

***Los ejercicios integradores: Su impacto desde Disciplina
Principal Integradora Producción Agropecuaria
The integrative exercises: Its impact from Main Integrative
Discipline of Agricultural Production***

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Resumen

La propuesta se desarrolló en el departamento de Agronomía de la Universidad de Guantánamo, por la necesidad de dar respuesta a las insuficiencias que aún existen en el desarrollo de los ejercicios integradores en la carrera Agronomía, como vía para el establecimiento de las relaciones interdisciplinarias. La totalidad de la muestra estuvo conformada por los estudiantes de tercer año de la referida carrera (n=18). Ofrecer ejercicios integradores direccionados por la asignatura Sistema de Producción Agropecuaria III, como parte de la Disciplina Principal Integradora Producción Agropecuaria constituye el objetivo del trabajo. Los ejercicios dan respuesta a situaciones claves en el accionar del ingeniero agrónomo y están en correspondencia con las exigencias del modelo del profesional.

Palabras clave: Relaciones interdisciplinarias; Ejercicios integradores; Carrera Agronomía; Sistema Producción Agropecuaria III.

Summary

The proposal was developed in the Department of Agronomy of the University of Guantánamo, due to the need to respond to the insufficiencies that still exist in the development of integrating exercises in the Agronomy career, as a way to establish interdisciplinary relationships. The entire sample was made up of third-year students of the aforementioned major (n=18). Offering integrative exercises directed by the subject Agricultural Production System III as part of the Principal

Integrating Discipline Agricultural Production constitutes the objective of the work. The exercises respond to key situations in the actions of the agronomist and are in line with the requirements of the professional model.

Keywords: Interdisciplinary relations; Integrating exercises; Agronomy career; Agricultural Production System III.

Introduction

The transformations that are carried out in the educational sphere in Cuba, in each of its educational levels and particularly in Higher Education, require an innovative and creative professional, possessing a scientific and pedagogical culture; with a high social commitment, who links the general objectives in the formation of students with the singularities of each one, circumscribing the particularities of the school and its context of action with an integrative and interdisciplinary approach to the subject, Fiallo (2004), states:

The interdisciplinary conception is a goal to be achieved from the model of the university professional, because it determines and makes possible the coordination of educational influences and the coherent combination of work from each subject of the curriculum in terms of achieving the objectives of each year, as an aspiration or tendency to the logical unity of knowledge. (p.96)

In the model of the Agronomy professional and in the study plan of the career, it is explained that the agronomist engineer is a professional who, making rational use of human, physical, chemical, mathematical, biological and social resources, must direct the agricultural production process with a logic that involves: diagnosing, forecasting, planning, organizing, applying, executing and controlling it.

The above highlights the importance of integrative exercises as a way to establish interdisciplinary relations and the incorporation of interdisciplinary as a work philosophy, as a way of thinking and acting (MES, 2019).

In the current Cuban historical conditions, where there are a series of changes that are reflected in the conceptions and practices of the training and professional performance of our teachers, this idea becomes valid, since one of the teacher's missions is to achieve in their students a general culture, which allows them to become aware of themselves and their responsibility as critical and transforming social beings, capable of having a global vision of reality in all its complexity.

For (Salazar, 2000), "if this aspiration is to be achieved, it is necessary to achieve a higher level of integration of the contents acquired by the student in the teaching-learning process" (p. 23). 23), so

that integrative exercises emerge as a necessity, which enable, to the extent that contents of one or more subjects are integrated, their relationship for their solution, as well as the investigation of new knowledge, This integration of contents can be based on intra and interdisciplinary links between the objectives to be met by the student, which is a condition in the teaching-learning process, since the knowledge of natural phenomena requires that they be studied in relation to each other.

The interdisciplinary integrators are a process and a philosophy of work, it is a way of thinking and proceeding to know the complexity of objective reality and solve any of the complex problems it poses.

Integrating exercises are a didactic condition that facilitates the fulfillment of didactic principles such as systematicity, scientificity, link between theory and practice, among others. According to Fiallo (2004), "these ensure the consistent reflection of the objective relationships in force in nature, society and thought, through the integration of the content of the different disciplines that make up the curriculum of any professional" (P.65).

One way to achieve an integral general culture in the Agronomy career at the University of Guantánamo is precisely the relationships between the different disciplines of the career. To deal with the integration of contents from any angle presupposes seeing it in relation to life and the social environment, hence its human relevance, because it not only responds to a need of theory, but also to a need of pedagogical and therefore social practice; that of transforming the world with transformed men.

That is why the integration of contents, in its essence, is an effective work tool that implies a collaborative work of a group of people in a disciplinary level, because it cannot be the result of spontaneous, isolated and occasional activities, but it is the consequence of the group of teachers.

The authors agree with Fiallo (2004), when considering "that integration is a moment of organization and study of contents, a stage for interaction that can only occur in a regime of co-participation, reciprocity, mutuality" (p. 166).

It has been noted that, in pedagogical practice, it is still insufficient to take advantage of the potentialities of the content of integrative subjects for integration. Therefore, it is assumed as an objective to offer a set of exercises that contribute to the achievement of the integration of contents from the subject Agricultural Production System III, in the Agronomy career of the University of Guantánamo.

Development

Materials and Methods

The experiment was developed during the 2022 school year, with the objective of testing the effectiveness of a set of exercises aimed at the integration of contents from the subject Agricultural Production System III, in the third year of the course. A sample of 18 third year Agronomy students was used for the development of this exercise.

This set of exercises constitutes a dynamic tool that facilitates the practice of the students of the different teaching levels, their preparation as future Agronomist Engineer, regarding how to integrate the contents of the different subjects and disciplines that are studied in the determined year and also contributes to the enrichment of their scientific-methodological level.

For the realization of the proposal, empirical methods and techniques were used, the historical-logical method for the analysis of the professional training process of the agronomist engineer and its dynamics; the method of analysis-synthesis goes through the whole process of scientific research and the dialectical-materialistic method that directs the whole research by making possible an objective and scientific analysis of the investigated problematic. The model of the professional of the Agronomy specialty and the Ministerial Resolution of Higher Education 47/2022, in force, were used, in addition to the document of the National Meeting of Agronomy Career that exposes the form of integrating exams for Agronomy careers throughout the country.

It is based on the previous determination by the professors of the articulation nodes of the subjects of the year, from the methodological work and the didactics of interdisciplinary relations.

It is also supported philosophically in that it is assumed as a methodological basis for the interpretation of the educational phenomenon and its application to practice, psychologically it is based on the theoretical-methodological framework of the materialist dialectic, which places the human being in his social environment and analyzes the origin and development of the personality in the historical-cultural context and pedagogically it is part of the teaching-learning process with its general and methodological criteria that support the integrating activity with emphasis on the formation of man, as a social being.

The topics selected are: "Production and conservation of pasture and forage" and "Milk and meat production systems for species of economic interest" of the subject "Agricultural Production System III", which is taught in the third year of the study plan of the Agronomy career.

The rationale for choosing the topics of pastures and forages and milk and meat production was their application in Botany contents (properties and constitution of plants), in General Zootechnics

(agricultural ecosystems, animal breeds, productive linkage, among others) and in Animal Nutrition (nutritional properties of food).

- Initially, a pre-exercise guide was written in which the disciplinary topics were presented (properties of composite fiber, rumen assimilation, general ruminant metabolism, fiber degradation, ways of feeding cattle, feed acceptability, rearing conditions). This facilitates the students' understanding of the linkage of these topics with other related subjects of the career (Botany, Pasture and Forage Management, Animal Nutrition, Morphophysiology, General Zootechnics, Inorganic Chemistry, Biochemistry, Agricultural Economics and Physics).
- In the application of these research methods, the establishment of links between the knowledge and skills systems of different disciplines predominated, for which the indicators proposed by Perera (2000) were taken into account:
 - - Establishment of relationships between contents of different areas of knowledge (General Chemistry, Materials Science, Mechanisms Theory and Design of Machine Elements).
 - - Reflection on the meaning of the learning content for their development as a subject and future professional.
 - - Manifestation of the mode of action

Results

The integration of contents has its roots in Plato's time (427-347 B.C), highlighting the contributions of prominent figures such as: Bacon, 1561-1626; Comenius, 1592-1670; among others.

Insignificant Cuban pedagogues were projected by the integration of content as (Luz Caballero, 1800-1862; Martí, 1853-1895; Varona, 1849-1898 and Varela, 1766-1853); and many others whose postulates today maintain an extraordinary validity.

At the end of the twentieth century and the beginning of the present, research has been carried out in this sense, with the work of (Fiallo, 2004; and Fernández, 2000) standing out, among others, which pay attention to the integration of the contents of the disciplines as a highly effective process to stimulate the cognitive activity of students and to form in them a dialectical, creative and interdisciplinary thinking.

All these great thinkers agree that knowledge alone does not promote the solution of problems, if it is not unified; it is a fusion of contents, not the sum of its parts.

Other pedagogues and psychologists from other latitudes have studied the subject in which we can generally cite (Espinoza-Freire, 2018; Rubio et al, 2018); which pay attention to the integration of

the contents of the disciplines as a highly effective process to stimulate the cognitive activity of students and form in them a dialectical and creative thinking.

Perera (2007) presents an integrative proposal for teaching, which is fundamentally based on the following premises 1-50:

- Encourage, among teachers, reflection, collegiality and teamwork.
- Delimit those contents that are objects of attention of several areas of knowledge, since they are located on the frontiers of the disciplines taught.
- Contribute to interdisciplinary thinking.
- To promote a closer approach to reality.
- To favor the realization of integrative exams.
- To make viable the extrapolation of the principle of integration of knowledge to other educational levels.

However the above premises, in the educational systems it can be seen that when teachers are ready to conceive a system of integrative and interdisciplinary exercises, a mentality tends to overvalue their discipline or subject, and this leads them to consider it as the highest point in the integrative process. Thus, a contradiction appears, to a certain extent inevitable, in favor of the contents being nucleated around this or that subject.

In these cases, it is necessary from a logical reasoning to propose, as a way to solve the contradiction, to prioritize the description of a certain system or phenomenon, to start from its explanation and then to place in the lesson plan a problem involving agricultural, forestry and animal breeding phenomena. In these cases, problem-based teaching can help, because, for example, when dealing with productive phenomena, after describing and explaining them, and with the mastery of the contents of several disciplines, which is a prerequisite when working in an interdisciplinary program, the different relationships derived from the phenomena studied are exposed and provide an integral solution to the problem studied.

In the first instance, it is necessary to contemplate some theoretical foundations, starting with the identification of the different paradigms through which knowledge has evolved; it is proposed that it has gone through three types of dynamics:

- The specialization and over-specialization of the different disciplines, parceling out knowledge.
- The integration of plots to achieve a common goal, forming new interdisciplinary fields of knowledge.
- Interdisciplinarity, declared to understand and solve problems relevant to today's world, has reached more followers today, which is congruent with the disappearance of communication barriers and the global exchange of information.

Disciplinary integration is a fundamental part of curricular flexibilization, particularly of curricula, in order to train more universal professionals, able to face the rapid transformations of competencies and knowledge.

According to Suárez, (2014), "a discipline is a theoretical and technical body that must be studied and mastered in order to put it into practice, which allows the acquisition of certain skills and competencies, which implies a constant commitment to learning" (p. 33).

The integrative disciplines with their integrative exams confront the student, once graduated, with the contents of the professional activity itself, and reflect the reality of life, in a globalized whole, where they must demonstrate academic, work and research skills. Those who advocate interdisciplinarity defend, therefore, through it, a new type of person, more open, flexible, supportive and critical.

Today, in general, the formation of students in higher education presents career grids that maintain a linear type of curricular organization, with subjects whose names attempt to represent the different parcels of human experience and knowledge. Thus, disciplines are an organization where thought, the way of perceiving reality and human action are exercised, created and transformed, using specific languages and methods that allow for the analysis and intervention of reality.

In relation to the above, Perera (2007) speaks of a puzzle or collection type curriculum, where its contents are isolated from each other, without any relationship and where teachers and students have little control over the design and development of the curriculum.

Under this perspective, students fail to see the usefulness of what they learn, nor relate it to real life. The education of the individual also needs to include the ability to try and apply knowledge, estimate its limitations and develop the means to overcome them (Perera, 2007).

It is proposed that integrative exercises meet the following requirements:

1. Have a previous preparation, which gradually includes new actions and operations in the tasks; that allow the application of knowledge to new or unfamiliar situations.
2. Include actions and operations that promote the integration of theoretical and practical contents that improve the development of the modes of professional performance.
3. Lead to reflection.
4. Promote the search for and use of different solution alternatives to the exercises presented.
5. Have a link with practical life.

The above mentioned, confers to the Integrating Main Discipline Agricultural Production an important role for its integrating and interdisciplinary character to achieve the Model of the Agronomy professional, because it is able to contribute to a decisive role, determines the coordination of educational influences and the coherent combination of work from each subject of the curriculum, depending on the achievement of the objectives of each year, as an aspiration or tendency to the logical unity of knowledge.

A sensitization phase is proposed beforehand, with its consequent steps to contribute to the achievement of the proposed objectives.

Sensitization phase

1. The essence and objective of the exercise to be carried out are offered, highlighting its need and importance based on demonstrating the social and productive priority nature of the Agronomy specialty in the province of Guantánamo.
2. To propose a way of integrating the knowledge to carry out the integrating exercise and contribute to the process of disciplinary integration of the students of the Agronomy specialty.
3. Generate an exchange with the students who are going to intervene, where the need and actuality of the integration process is based.

4. Highlight the potential of the inter-subject integration to develop the students' exercise process.
5. The realization of previous integration meetings is encouraged and reminded in order to appreciate the level of commitment, motivation and disposition, for the sake of the effectiveness of the exam to be developed, so that they become active and creative entities in the conduction, assurance, follow-up, control, evaluation and feedback of the integration exam process.
6. Promote the active participation of each one of the students who participate in this activity that acquires socio-educational value with methodological character due to its purpose, seen as a process and result for the Agronomy specialty.

Proposal of integrating exercises

Integrating Exercise 1: Milk production

Learning situation:

As a result of a tour of dairy cattle production areas in eastern Cuba, the "La Teresita" and "El Cerezo" units were visited. In the "La Teresita" unit, there is a herd of 120 pure Holstein cows, confined (concrete installations), mechanized milking is used, feeding is based on balanced concentrate, and feed distribution is mechanized.

In the case of the "El Cerezo" unit, consisting of 88 crossbred cows with high resistance to tropical conditions, in rustic facilities, manual milking, and its feeding is based on crossbred Bermuda 1 pasture and supplemented with final honey in the afternoon.

When analyzing the statistical data of the units, the following was found:

Unit "La Teresita": Milk production in the month: 43 200 liters, Cows in milking: 72, Total workers 15, Forage area 20 Ha, Average salary 5500 pesos, Milk price 25 pesos.

El Cerezo" Unit: Milk production for the month: 18,480 liters, Cows milking: 62, Total workers 5, Forage area 85 Ha, Average wage 3800 pesos, Price of milk 25 pesos.

Based on the information provided for both units, answer the following questions:

1. Identify the farming system used in each milk production unit. Justify your answer.
2. Determine the following indicators: Milk production per milking cows, Milk production per worker, and Milk production per total cow.
3. Which of the units do you consider to have the highest economic viability in your farming system?

Integrating Exercise 2: Small livestock production system

Learning Situation

As an engineer, you are asked to design a livestock production system with the purpose of inserting it in the productive activity of the Arturo Lince Company, which can be compatible with the real conditions existing in the company. Consider that it should supply food for the producers of the system and achieve surpluses to guarantee the feeding in the market of at least 190 people, in addition it must prioritize a balanced feeding to the consumers and an efficient socioeconomic and environmental operation.

Mention the morphological and productive characteristics of the Yorkshire and Duroc Jersey swine breeds. Explain which of them you would use in your production system.

Mention four goat breeds and explain the morphological and productive characteristics of the one you would select for your farm and what system of exploitation you would use for them.

Of the poultry and rabbit breeds present in Cuba, select one breed of each and explain the characteristics that led you to use it in your production system.

Taking into account the conditions of the entity, select two breeds of sheep, pigs, goats, and fish. Explain why you selected them.

Propose swine breeds to increase meat production, taking into account the conditions of the entity. Explain.

Propose alternatives that contribute, from your production system, to the achievement of a balanced diet for consumers with an efficient socioeconomic and environmental performance.

Integrating Exercise 3: Integration of agriculture - livestock

Learning situation:

In the Ruta Invasora Livestock Company, it is necessary to establish an integrated system for raising cattle for milk production for 60 dairy cows, a system for raising sheep and goats with a capacity of 120 animals and a system for raising dogs with a rabbit hutch structure with 40 cages for breeding cows. The milking cows and sheep graze in an area of 24 ha, on a rolling terrain, planted with Star Grass in February, without irrigation or fertilization, divided into 31 equal quarters, with an average availability of 0.8 t M.S/ha, with an occupancy time of 1 day/quarter. The water source is located 1 km away. The average live weight of this group of cows is 380 kg, as they are underweight, they need to gain 500 grams per day, so that at calving time they have a weight of approximately 500 kg and the calf is not born underweight.

The following feedstuffs are used to feed the young cattle: waste rice, cassava flour, soybean meal, corn, calcium carbonate, fish meal, sunflower meal, and zeolite.

1. State an agroecological proposal for the management of these production systems.
2. Expose the systems of exploitation of the different livestock species. Explain which factors could influence the production of milk and meat.
3. What genetic characteristics should the female cattle have and how would you proceed for their selection? Explain this process.
4. Of the exposed feedstuffs to be used in animal feeding. Give the classification, which are protein, energy, additives and minerals.
5. Classify these feeds in conventional and non-conventional or alternative.
6. How would you handle the calves in your unit? Argument

The integrating exercises are in correspondence with the practical reality faced by the future agronomist engineer in his working life, allowing students to strengthen their knowledge, using the knowledge of different subjects directed by the Main Integrating Discipline, to provide a unique and integral answer or solution, with a sustainable management of natural resources and care of the environment, contributing to the formation of an interdisciplinary professional mode of action.

The authors consider that this integration of disciplinary contents constitutes a challenge in the training of the agronomist engineer; at the University of Guantánamo it is insisted that the educational teaching process does not reflect all the existing potentialities in this sense. In addition, the sources consulted agree in recognizing that the interconnection between subjects with different positions, according to the logic of the profession, constitutes a key aspect during the execution of the integrative exam and the organization should generate spaces for the debate between the discipline, year and subject subsystems, as well as take advantage of the potentialities of the cycle and the curricular strategies defined.

The work of preparing the planned integrative exams cannot have the same objectives every year and their questionnaire should not be routine and repetitive, since the possibility of deploying a formative process of excellence is based on the presence of a work of teaching management of the subjects of the year that breaks schemes and offers solutions to the existing productive problems, with a progressive increase of its demands, through the use of pertinent and quality tools that intend the interrelation between the subsystems of the career and facilitate the interdisciplinary approach according to the new educational scenarios and trends.

With respect to the integrative exams, the integration of knowledge is the responsibility of the faculty, so it must be ensured that they are properly trained through the different modalities of the postgraduate program, which will provide the didactic and methodological tools for the teaching of

the contents referred to, as well as their self-preparation to advance in this endeavor, since it influences the quality of the collective work and their progress in the scientific-technical, didactic, philosophical, political-ideological and informatics aspects must be ensured, as an essential basis to undertake a creative methodological work.

Conclusions

The integrating exercises are characterized by the fact that the contents dealt with in them are linked to the professional context of the agronomist engineer, evidencing the link between theory and practice. The application of the integrating exercises, from the subject Agricultural Production System III, allowed a better preparation of future professionals in close connection with the model of the professional of the Agronomy Career.

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