

# MENDIVE



## REVISTA DE EDUCACIÓN

Original article

### Preparation of Pre-University Teachers for Career Guidance in Sciences

La preparación de los docentes de preuniversitario para la orientación profesional hacia carreras de Ciencias

Preparação de Professores Pré-Universitários para Orientação Profissional em Ciências

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**Received:** November 4, 2023

**Accept:** April 29, 2024

#### ABSTRACT

The preparation of pre-university teachers for professional orientation towards careers in science is of great importance and relevance; for their contribution to the scientific training of future high school graduates as part of their integral development. Careers in this area of knowledge provide knowledge, where the foundations are laid to train professionals with a scientific conception of the world. The objective of this article was: to characterize the preparation of pre-university teachers for professional orientation towards Science careers, at the Pre-University Vocational Institute of Exact Sciences of Pinar del Rio. A descriptive study was carried out based on a bibliographic review and from the theoretical point of view was used as methods: historical-logical, analysis-synthesis and inductive-deductive, which allowed us to analyze conceptions on the topic from various approaches and contexts. Likewise, a group of empirical instruments was applied (analysis of documents, survey of teachers, interviews with students and officials, observation of science classes), which revealed a set of strengths and weaknesses. The main results were specified in the systematization of relevant concepts, and the identification of characteristics of this process, in the uniqueness of the context defined above. In summary, the preparation of pre-university teachers for professional orientation towards science careers currently presents insufficiencies; from which emanates the need to grant the necessary priority; since it constitutes a key factor to promote their professional pedagogical performance, as agents of change in educational institutions.

**Keywords:** preparation; professional orientation; sciences, teacher.

#### RESUMEN

La preparación de los docentes de preuniversitario para la orientación profesional hacia carreras de Ciencias, es de gran importancia y pertinencia; por su

contribución a la formación científica de los futuros bachilleres como parte de su desarrollo integral. Las carreras de esta área del conocimiento, aportan saberes, donde se sientan las bases para formar profesionales con una concepción científica del mundo. Constituyó el objetivo de este artículo: caracterizar la preparación de los docentes de preuniversitario para la orientación profesional hacia carreras de Ciencias, en el Instituto Preuniversitario Vocacional de Ciencias Exactas de Pinar del Río. Se realizó un estudio descriptivo a partir de una revisión bibliográfica y desde el punto de vista teórico se utilizaron como métodos: el histórico -lógico, análisis-síntesis e inductivo-deductivo, los que permitieron analizar concepciones sobre el tema desde diversos enfoques y contextos. De igual modo se aplicó un grupo de instrumentos empíricos (análisis de documentos, encuesta a profesores, entrevista a alumnos y a funcionarios, observación de clases de Ciencias), que arrojó un conjunto de fortalezas y debilidades. Los resultados principales se concretaron en la sistematización de conceptos relevantes, y la identificación de características de este proceso, en la singularidad del contexto definido anteriormente. En resumen, la preparación de los docentes de preuniversitario, para la orientación profesional hacia las carreras de Ciencias, en la actualidad presenta insuficiencias; de lo que emana la necesidad de otorgar la prioridad necesaria; pues constituye un factor clave para favorecer su desempeño profesional pedagógico, como agentes de cambio en las instituciones educativas.

**Palabras clave:** preparación; orientación profesional; ciencias, docente.

## RESUMO

A preparação dos professores do ensino pré-universitário para a orientação profissional em direção às carreiras de Ciências é de grande importância e pertinência, devido à sua contribuição para a formação científica dos futuros bacharéis como parte de seu

desenvolvimento integral. As carreiras nessa área do conhecimento fornecem conhecimentos fundamentais, estabelecendo as bases para formar profissionais com uma concepção científica do mundo. O objetivo deste artigo foi caracterizar a preparação dos professores do ensino pré-universitário para a orientação profissional em direção às carreiras de Ciências no Instituto Preuniversitario Vocacional de Ciencias Exactas de Pinar del Río. Foi realizado um estudo descritivo com base em uma revisão bibliográfica e, do ponto de vista teórico, foram utilizados métodos como histórico-lógico, análise-síntese e indutivo-dedutivo, que permitiram analisar concepções sobre o tema a partir de diversas abordagens e contextos. Da mesma forma, foram aplicados instrumentos empíricos (análise de documentos, pesquisa com professores, entrevistas com alunos e funcionários, observação de aulas de Ciências), que revelaram um conjunto de pontos fortes e fracos. Os principais resultados se concentraram na sistematização de conceitos relevantes e na identificação de características desse processo, considerando a singularidade do contexto definido anteriormente. Em resumo, a preparação dos professores do ensino pré-universitário para a orientação profissional em direção às carreiras de Ciências atualmente apresenta deficiências, o que torna necessário priorizá-la, pois constitui um fator fundamental para favorecer seu desempenho profissional e pedagógico como agentes de mudança nas instituições educacionais.

**Palavras-chave:** preparação; orientação profissional; ciencias; docente.

## INTRODUCTION

The continuous training of teachers in Cuba is of great significance and priority today, where educational processes escape the traditional frameworks of the school, the family or the community to also delve into the information flows that

take place through the Information and Communications Technologies (ICTs) that absorb students on a daily basis in a communicative environment of multiple knowledge. Therefore, continuous training is considered as a process of training and professional development, in which the interaction between teachers, universities and employing organizations plays a fundamental role, and in which professionals assume a leading role in this process. learning based on collaborative work (MES, 2016; Aparicio and Sepúlveda, 2023).

According to Echeverría and Martínez (2021), the importance of the continuous professional training of teachers is revealed in the face of the complexity of current social dynamics, which requires facing technological transformations and the challenges of economic and social development, therefore It is necessary that this process of permanent learning allows for acquiring, updating, deepening and enriching professional skills and adapting to the environment.

Under these conditions, teachers must have comprehensive preparation that allows them to fulfill their professional role, with emphasis on the formation of values; That is why they must become aware of their pedagogical duties and develop higher levels of commitment and identification with their profession in line with the current demands that emerge from the current context.

According to Taquechel et al. (2020):

The 21st century, colored by a globalized and computerized world, poses colossal economic, social, ideological, scientific-technological challenges and the educational policies of all countries on a global scale. In this sense, the Sustainable Development Goals (SDGs) expressed in the 2030 Agenda place human and social development as one of their concerns and position education as one of the aspects to be prioritized by different governments; specifically SDG 4, which proposes:

guarantee inclusive, equitable and quality education and promote lifelong learning opportunities. (p. 176)

The current challenges, exacerbated by highly complex global problems, demand the need to continue searching for ways to guarantee the improvement of the quality of education. This aspect has been present throughout the revolutionary process and its priority remains to this day, which is clearly evident in the Constitution of the Republic, as well as in the Guidelines of the Economic and Social Policy of the Party and the Revolution, This implies that the professional performance of education professionals is a function of putting into practice the necessary changes in their context of professional action.

In this way , it becomes a challenge and an urgent need to offer answers from the sciences to the demands of Cuban society and consequently channel the actions of the Cuban pre-university teacher according to the objectives pursued by the Third Improvement of the National System. of Education, raising the quality of the teaching-learning process and increasing teacher training (Martínez, 2022).

The concept of preparation has been used throughout the historical development of society, as well as in the educational context; in which it reaches a significance of vital importance with the historical-social context in which man develops, having at its base the needs that are in correspondence with each historical moment.

In the educational context, the preparation of teachers acquires a constant concern of society, the teaching profession requires constant, systematic and permanent renewal, the educator requires constantly appropriating the main results achieved in the pedagogical framework.

The preparation of teaching staff in general is developed from undergraduate

training, preparation for employment and postgraduate training, through improvement activities organized in Higher Education through postgraduate courses, diplomas, master's degrees and others.

Currently, the preparation of teaching staff is a priority that responds to the context in which they carry out their practical work; which means that each territory, based on its own needs, potential and aspirations, has the possibility of designing, executing, controlling and evaluating its preparation system in correspondence with the general objectives of the educational system.

It should be noted, as part of the study being carried out, that, in Cuba, authors such as Álvarez (1999); Addine (2004), among others, have conducted studies on preparation in general and of the teacher in particular; Álvarez (1999), when approaching preparation with a social vision, is of the opinion that:

The preparation of the citizens of a country is one of the most important needs to be satisfied in any society, which becomes an essential problem of the same (...) A society is prepared when all or the majority of its citizens are; An individual is prepared when he can face the problems that arise in his job and solve them. (p.36)

Therefore, various authors such as Cala and Breijo (2020) consider that the training and development process of professionals becomes a professionalization process.

While these and other authors converge in recognizing the existence of several processes in initial, postgraduate and work training, which constitute paths to professionalization. In particular, Addine (2004) distinguishes that this process must contribute to the formation and development of professional modes of action, from a solid understanding of the role, tasks and functions, expressed in the

characterization of the object, logic and methods of science, the logic of the profession and a specific historical context. (p.27)

The professionalization of teaching staff must be linked, therefore, to a progressive improvement in their daily work, which leads, as López (2005) points out:

... to achieve pedagogical mastery, an aspiration (...) that achieves its improvement through essential didactic work in this sphere, and (...) guarantee the conditions, necessary and sufficient tasks to promote the gradual transition from lower levels to higher levels of development in students; Only in this way will it be able to play out the role it must assume as a protagonist and active entity in the process. (p. 207)

Vocational training and professional guidance have been recognized as one of the most important objectives of educational work and is aimed at guaranteeing the preparation of students, related to their incorporation into the complex world of production and services, so such that they are capable of making a conscious professional selection, based on their interests and real possibilities and also in accordance with the needs of the country, hence this process must be conceived as having a proactive nature, not only aimed at specific action in the terminal years, but as a continuous process of accompaniment and mediation (Martínez et al, 2014).

This work is carried out through the coherent actions of the school and other educational agencies; but where the work of the teacher is central, which is why raising the quality of vocational training and professional guidance requires

greater and better preparation from Cuban teachers.

The current reality is characterized by the fact that for some careers there is an excess of applicants, especially for those that traditionally enjoy greater social prestige, while others that are also very necessary for the country are not very attractive, which can sometimes be related to the fact that the professional profiles of these are practically unknown or, what is worse, poorly known by students.

In particular, the professional guidance process constitutes a particular case of educational guidance and is made up of a system of political, psychological, pedagogical and social influences, aimed at providing students with the necessary information so that, when the moment of choice comes of the career, they do so with full conviction and in accordance with the demands and needs of the country, and their personal interests and possibilities (Manzano, 2005).

The pre-university level in Cuba aims to achieve the development and comprehensive formation of the personality of the student with a cultural base in correspondence with the patriotic, civic and humanist ideals of the Cuban socialist society, in its prosperous and sustainable development. Ideals also expressed in the ways of feeling, thinking and acting, according to their particularities and individual interests, in correlation with social needs, which allow them to assume a scientific conception of the world and prepare for life.

Science careers have an essential contribution to achieving this goal, and are outlined as general objectives:

- Demonstrate the appropriation, expansion, deepening and application of contents of the educational process

- Interpretation of facts, objects, processes and phenomena of nature with a scientific conception of the world

- Strengthening interdisciplinary links and familiarization with scientific research

- Consolidation of theoretical thinking and self-determined, independent and creative behavior.

This whole scenario is particularized in the specific case of the Pre-University Vocational Institutes of Exact Sciences (IPVCE) which are school centers of Pre-University Education. They delve into science and technology, based on the application of the principle of polytechnicism and the combination of study with work. The study plan includes elective courses to prepare students according to their interests. To enter these centers, ninth grade graduates must pass competitive exams in Mathematics, Spanish and Cuban History.

The IPVCE according to their size at the country level are classified as small, medium and large, their structure is not the same in all the provinces of the country. Currently, the students who enter the IPVCE are those who aspire to science careers and the requirement to remain in them is to have an academic index greater than 85 points and also obtain more than 85 points as a final grade in the subjects of Mathematics, Physics , Chemistry and biology.

For all of the above, the objective of this article is defined: to characterize the preparation of pre-university teachers for professional orientation towards Science careers, at the IPVCE of Pinar del Rio.

## MATERIALS AND METHODS

A descriptive study was carried out based on a bibliographic review and from a theoretical point of view the following methods were used: historical-logical, analysis-synthesis and inductive-deductive, which allowed us to analyze conceptions on the topic from various approaches and contexts. At the empirical level, documentary analysis was used to collect information from a group of documents such as: governing documents for pre-university education, curricular adjustments for pre-university, director's manual, science subject programs, preparations for science subjects. Sciences, Regulations for the methodological work of the MINED, Ministerial Resolution No. 200/214, center strategies.

To fulfill the objective of this article, a series of instruments were applied to diagnose the initial state of the preparation process of pre-university teachers for professional orientation towards Science careers at the IPVCE Federico Engels in Pinar del Rio. worked with the entire population of students who opt for careers with this profile (271) and teachers in the area of Sciences (35) belonging to the 2022-2023 academic year.

The theoretical systematization carried out allowed us to arrive at an operational definition of the variable under study.

In turn, four dimensions underlie it as inherent aspects, which are clearly expressed in the distinctive features that make up its conceptualization and which, deployed through indicators, allowed the evaluation of the process being studied.

## RESULTS

The application of the instruments and methods described above allowed us to obtain the following results:

- A group of trends was identified in the preparation process of pre-university teachers in the international context, namely:

- Recognition of teacher preparation as a key factor in the continuous training of education professionals.
- Strengthening national and international inter-institutional links in order to develop cooperation actions, in order to improve the preparation of teachers.
- Increased integration of information and communications technologies into the teacher preparation process.
- Design of preparation actions as a way to satisfy the improvement needs presented by teachers.
- Priority of educational institutions as a center for the comprehensive management of teacher preparation, making the most of networking.

-The preparation of teachers in the area of Sciences has been an essential aspect to contribute to the training and development of scientific and research training in students based on:

- Hypothesis statement
- Development of general skills and student creativity.
- Importance of cooperative relationships and teamwork
- Design of experiments by students
- Correct use of Mathematics and oral and written expression in solving problems
- Use of IT in the search and presentation of information, carrying out numerical calculations, use of intelligent programs, simulation and automation of experiments

-Vocational training and professional guidance have been recognized as one of

the most important objectives of educational work and is aimed at guaranteeing the preparation of students,

-The organization of vocational training and professional guidance of the student has not always had the full support of state organizations on the fronts of science, culture, production and services, and political and mass organizations, to in order to harmonize, on the one hand, the student's choice of professional studies or specialties based on their vocational abilities and interests, and on the other hand, the satisfaction of social needs derived from state planning.

-The need to promote scientific education in pre-university students in Pinar del Río was identified as a social problem. The social causes lie in:

- Although there is recognition of the need to prioritize professional orientation towards Science careers, there is still a need to join forces to design creative and innovative strategies to address this as a social problem involving the entire society.
- The preparation of teachers for professional orientation towards careers in Exact Sciences.
- Insufficient incorporation of the family into the process of professional orientation towards Science careers.

-Professional orientation in secondary education towards careers in the area of Sciences such as engineering is insufficient because:

- There is a lack of integration of educational agencies based on this.
- Professional interests take precedence based on interaction with family and friends.
- Little basic knowledge about the different professions in students and teachers and their occupational profile, the demands of the professional model; which prevents them from assessing their intellectual possibilities for professional performance.

-A group of external manifestations of the inadequacies of the teacher preparation process were identified based on this, such as what evidences the existence of a social problem such as:

- Low level of student participation in competitions, scientific societies and extracurricular activities for professional training work towards Science careers.
- Few optional courses designed based on this and in connection with the scientific community of the province.
- Only 90.03% of student enrollment opts for Science careers.
- Insufficient incorporation of professional guidance work into methodological work and professional improvement from the activities of the institutional project.
- Insufficient incorporation of the family into the process of professional orientation towards Science careers.

- An initial exploratory study of the preparation process of pre-university teachers for professional orientation towards Science careers was carried out at the IPVCE Federico Engels of Pinar del Río, through the application of empirical instruments (analysis of documents, survey of teachers, interview to students and officials, observation of Science classes), which revealed a set of strengths and weaknesses, which are set out below:

The following were identified as strengths:

- A group of teachers recognized in the community and committed to their social responsibility.
- Center with prepared students.

And as weaknesses:

- Exact Sciences classes do not constitute a space where the development of motivational and professional interests towards related careers is encouraged in an innovative and creative way.
- Low use of the potential of competition processes, scientific societies and

extracurricular activities for professional guidance work towards these careers.

- Insufficient networking for the development of elective courses in connection with the scientific community of the province.
- Limitations to plan, organize, execute and control the methodological work in correspondence with the diagnosis of managers and teachers from the activities of the institutional project.
- Deficiencies in the use of methods that allow achieving the transformation of the problems detected in the process of professional orientation towards these careers

-The preparation of pre-university teachers for professional orientation towards Science careers at the IPVCE "Federico Engels" in Pinar del Rio was defined as a complex process in which knowledge, skills and professional values necessary for the qualitative turn are developed. from the subject towards professionalism.

- Within the defined variable, the dimensions of the process being studied were determined, namely:

**-Dimension I.** Preparation of Science teachers for professional guidance as a process.

**-Dimension 2 .** Preparation of science teachers for career guidance as a result.

-The identified dimensions were evaluated through the following indicators:

Dimension 1:

-Correspondence between the preparation of teachers and their needs for updating, improvement and completion in the content of professional orientation towards Science careers.

-Planning of sufficient, creative and differentiated preparation activities in order to improve their professional

pedagogical performance for professional orientation towards Science careers.

-Development of preparation activities in relation to formal, informal, non-formal and community education modalities

-Evaluation, from an inter and transdisciplinary approach, of the process of preparing teachers for professional orientation towards Science careers.

Dimension 2:

-Updating, perfecting and completing the content of professional orientation towards Science careers.

-Systematicity in the use of the content of professional orientation towards Exact Sciences careers in each teaching, extra-teaching and extracurricular activity.

- Planning, execution of actions and evaluation of the teaching-methodological work for the transdisciplinary treatment of the content of professional orientation towards Exact Sciences careers at the level of the pedagogical group.

The analysis of the governing documents identified above yielded the following results:

- General recognition of the need for coherent and integrated treatment of professional orientation towards Science careers through networking.

- Recognition of the need to improve the preparation of teachers in this area based on professional guidance.

- Insufficient priority and attention to this aspect, from the center's work system.

- Limited treatment and updating of professional guidance in the subject programs.



- Insufficient pedagogical conception for the treatment of professional orientation in the undergraduate and graduate levels.

- Limitations in the pedagogical and didactic preparation of IPVCE teachers, to address professional orientation towards Science careers.

## DISCUSSION

From the programmatic documents of the First Congress of the PCC and later the Guidelines of the Economic and Social Policy of the Party and the Revolution, the need to continue advancing in the elevation of the quality and rigor of the teaching-educational process is established, prioritizing permanent improvement, exaltation and attention to the teaching staff, an aspiration to which numerous professionals have joined over the years, since as López Palacio (2005) refers,

...this purpose not only responded to the immediate and future need for education in our socialist society (...) but also (...) to the expressed desire for scientific and pedagogical improvement of the country's teachers, aware of their highest mission in the formation of the new man. (p. 207)

Result coincident with the studies carried out by Murrain & Vargas (2017). These researchers recognize teaching as a profession with social significance. They affirm that whoever opts for it must be a person committed and competent to their profession.

It coincides with the approaches that the school as an institution and the teacher as a socializing agent face the challenge of facing the challenges of the 21st century by introducing changes in its organization,

in its work and ensuring that they operate not only in the discourse, but in the daily actions. Educational systems do not remain inert and their optimal functioning becomes a priority for each country to guarantee the preparation of its citizens. In response to these transformations, the reconceptualization of the role of the teacher and his preparation is a requirement of the current educational model to achieve effective learning in his students.

On the other hand, the new conditions where the emergence of new technologies into contemporary life and therefore into educational processes, marks challenges for the preparation of pre-university teachers in their integration into the professional guidance process.

However, there are still limitations in this sense, according to Martínez (2018), the scarcity of training programs and training in technologies for the field of teaching has an impact on the teacher.

Another interesting contribution to this topic is provided by Addine Fernández (2004), when she refers to the phases through which the levels of assimilation of knowledge and skills pass under the correct direction of the educational teaching process by the teacher. They are:

- Motivation: Form motives, promoting active search for knowledge. It must become a premise as a result of the learning activity.
- Guiding basis of the activity (BOA): Fundamental element for the future execution of the activity. It facilitates adequate organization and control by ordering activities aimed at the essence of knowledge.
- Execution: It is essential to follow the steps oriented to enable the development of skills related to the concepts that are assimilated and worked on in class.
- Control: Systematic feedback of the assimilation process carried out

throughout the class collectively, individually, in groups, in pairs or self-control. (p.301)

The authors of this research agree with the criteria of the different sources consulted and believe that the mastery of this topic by all pre-university teachers, particularly those in the area of Sciences, is of vital importance to achieve better quality in the classes taught. , and at the same time a high level of preparation of the graduate, who of course, will be the future professionals of the territory and the country.

Given the results obtained in the diagnosis and what was stated on a theoretical level, the need to improve the ways from the school's methodological work system and the professional improvement strategy to prepare teachers in the management of the orientation process is evident. professional towards these careers.

For all of the above, it should be noted that the preparation process in the context in which it is investigated is the object of a scientific research process and therefore is a problem of Science and Technology because:

- It deals with a social problem that starts from a problematic situation of a factual nature.

- It is a problem that has a specific socio-historical character of PR with multiple social implications.

- It is a scientific problem because it has been confirmed through an initial diagnosis where its objective, verifiable and predictive nature has been demonstrated.

- The logic of scientific knowledge has been followed in the search for objective truth, since there are starting theoretical references that allow the known to reach the unknown.

- Allows the transformation of reality through practical activity.

The hypothetical assumption is that, if a contextualized and developmental preparation of Exact Sciences teachers is achieved, a better professional orientation towards these careers will be favored.

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#### Conflict of interests:

The authors declare not to have any interest conflicts.

#### 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.

#### Cite as

Milians Carbo, M., Paula Acosta, CA, Breijo Worosz, T. (2024) *Preparation of Pre-University Teachers for Career Guidance in Sciences*. *Mendive. Journal of Education*, 22(2), e3678.  
<https://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/3678>



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