accordance with the aim. The theoretical methods used were analysis, synthesis, induction-deduction, historical-logical, which enabled theoretical systematization that helps understand the direction of technical professional training in ETP, in agriculture, based on the professional cycle study.

The empirical methods were document review, interview to professors and advisors, to assess the information collected, and to diagnose the current state of the formative curriculum of the Zootechnia-Veterinary specialty, and the performance of technicians in the education of this specialty. (Appendixes 1 and 2).

Participatory observation of real formation conditions was included, in order to diagnose the performance of the technical professional in the Zootechnia-Veterinary specialty, before and after the implementation of the proposal.

For observation, a number of indicators were considered, including the professional competences of the technicians:

- Proper use of aids available for work.
- Implementation of professional tasks (professional competences).
- Confidence and acknowledgment of potentials during the execution of working functions.
- Satisfaction with the activity performed.

Based on observation, the indicators were evaluated by groups, using four categories: very good, good, average, bad. The following scale was used to evaluate the indicators:

Vary Good (VG) when the indicator is accomplished 90% or more by the students.

Good (G) when the indicator is accomplished 70% or more by the students.

Average (A) when the indicator is accomplished 40% or more by the students.

Deficient (D) when less than 40% of students meet this indicator.

## Results and discussion

The main task of ETP, and particularly of the family of Agroindustrial specialties, a branch of agriculture; Zootechnia-Veterinary, is to raise the quality of education of technical professionals and skilled workers. To achieve this goal, it is important to define or determine the type of desired professional, and the ways of training.

Following a review of the related literature, a link between the profession and the curriculum was found to be given in cycles that group subjects, depending on the level of approximation of the scope of profession (Barrios, 2005). From theory, the results achieved by Portuondo (2000, 2015), Barrios (2005), Cruz & Barrios (2017) refer that the cycles represent the expression of the profession in the curricula.

Several authors have studied the education cycles, such as Addine *et al.* (2000) and Gutiérrez (2003), who recognized the need to conduct in-depth studies of the existing link among curricula. Barrios (2005) analyzes the formation of technical professionals, adding that the definitions of cycles does not include real technician performance; Polo (2012) recommended further studies of the potentials of curricular design at different levels of development to improve the results of the basic technical cycle in relation to the demands, both in technical education and skilled worker education.

In this paper, the classification of cycles that make up a syllabus aimed to train technical professionals, is assumed, according to the performance mode given by Barrios (2005, p.61). It considers cycles as a system of contents where specific technological processes intervene. (Table 1)

Cycles in the syllabus	Characteristic contents
General education cycle	Objects of culture that tend to qualify the performance modes of technicians.
Technical basic cycle	Objects of culture that shape natural objects, whose laws were used for transformation in working objects and tools that intervene in specific technological processes.
Specific technical professional cycle	Objects cemented in the sciences that explain processes, working objects and tools that intervene in technological processes.
Cycle of	The science of a particular

technical profession execution	technological process that constitutes the scope of work, and intervenes in specific technological processes
Specialization cycle of technical profession	The science of a specific technological process that constitutes the working object, where various techniques and procedures intervene.

**Table 1:** The contents that characterize ETP education cycles, according to the performance model of the technical professional, Barrios (2005)

By focusing on the technical professional cycle, Guzmán (2014, p. 27) defines it as the system of contents that corresponds to the science of a specific technological process, based on the performance of the technical professions, that makes up the scope of work, and where technology procedures intervene, thus characterizing the technician’s mode of performance.

This definition allows for determination of the structure of the professional cycle to form technical professionals in the essence of their technical professions, which identifies them as to,

- The basics of methods and procedures.
- The specifics of method and procedure techniques.

Then, the technical professional cycle is what the specialty needs to identify with the technical profession, consciously and systematically, to ensure training technical and worker education, together with material, cultural, scientific, and technical development of the society.

To materialize this study, this paper proposes a methodology based on the curricular design of the technical professional cycle that can provide education of competent technical professionals, derived from a study of the profession to achieve coherence between technical professional performance and social development.

## Rationale

Productive processes are characterized by a rapid incorporation of high technology and motility in the area of knowledge, skills, and value application. The technological development reached, and the social perspectives, require the technicians to respond to the needs of the profession, be able to face the new challenges, and provide solutions to technical and professional problems.

In that sense, curricular design is in charge of, from the conception of the technical professional cycle,

interpreting the genetic factors of curricular design of technical professions, according to a technological perspective, and the demands of a socio/cultural expression, to determine technical-professional competences, defined by Cabrera, Crespo & Portuondo as the expression of reflective and creative actions of the professional, by using specific methods of the profession (modes of action), to solve professional problems observed during their performance (2017, p.8)

### Demands for application

- A favorable will of curriculum decision makers to the incorporation of a technical identity of technical professionals in the curricular design of their cycle.
- Theoretical and methodological preparation of teachers and employers to achieve proper professional performance according to the requirements of curricular design in the technical professional cycle.
- Preparation of technicians, providing a favorable environment that favors their roles in the proposal, including their motivation to embrace transformation, using technological procedures, and technical professional competences in the specialty of Zootechnia-Veterinary, which demands technical-professional performance from a curricular integrality standpoint.

### Principal characteristics

- The contextual meaning of curricular design of the technical professional cycle in the specialty of Zootechnia-Veterinary is achieved through adequate characterization of the technical profession.
- The mode of performance of technical professionals is promoted through correct interpretation of the demands of cultural partners in the profession.
- Integrality of the technical professional performance is achieved by determining the methods and procedures of the technology and technical professional competences, depending on determination of the work areas of the professional.
- The stages of the methodology for the curricular design, based on considering the role played by the technical professional cycle in the formative curriculum of ETP technical professionals, are shown in figure 1.

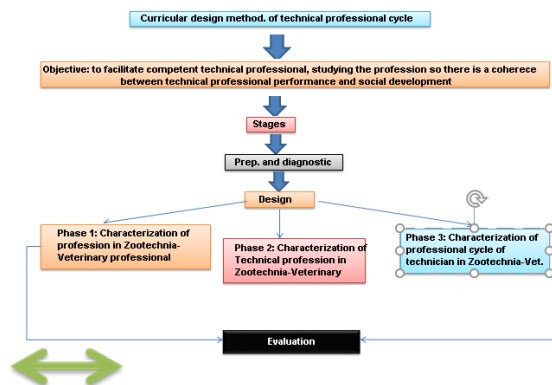


Fig. 1: Graphic representation of the methodology for curricular design of the technical professional.

The methodology for the curricular design of technical professionals in the specialty of Zootechnia-Veterinary, based on technical professional competences, is characterized by principles of flexibility an context, which also correspond to the principles for ETP optimization, which include,

- A vision of technical identity, since the curricular macro design of the technical professional responds to the requirements of the technical profession of the technician in Zootechnia-Veterinary, and the need to design the technical professional cycle, depending on the study of the profession.
- A broad vision of technical professional competence determination, and the procedures of technology in the specialty Zootechnia-Veterinary.
- A developing vision that permits observation of the evolution of the Zootechnia-Veterinary specialty depending on its trends.

### Results:

To implement the methodology suggested, the specialty of Zootechnia-Veterinary, delivered at Martires de Pino Tres Agricultural Polytechnic School, in the municipality of Jimaguayu, was chosen.

The first stage was **Diagnostic and preparation**. In it, the parameters evaluated determined the preparation levels of teachers in the specialty, and the instructors in production, which was favorable to deal with the curricular design of the Technician in Zootechnia-Veterinary. Besides, it should be near the production centers, whose highly skilled personnel assist in their preparation, and therefore, shortages of resources can be addressed through the association between IPA and the companies, with existing agreements.

Joined meetings were held between professors and instructors from stocking companies, to determine the



procedures of technologies and technical professional competences, which also considered,

1. The representativeness of technical professional competences in the solution of technical professional problems, which, within the technical professional cycle, become teaching problems.
2. Relations between technical professional competences and technology procedures in the syllabus.
3. Curricular flexibility to address specialty problems, as to the realities and perspectives of the Zootechnia-Veterinary specialty, within the national and local contexts.

Accordingly, it was necessary to develop trainee stimulating work by teachers to endorse the new approach based on technical professional competence formation in the context of ETP. A favorable environment was developed in favor of the specialty.

The second stage of the **Design** considered that to structure the technical professional cycle, and to organize the other cycles of the syllabus, it is important to start from characterizing the profession, for which essential links were identified according to their principles of flexibility and context.

### **Stage 1: Characterization of the profession of the technical professional in Zootechnia-Veterinary**

Team work allowed the teachers in the study to determine the main problematic of the profession, during a discussion workshop, under the following terms: “The need to guarantee sustainable animal production, which should be economically viable, ecologically sustainable, and socially fair, as declared in the development goals for the millennium.

### **Stage 2: Characterization of the Zootechnia-Veterinary specialty**

To characterize the curricular model of the technical professional cycle in the Zootechnia-Veterinary specialty, it is important to determine the regularities of the profession, starting with the study of this kind of professional:

What is the history? The practice of Zootechnia-Veterinary is probably as old as animal taming; it was introduced in Cuba in the mid twentieth century, mainly after the triumph of the revolution, with the government initiative of contributing to the modernization of livestocking, and boosting programs for scientific development in agriculture.

What is it? Zootechnia-Veterinary is a branch of

agriculture.

What matters does it address? It deals with modern livestock problems.

What is it in charge of? To ensure animal health, implement new sustainable techniques and technologies that help save material and human resources, and to produce harmless foods efficiently, which tackle the growing needs of the population.

What is its purpose? Animal production in sustainable conditions, food safety of people and animals, and the protection of the environment.

Under what conditions does it develop? It needs the direct intervention of the production technician with the application of procedures and tools of the profession.

- Determination of professional problems of the specialty. Zootechnia-Veterinary.

In the process of abstraction and synthesis of the most general and frequent professional problems, as a technical professional problem in the specialty Zootechnia-Veterinary were identified.

“The need to ensure livestock production with sustainability, and respect for animal welfare”. Accordingly, it demands knowledge with an agronomic base in animal health, culture in different species, and an economic base to face the challenges of modern livestock production.

- Determination of the extent of the scope of technical profession in the Zootechnia-Veterinary specialty.

As a result of the analysis of professional problems, and the professional problem in the specialty Zootechnia-Veterinary, and considering the relation of basic sciences with basic specific knowledge, and technical sciences that assist professionals in addressing problems of the profession through procedures inherent to technology, it became clear that the part of culture belonging to specialty Zootechnia-Veterinary is structured by the “Process of agricultural production: Pastures, forages, soil, tools, equipment, and farming aggregates, the economy, domestic animals from different species, rearing, handling, and exploitation, social relations, administration, and communication.”

The modes and forms of action of technicians in the specialty Zootechnia-Veterinary are synthesized in the performance mode, which allow them to solve multiple professional problems in their specialty, as mentioned above. They are synthesized as,

**Mode of performance** To develop activities that ensure animal production, and with it, food safety of people and animals, and the protection of the environment.

**Form of performance** Interpretation and realization of agricultural activities.

- Determination of the professional objective in the Zootechnia-Veterinary specialty.

After determining the teaching problem and the scope of the technical profession in the Zootechnia-Veterinary specialty, the professional objective of the specialty was determined during a discussion workshop, which were expressed as follows:

“To implement actions from an agroecological and sustainable conception, using state of the art agricultural technologies in animal production. This prepares professionals for a responsible social, professional, and personal life, in accordance with their rights and duties as revolutionary citizens, and in compliance with the regulatory documents using a producer mentality (saving), preserving health, safety, quality, and love for the profession, the mitigation of environmental impacts, and a demanding attitude to life, by being unconditional to the revolution and socialism, with values such as, high revolutionary combativeness, patriotism, and anti-imperialism.

**Stage 3: Characterization of the technical-professional cycle of the technician in Zootechnia-Veterinary**

- To determine teaching problems of the technical professional cycle.

Guzmán (2014) explained that when technical professional problems are taken to the technical professional cycle, they become teaching problems through a didactic arrangement made in this category. Technical professional problems are the genesis of the technical profession.

Therefore, after considering the requirements of the technical professional cycle, the teaching problem of the technical cycle identified in the Zootechnia-Veterinary specialty was,

“The need of integrated application of knowledge, capacities, and professional skills of the specialty, and in locally foreseen specializations, based on economic assessment of production, based on information technology use, relying on organic, sustainable agriculture, in modeled or production conditions.”

- Determination of the objective of the technical

professional in the conception of the technical professional cycle.

The discussion workshop agreed to consider the objective of the professional in Zootechnia-Veterinary, expressed under these terms:

“To have basic and technical training that allow them to ensure livestock production, and produce foods efficiently, which contribute to meeting the growing needs of the population by mastering and implementing advanced technologies, adopting technological alternatives that preserve human, natural, and environmental resources in the conditions of sustainable development, proving technical identity throughout their professional, social, and personal lives, in fulfilling their duties and rights as revolutionary citizens with a producer mentality (saving), preserving health, safety, and love for the profession, and combativeness against corruption, neglect, and tolerance.”

- Determination of the scope of the technical profession of the technical professional cycle.

As part of the activities to determine the scope of technical profession of the technical professional cycle for the Zootechnia-Veterinary specialty, as a category that designs the essence of profession activity in the cycle, a discussion workshop was held. As a result, it was determined that the part of the culture inherent to the technical professional cycle of the Zootechnia-Veterinary specialty is composed of “pastures, forages, soil, instruments, equipment, and farming aggregates, the economy, domestic animals of different species, rearing, management, and exploitation.

- Determination of technical professional competences that will permit performance evaluation of technical professionals in Zootechnia-Veterinary.

- To evaluate the technical professional performance, the technical professional competences of the technical professional cycle were determined.

- Performance of different category activities required by species.

- Control and participation in mechanized and hand-milking, as well as daily maintenance of milking equipment, milk weighing, and milk preservation.

- Detection of sick animals and plants, treatment of common diseases, following the directions of the Zootechnia-Veterinary doctor, and Agronomy engineer, implementing disease

preventive and recovery measures.

- Control and demand of cleansing actions and biosafety measures in livestock facilities, equipment, and tools.
- Implementation of measures and methods to fight undesirable woody plants that affect pastures and forages, as well as significant pests and diseases.
- Planning and participation in the manufacture and preservation of hay, ensilage, rustic feed, and other feeds for animals.
- Sample collection, preparation, and preservation for laboratory use. Participation in necropsy, performing simple surgery procedures.
- Implementation of preservation measures and use of medication and biological products used in integrated fight against plant and animal diseases.
- Inclusion of oxen and horses in soil tilling.

The technical professional competences are closely related to the technical professional cycle; they are made of a set of knowledge requirements (knowing, knowing ways of performance, and knowing attitudes), and sharing life experiences, which are integrated and systematized to express the qualities of the technical professional.

#### Stage 4: Evaluation

The objective of this stage is to eradicate the mistakes from implementation, with evaluation and controls of phases, which contributes to the identification of problems by stage, which teachers of the Zootechnia-Veterinary specialty should modify. This includes the valuable participation of executives, technicians, and instructors of companies, and it was based on qualitative and quantitative assessment of the results of the different stages in the methodology proposed. The collective and personal contribution to the development of the methodology and the results of the stages implemented to enhance technical professional performance were also assessed.

#### Results before implementation

A number of 32 students enrolled in the Zootechnia-Veterinary specialty were chosen, and then split in subgroups of three to four students each. Close observation was done during the practical hours of subject Base of Agricultural Production, and Manual Agricultural Activities, when the students were evaluated according to already-established indicators

to measure technical professional performance, with the following results:

- Proper use of aids available for work. Deficient
- Implementation of professional tasks (professional competences). Deficient.
- Confidence and acknowledgment of potentials during the execution of working functions. Deficient
- Satisfaction with the activity performed. Average

In general terms

- There are limitations to master technical professional competences, which affect the establishment of a technical professional performance, thus requiring permanent assistance to implement tasks. As a result, this indicator is evaluated as deficient.
- There are difficulties in proper utilization of available aids for the activity, though there is also a shortage of resources for practices.
- Absence of confidences, and no recognition of their potentials to perform work functions, and barely half showed satisfaction.

#### Results of implementation (Pre-experiment)

Evaluation of the transformations accomplished with the implementation of the methodology in the Zootechnia-Veterinary specialty was made in two moments: at the beginning of on-the-job-practices of the specialty, and just before the conclusion of the practices. Three sets of close observation were performed in each moment, under real conditions of formation of the technician in the Zootechnia-Veterinary specialty (Table 2)

Indicators	Beginning of practices				End of practices			
	VG	G	A	D	VG	G	A	D
Proper use of available aids for the activity		X				X		
Implement professional tasks			X			X		
Confidence and acknowledgment of potential to perform the functions of the job			X			X		
Satisfaction with the activity			X	X				

Table 2. Results of the implementation of the methodology

At the beginning of on-the-job-practices (Table 2): The first indicator showed an increase compared to the initial diagnostic values, so it was evaluated as Good. Improvements were observed in the implementation of professional tasks, which are evaluated as average, though the levels of assistance decreased, it was still required. They showed little

satisfaction with the activity they perform, so no improvements were observed in this indicator.

In the second evaluation, which coincided with the conclusion of the practices, every indicator was evaluated as Good, with the following observations: The implementation of professional tasks are evaluated as Good, since most of the results observed showed lower levels of assistance, though the Very Good category was not achieved.

Most of them are confident and recognize their potential in job posts, so this indicator was also evaluated as Good. Currently, most students show satisfaction with the activities they perform.

In general terms, the implementation of the technology shows qualitative and quantitative improvements in technical professional performance of undergraduate technicians in the Zootechnia-Veterinary specialty, proving general mastery of professional tasks belonging to their specialty. Technicians are bestowed with a technical identity based on considerations of the curriculum as having a developing character that responds to the development of the technical profession.

The results observed following the implementation of this methodology ensure the validity, need, and usefulness of the scientific proposal presented to address insufficiencies in the design of the technical professional cycle of the Zootechnia-Veterinary specialty, that limit the professional performance of Zootechnicians-Veterinarians in livestock raising, at "Martires de Pino Tres" IPA, in the municipality of Jimaguayu, an expression of the relevance they have to meet the social demands, and the essence of ETP in Cuba.

## Conclusions

1. As part of curricular design of the Zootechnia-Veterinary specialty, the technical professional cycle plays a significant role, identifying limitations resulting from the absence of a theoretical rationale in the process of curricular macro design within the technical professional cycle.
2. The diagnostic evidenced insufficiencies in the performance of the technical professional of Zootechnia-Veterinary technicians, as a result from theoretical shortages that justified the need of this research.
3. A methodology for curricular macro design of technical professional competences was implemented through a pre-experiment, which showed positive changes in the professional performance of technicians, with special emphasis

on professional issues, and in-depth characterization of the degree.

## Author contribution

Humberto B. Sónora Revoredo: Research planning, information processing, redaction of the manuscript, and final review.

Riselda Guzmán Méndez: Research planning, information processing, redaction of the manuscript, and final review.

Ana María Godinez Do Val: Application of instruments, interviews, information processing, and redaction of the manuscript.

Mariuska Simón Foustén: Application of instruments, interviews, and redaction of the manuscript.

Biofredis Castro Torres. Application of instruments, interviews, and redaction of the manuscript.

## Conflicts of interest

Not declared

## References

- Addine, F., González, M., Ortigoza, C., Batista, L. C., Pla, R., Laffita, R., ... Fuxá, M. (2000). *Diseño Curricular*. [Soporte electrónico] Cuba: IPLAC.
- Barrios, E. A. (2005). *Modelo desarrollador de actuación del profesional Técnico*. (Tesis doctoral inédita). Instituto Superior Pedagógico "José Martí", Camagüey.
- Cabrera, I., Crespo, L., & Portuondo, R. (2017, set.-dic.) El diseño curricular desde la perspectiva de la actividad profesional. *Revista Transformación*, 13 (3), 406-415. Retrieved on June 4, 2019, from: <http://scielo.sld.cu/pdf/trf/v13n3/trf10317.pdf>
- Cruz, Y del C., & Barrios, E. A. (2017). El Diseño Curricular en la Educación Técnico Profesional Cubana: Características Teórico – Metodológicas Esenciales. *INNOVA Research Journal*, 2(5), 45- 59. Retrieved on May 22, 2019, from: <https://doi.org/10.33890/innova.v2.n5.2017.164>
- Gutiérrez, M. (2003). *Metodología del diseño curricular desarrollador del Ciclo Básico de las carreras de ingeniería*. (Tesis doctoral inédita). Universidad de Camagüey, Cuba.
- Guzmán, R. (2014). *Metodología para el macrodiseño curricular del ciclo profesional técnico, especialidad albañilería, en base a competencias profesionales técnicas*. (Tesis en Opción al Grado Científico de Doctor en Ciencias Pedagógicas). Universidad de Ciencias Pedagógicas "José Martí", Camagüey, Cuba.



Retrieved on June 5, 2019, from: <http://eduniv.mes.edu.cu/bd/td/Guzman%20Mendez%2C%20Riselda/Metodologia%20para%20el%20macrodiseno%20cur%20%28426%29/Metodologia%20para%20el%20macrodiseno%20%20Guzman%20Mendez%2C%20Riselda.pdf>

Partido Comunista de Cuba. (2017). *Lineamientos para la Política Económica y Social del Partido y la Revolución para el período 2016-2021*. La Habana, Cuba: Autor. <http://www.granma.cu/file/pdf/gaceta/Lineamientos%202016-2021%20Versi%C3%B3n%20Final.pdf>

Polo, A. (2012). *Metodología para el microdiseño curricular de la asignatura Matemática, especialidad Electricidad de la ETP*. (Tesis doctoral en Ciencias Pedagógicas, inédita). UCP "José Martí", Camagüey, Cuba.

Portuondo, R. (2000). *Diseño curricular desarrollador*. Camagüey: Universidad de Camagüey. [Soporte electrónico].

Portuondo, R. E., & Díaz, A. (2009). *Diseño curricular desarrollador por competencias. Un reto transdisciplinar*. Camagüey. [Soporte electrónico].

Portuondo, R. (2015). *Dialéctica Curricular. Entrevista abierta a profesores que atienden las prácticas de Zootecnia-Veterinaria y pre-profesionales*. En *Memorias de la XIII Conferencia de Ciencias de la Educación*. Camagüey. (s.p.). Cuba: University of Camagüey

#### Appendix 1

Objective: To check the level of professional performance of undergraduate technicians during their practices.

1. How many years have you worked in the specialty of Technician in Zootecnia-Veterinary?
2. What is your opinion about undergraduate and graduate student knowledge of the contents of the specialty?
3. Do you think they have the basic knowledge needed to perform their profession?
4. What do you think about the development of professional skills in the specialty?
5. What skills have you developed?
6. What are the limitations to the development of professional skills in the specialty at the polytechnic school and the workplace?
7. Do you think students are motivated?

Result: Seven teachers in charge of the Zootecnia-Veterinary practices were interviewed.

Positive aspects:

1. All the teachers interviewed have worked for ten or more years in the specialty.
2. They have the basic knowledge of the specialty.

Negative aspects:

1. Undergraduate and graduate student knowledge of specialty contents is little, especially in relation to practical matters.
2. Absence of professional knowledge updating.
3. The skills of technicians are deficient.
4. The limitations to the development of professional skills in the specialty at the polytechnic school and the workplace are,
5. Poor conditions of facilities and laboratories of the polytechnic.
6. In the company, assistance is not always accurate and systematic, which leads to the absence of practices, indiscipline, and lack of motivation for the activity.

#### Appendix 2

Interview to company tutors.

Objective: To check the level of performance of graduate technicians during their incorporation in companies.

General data: You are graduate [check with an X]:  
 \_\_\_ skilled worker in agriculture. \_\_\_ Technician in Zootecnia-Veterinary. \_\_\_ Veterinary doctor.  
 \_\_\_ Another specialty. Which? \_\_\_\_\_.

1. Do you think that undergraduate technicians have the basic knowledge for the specialty?
2. What are the most deficient skills?
3. Did you contributed to the development of professional skills necessary for the technician in Zootecnia-Veterinary during the on-the-job-practices? List them.
4. What are the limitations to the development of professional skills observed throughout the practices in the areas where you work?

5. What do you think about the technical and methodological training needed to contribute to improvements in the technical professional performance of skilled workers in masonry? 8.
6. What ways do you use to receive directions to conduct the professional training process of students in Zootechnia-Veterinary?

#### Results

Seven tutors of livestock companies Triangulo 1, Najasa, and Maraguan were interviewed.

#### Positive aspects:

1. The interviewed personnel working directly with the technicians in the practices are Technicians (five), and Veterinary Doctors (two).
2. The technicians under training have the basic knowledge of the specialty.
3. They have developed skills in animal handling.

#### Negative aspects:

1. The time needed to develop the skills is long, since students have few practical skills. The main difficulties have been observed in diagnostic and treatment of diseases, with material limitations that hinder practical activities, such as instruments, and protection outfits.
2. The methodological training is poor, and sometimes none.
3. The ways used to get directions for professional training delivery are few, only counting on the teachers in charge of the practices.