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Original article

Teaching and learning process of the Television Fundamentals subject: Theoretical references

Proceso de enseñanza aprendizaje de la asignatura de Fundamentos de Televisión: Referentes teóricos

Processo de ensino e aprendizagem da matéria Fundamentos de Televisão: Referências teóricas

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ABSTRACT

This article presents a descriptive study of the teaching-learning process in the subject of Television Fundamentals in the Telecommunications and Electronics Engineering program. The objective is to characterize the main theoretical references of the process, emphasizing the relationship of its components to develop modes of action and work performance of graduates once they graduate. A set of theoretical and empirical methods were used, which allowed interpreting, from a dialectical materialist methodological basis, the historical evolution of the teaching-learning process and its contextualization in the teaching of the subject, as well as to substantiate each of its elements. The results obtained from the applied instruments allowed identifying the main weaknesses in relation to

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the components of the process and that influence the development of students in the problems of their professional profile and specific within the objectives of the subject under study. The main results are concentrated in the initial diagnosis of the teaching-learning process, determining each of the existing needs and deficiencies. In summary, the teaching-learning process in the studied context should contribute to the integral formation of students, promoting the acquisition of competences, knowledge, abilities, skills and values. In addition, this process must be developmental, contextualized and professionalized to favor a competent professional performance, allowing graduates to be in accordance with the current educational demands in Cuba.

Keywords: telecommunications; teaching-learning process; tools.

RESUMEN

Este artículo presenta un estudio descriptivo del proceso de enseñanza-aprendizaje en la asignatura de Fundamentos de Televisión en la carrera de Ingeniería en Telecomunicaciones y Electrónica. El objetivo es caracterizar los principales referentes teóricos del proceso, enfatizando la relación de sus componentes para desarrollar modos de actuación y el desempeño laboral de los egresados una vez graduados. Se emplearon un conjunto de métodos teóricos y empíricos, que permitieron interpretar, desde una base metodológica dialéctica materialista, el devenir histórico del proceso de enseñanza-aprendizaje y su contextualización en la impartición de la asignatura, así como fundamentar cada uno de sus elementos. Los resultados obtenidos de los instrumentos aplicados permitieron identificar las principales debilidades con relación a los componentes del proceso y que influyen en el desenvolvimiento de los estudiantes en los problemas propios de su perfil profesional y específicos dentro de los objetivos de la asignatura en estudio. Los principales resultados se concentran en el diagnóstico inicial del proceso de enseñanza aprendizaje, determinando cada una de las necesidades y carencias existentes. En resumen, el proceso de enseñanza aprendizaje en el contexto estudiado debe contribuir a la formación integral de los estudiantes, promoviendo la adquisición de competencias, conocimientos, habilidades, destrezas y valores. Además, este proceso debe ser desarrollador, contextualizado y profesionalizado para favorecer un desempeño profesional competente, permitiendo a los egresados estar en concordancia con las exigencias educativas actuales en Cuba.

Palabras clave: telecomunicaciones; proceso de enseñanza-aprendizaje; herramientas.

RESUMO

Este artigo apresenta um estudo descritivo do processo de ensino-aprendizagem na disciplina de Fundamentos de Televisão no curso de Engenharia em Telecomunicações e Eletrônica. O objetivo é caracterizar os principais referenciais teóricos do processo, enfatizando a relação de seus componentes para desenvolver modos de atuação e o desempenho laboral dos egressos uma vez graduados. Empregaram-se um conjunto de métodos teóricos e empíricos, que permitiram interpretar, desde uma base metodológica dialética materialista, o devir histórico do processo de ensino-aprendizagem e sua contextualização na ministração da disciplina, assim como fundamentar cada um de seus elementos. Os resultados obtidos dos instrumentos aplicados permitiram identificar as principais debilidades com relação aos componentes do processo e que influem no desenvolvimento dos estudantes nos problemas próprios de seu perfil profissional e específicos dentro dos objetivos da disciplina em estudo. Os principais resultados se concentram no diagnóstico inicial do processo de ensino-aprendizagem, determinando cada uma das necessidades e carências existentes. Em resumo, o processo de ensino-aprendizagem no contexto estudado deve contribuir para a formação integral dos estudantes, promovendo a aquisição de competências, conhecimentos, habilidades, destrezas e valores. Ademais, este processo deve ser desenvolvedor, contextualizado e profissionalizado para favorecer um desempenho profissional competente, permitindo aos egressos estarem em concordância com as exigências educativas atuais em Cuba.

Palavras-chave: telecomunicações; processo de ensino-aprendizagem; ferramentas.

INTRODUCTION

In the current era, considered to be plenty of information, technology and significant changes, society advances in line with scientific and communication development and, is constantly reinventing itself. The rapid step at which technology and humanity evolve is so fast that it even exceeds understanding. This understanding leads us to recognize that change is the only constant and resisting it would be an obstacle to human progress and the creation of new knowledge.

The authors Aras *et al.* (2017) and Fernández Cruz *et al.* (2018) emphasize the continuous improvement of university curricula as a fundamental basis of Higher Education, contributing to the comprehensive development of graduates, and in accordance with the guidelines of the country's economic and social policy, which support the need to update university training and research programs in alignment with Cuba's economic and social development and new technologies.

In the Cuban context, over the course of a decade, the dynamics of a society marked by the need for professional replacement in various branches due to population ageing, the possibilities allowed by the rise of technologies and the growing demands for training professionals for the state and non-state sectors of the economy, became scenarios that conditioned the urgency of creating a new model of Cuban professional. In the document presented by the MES in 2018, these dynamics became more evident, underlining the need to renew and adapt professional training to the new times.

Cuban Higher Education, according to Tejada Fernández and Pozos Pérez (2018), must continuously align itself with the needs of society and improve its curricula to contribute to its evolution and development. The objective is to train competent professionals who can transform the organizations in which they work and offer effective solutions to the problems they face. The "E" Curricula represents this continuous improvement.

To achieve this goal, the importance of the continuous training process of Cuban professionals is emphasized, increasing the quality of training and facing the challenges of continuing education in three scenarios: undergraduate training in broad-profile careers, preparation for employment and postgraduate training. The proposal by Tejada Fernández and Pozos Pérez (2018) underlines the need to create modern incentives that support and motivate first-year students of Telecommunications and Electronics Engineering, considering the challenges and deterioration of the career, the lack of resources and the impact of the pandemic.

In short, Cuban Higher Education is focused on adapting and continuously improving to train professionals capable of responding to the current and future demands of society, despite current challenges.

From the undergraduate level, students are provided with the necessary knowledge and tools that will allow them to perform in the basic link of their profession and in other related spheres. Likewise,

the acquired skills allow them to specialize in their workplace, through a system of advanced courses, master's degrees and doctorates.

Echeverría Samanes and Martínez Clares (2018) state that it is not about overloading the student with another library of books, materials and content, since the undergraduate degree cannot cover the entire culture of a profession in a few years; mainly because knowledge is aging very quickly. Instead, there is a search for a new method of self-management of knowledge that allows the student to advance on their own in solving problems and that constitutes a guide when it comes to developing in work environments, seeking solutions to problems that arise from engineering.

In this sense, engineering education requires needs and requirements to ensure that the training process responds to the demands of the context, an aspect that demands an organization of the educational teaching process centered on the student, developed in an interactive and collaborative manner and that allows the student to acquire lifelong learning.

A future telecommunications engineer, when pursuing a degree, expects to move through the following fields of action: design, execution, resolution of practical problems with scientific methods, teaching based on the theory-practice relationship with deep relationships with industry and technical innovation. However, in 2018, it was observed that these fields were barely visible during their university education.

The authors De Brito Salazar *et al.* (2022); Tejada Fernández and Pozos Pérez (2018); Haleem *et al.* (2022); Putnik and Alves (2022); Echeverría Samanes and Martínez Clares (2018) emphasize the importance of students applying their theoretical knowledge in practice. The university must foster a closer connection with productive companies, assigning students to professionals during their internship period, to guide them and make them feel part of the collective. In addition, it is essential that the subjects are relevant and practical, and not taught in too short a time. Research on first-year students and the obstacles they face in their learning is a developing field that seeks to consolidate itself on a theoretical-methodological scale, applying both in-person and virtual resources. Among the essential points highlighted is the importance of applying theoretical knowledge in practice, achieving a close connection between the university and productive companies, the assignment of professionals to students during internships, providing the corresponding relevance and practicality of the subjects, research on obstacles in the learning of first-year students and the use of in-person and virtual resources in education.

For all these reasons, the objective of this article is: to characterize the main theoretical references of the process, emphasizing the relationship of its components to develop modes of action and the work performance of graduates upon graduation.

MATERIALS AND METHODS

A descriptive research was carried out, which worked with the entire population of professors who made up the faculty and students in the daytime course modality belonging to the 2022-2023 course, in the Telecommunications and Electronics Engineering career of the University of Pinar del Río "Hermanos Saíz Montes de Oca".

In the research, the following methods were used, starting from assuming as a methodological basis the dialectical materialist approach, which allowed the study of the object as a process, the determination of its components, its contradictions and the foundation of the methods used.

As a theoretical method, the historical-logical analysis was used, with the objective of showing the historical evolution of the teaching-learning process and its contextualization in the subject of Television Fundamentals in the Telecommunications and Electronics Engineering course.

The empirical methods used were:

Documentary analysis: It included the model of the professional in the Telecommunications and Electronics Engineering career, the E Curriculum, the Base Document for the Design of the "E" Curricula, Resolution No. 47/2022, documents of proposal of modification of the curricula, analytical program of the subject and all its documentation methodology and the review of documents according to the Field Manual applied by the III Perfectioning of the National Education System. This analysis allowed to know the main elements related to how the teaching-learning process is developed in the subject of Fundamentals of Television.

Interviews to directors, professors of the career and students: with the objective of knowing the state of opinion of the current situation of the teaching-learning process of the subject of Television Fundamentals and how it contributes to fulfill the objectives within the discipline of Radiocommunication Systems in which it is inserted and the ways to improve it.

Observation of teaching activities: with the purpose of diagnosing the object of study, evidencing the problem and verifying the results obtained from the practice of the implemented strategy.

As for the statistical-mathematical method, descriptive and inferential statistical techniques were used, as well as percentage analysis, which allowed interpreting the results obtained from the instruments applied.

RESULTS

The results of the survey of teachers and students from 1st to 5th year of the Telecommunications and Electronics Engineering degree at the University of Pinar del Río are presented in tables 1 to 6. Table 1 shows how they rated their overall experience in the Introduction to Telecommunications course.

Table 1. Rating of overall experience in the subject Introduction to Telecommunications

Indicator	Measurement criteria	Teachers		Students	
		N. 10	%	N. 25	%
General experience in the subject Introduction to Telecommunications	Very good	3	30	5	20
	Good	5	50	10	40
	Regular	2	20	8	32
	Bad	0	0	2	8
	Very bad	0	0	0	0

Table 2 identifies the main difficulties that teachers found when teaching the subject.

Table 2. Difficulties found by teachers when teaching the subject

Indicator	Measurement criteria	Teachers	
		N. 10	%
Main difficulties found by teachers when teaching the subject	Lack of resources didactic	7	70
	Difficulty in understanding concepts by students	5	50
	Lack of laboratories practical	4	40
	Other (specify): lack of time to prepare additional material	2	20

Table 3 shows the main difficulties that students found in the subject.

Table 3. Difficulties found by students when receiving the subject

Indicator	Measurement criteria	Students	
		N. 25	%
Main difficulties found by students when receiving the subject	Lack of didactic resources	18	72
	Difficulty in understanding concepts	15	60
	Lack of practical laboratories	14	56
	Others (specify): lack of tutoring	6	24

Table 4 shows the opinion of both teachers and students on the implementation of a web tool for the subject.

Table 4. Opinion of teachers and students on the implementation of a web tool for the subject

Indicator	Measurement criteria	Teachers		Students	
		N. 10	%	N. 25	%
Considerations on the proposal for the implementation of a tool to support the subject Introduction to Telecommunications	Yes	10	100	23	92
	No	0	0	2	8

Table 5 shows the suggestions made by teachers and students about the resources they suggested including in the web tool.

Table 5. Suggested resources to include in the web tool

Indicator	Measurement criteria	Teachers		Students	
		N. 10	%	N. 25	%
Resources of interest that are suggested to be included in the web tool	Educational videos	9	90	22	88
	Articles of interest	8	80	20	80
	practical classes	7	70	23	92
	Extra materials	6	60	18	72
	Documentaries	5	50	16	64
	Interactive experiments	8	80	21	84
	Discussion forum	4	40	15	60
	Others (specify): online tutorials	3	30	10	40

The application of the methods and instruments allowed carrying out an initial exploratory study through an analysis of works consulted, documentary review, observation of classes in their different forms and interviews with teachers and students, which allowed identifying a set of strengths and weaknesses in the teaching-learning process.

Among the strengths, the political will of the state and the Cuban government in the development of higher education was confirmed, which is manifested in the professional model for the current "E" Study Plan and the objectives to be achieved for the integral formation of our graduates are specified, which corresponds to their modes of action and it is highlighted that the career has a group of teachers with extensive experience in their scientific field, which allows them to be referents in the modes of action for students.

Within the manifestations of the teaching-learning process in the particular context of the Television Fundamentals subject in the Telecommunications and Electronics Engineering course, weaknesses were determined and are described below.

- It was identified that the teaching objectives are sometimes not well defined, which affects the students' motivation.
- A deficient relationship was found between the teaching-learning process and its link with companies related to their professional mode of action, which hinders the integration of students in their future professional practice.
- The predominance of traditional teaching that does not encourage student participation was detected, limiting their development of critical and practical skills.
- It was noted that even though there is potential in technological resources and tools to be used in the teaching-learning process, it is necessary to develop a greater number of practical activities.
- A lack of focus on continuous education was identified, which is essential to keep graduates updated with the latest developments in television systems.
- An insufficient adaptation of the subject to the current E Syllabus according to the objectives pursued was found.

The regularities of the applied diagnosis allowed defining the teaching-learning process in the subject of Television Fundamentals in the Telecommunications and Electronics Engineering course at the University of Pinar del Río as an intentional communication system that connects professors and students within an institutional framework. This process seeks to generate strategies to facilitate learning, based on the organization, planning and coherent and logical socialization of contents. The objective is to contribute to the integral formation of students, promoting the acquisition of competencies, knowledge, abilities, skills and values. Furthermore, this process must be developmental, contextualized and professionalized, ensuring that all elements of the educational system are interrelated and focused on the continuous and holistic growth of students.

DISCUSSION

Different authors, when studying this particular teaching-learning process, analyze it as a dialectical unit that relates instruction and education, teaching and learning.

According to Catal and Tekinerdogan (2019), Ellahi *et al.* (2019), Garcés and Peña (2020), Goldin *et al.* (2022) and Sonntag *et al.* (2019), educational programs had to be adapted and customized to address emerging technologies and the needs of today's industry, which involved designing skills-

based curricula, integrating digital technologies coherently and effectively, and promoting lifelong learning.

Secondly, De Brito Salazar *et al.* (2022); Goldin *et al.* (2022); García Meneses *et al*. (2021) and Putnik and Alves (2022) referred to the need to create successful learning environments where teachers act as facilitators, supporters, and advisors. This included adopting active, collaborative, and interdisciplinary methodologies and promoting students' autonomy, creativity, and critical thinking.

The idea of evolving and adapting to technological changes was defended, which involved keeping up to date with innovations and trends in the educational field, exploring and experimenting with new digital tools and platforms, and evaluating their impact and effectiveness in the teaching-learning process (De Brito Salazar *et al* 2022; Goldin *et al.*, 2022; Tejada Fernández & Pozos Pérez, 2018; Nieto Taborda *et al.,* 2020).

Technological tools, in this case web-based, fostered active and collaborative learning, where students were the protagonists of their own process. These resources enhanced and reinforced the learning processes and were located in key subjects, adjusting to the contexts and particular characteristics of the exchange spaces.

Digital tools have gained greater importance and relevance at global levels. However, many countries in the world had not trained teachers with digital skills nor were they prepared for technology-mediated education, as argued by the United Nations Educational, Scientific and Cultural Organization in 2020. However, these gaps were substantially narrowed due to the use of digital tools that facilitated the teaching-learning process.

In Cuba, research was carried out by authors such as García Meneses *et al.* (2021), Hernández Garcés and Avilés Rodríguez (2019) and Echeverría Samanes and Martínez Clares (2018), among others, who highlighted the need to use certain computer tools and information technologies for learning and problem solving, although they did not delve into the study of the formation and development of technological skills in students.

It is concluded that the demands for new training requirements are evident in the face of the extraordinary technological transformations that have revolutionized the dynamics of production and services, and a highly competitive and demanding labor market. The incorporation of this type of

web tools fostered the training of graduates capable of learning and unlearning in a short time, with sufficient preparation to interact with technologies, enhancing their search skills and developing the necessary capabilities to solve problems in changing contexts.

Furthermore, it is critical for educational institutions to invest in the ongoing training of teachers, ensuring that they are abreast of the latest technologies and pedagogical methodologies. Collaboration between universities and industry was also highlighted as a crucial factor in ensuring that educational programs are aligned with the needs of the labor market. This collaboration can include the implementation of internships, joint projects and mentoring programs, where students can apply their knowledge in real-life situations and acquire practical skills that better prepare them for their future careers.

The use of emerging technologies such as artificial intelligence and augmented reality was identified as an opportunity to enrich the educational process, providing new forms of interaction and personalized learning that can be tailored to the individual needs of each student. The integration of these technologies into the curriculum can significantly transform the educational experience and better prepare students to face the challenges of the future.

The study carried out showed that the teaching-learning process in the Fundamentals of Television in the Telecommunications and Electronics Engineering course should be comprehensive, innovative and contextualized, promoting student participation and continuous updating of contents and methods. It should include the use of advanced technologies, active methodologies such as project-based learning, problem solving in practice, and an integral evaluation that contemplates both theoretical and practical aspects. In addition, it should encourage linkages with the business sector to provide real practical experiences and prepare students to face the challenges of the labor market. This approach ensures a complete training, adapted to current needs and employers' expectations, in addition to developing professional modes of action that allow efficient and competent work performance in the field of telecommunications and electronics.

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Conflict of interest

Authors declare no conflict of interests.

Authors' contribution

The authors participated in the design and writing of the article, in the search and analysis of the information contained in the consulted bibliography.