



Original article




## **Methodology for career orientation toward basic science careers in junior high education**

**Metodología para la orientación profesional hacia las carreras de ciencias básicas en el preuniversitario**

**Metodologia para a orientação profissional para carreiras de ciências básicas no ensino médio**

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### **ABSTRACT**

Career orientation in senior high education plays a vital role in young people's training, by providing students with the necessary tools to make decisions about their future, which can have a positive impact on their professional satisfaction and success. The article presented aims to propose a methodology that contributes to the improvement of career orientation towards basic science careers in senior high education. A study was carried out based on a bibliographic review of career orientation, using different theoretical methods, such as: analysis-synthesis, historical-logical, inductive-deductive, system approach, modeling; likewise, a group of empirical methods were applied, such as classroom observation, documentary analysis, interviews and surveys. The scientific result is given in the methodology, with its essential stages of diagnosis, planning, implementation and evaluation based on designed actions. In conclusion, the importance of stimulating students'

motivation towards the study of basic science careers is confirmed, based on methodological approaches such as the proposed one.

**Keywords:** basic sciences; career orientation; senior high school.

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## RESUMEN

La orientación profesional en el preuniversitario juega un papel vital en la formación de los jóvenes, al proporcionar a los estudiantes las herramientas necesarias para tomar decisiones sobre su futuro, lo que puede tener un impacto positivo en su satisfacción y éxito profesional. El artículo que se presenta tiene como objetivo: proponer una metodología que contribuya al perfeccionamiento de la orientación profesional hacia las carreras de ciencias básicas en el preuniversitario. Se realizó un estudio a partir de la revisión bibliográfica de la orientación profesional, se emplearon diferentes métodos teóricos, como: el análisis-síntesis, histórico-lógico, inductivo-deductivo, enfoque de sistema, modelación; de igual forma, se aplicaron un grupo de métodos empíricos, como la observación a clases, el análisis documental, la entrevista y la encuesta. El resultado científico está dado en la metodología, con sus etapas esenciales de diagnóstico, planificación, instrumentación y evaluación a partir de acciones diseñadas. Como conclusión se corrobora la importancia de estimular la motivación de los estudiantes hacia el estudio de las carreras de ciencias básicas, a partir de enfoques metodológicos como el propuesto.

**Palabras clave:** ciencias básicas; orientación profesional; preuniversitario.

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## RESUMO

A orientação profissional no ensino médio desempenha um papel vital no desenvolvimento dos jovens, fornecendo aos estudantes as ferramentas necessárias para tomar decisões sobre seu futuro, o que pode ter um impacto positivo em sua satisfação e sucesso profissional. O artigo apresentado tem como objetivo propor uma metodologia que contribua para o aperfeiçoamento da orientação profissional para as carreiras de ciências básicas no ensino médio. Um estudo foi realizado com base na revisão bibliográfica da orientação profissional, empregando diferentes métodos teóricos, como análise-síntese, histórico-lógico, indutivo-dedutivo, abordagem de sistemas e modelagem. Da mesma forma, um grupo de métodos empíricos foi aplicado, como observação de aulas, análise

documental, entrevistas e pesquisas. O resultado científico é dado na metodologia, com suas etapas essenciais de diagnóstico, planejamento, implementação e avaliação com base em ações projetadas. As conclusões confirmam a importância de estimular a motivação dos estudantes para o estudo das carreiras de ciências básicas por meio de abordagens metodológicas como a proposta.

**Palavras-chave:** ciências básicas; orientação profissional; ensino médio.

## INTRODUCTION

Career orientation is a process that plays a crucial role in the development of the interests and vocations of individuals. It helps them to make the best decisions about their professional life. In Senior-High Education, this process has a special significance since students are very near to the moment of choosing a career, so a systematic, coherent and integrative process must be guaranteed by teachers.

The Ministry of Education of the Republic of Cuba (MINED) has considered vocational orientation as one of its main objectives and, to achieve this, has issued different documents that govern this activity in educational institutions. These documents, among other aspects, establish the need for the participation of different agencies, organizations and institutions as an essential premise for the successful development of this process.

Some of the most important documents that support this work from a legal point of view are: Ministerial Resolution 18/1981 of the Ministry of Education (MINED), which introduces the regulation on vocational training and professional orientation, in which this body is reiterated as the methodological governing body of the work, the school as the fundamental core and professional orientation as an integral part of the process and the priorities of vocational training and professional orientation are declared; Ministerial Resolution 92/1982, which indicates how to carry out the methodological work and exemplifies the preparation of the documentation of the circles of interest.

Finally, the Joint Resolution MINED-Cuban Academy of Sciences (2/1988) establishes Student Scientific Societies as a new form of the professional orientation process in junior and senior-high centers, related to the professional orientation process in general, such as methodological indications, as well as strategies arising from research carried out in the country.

Several authors stand out regarding the theoretical references on this subject, who carry out an analysis from different psychological and pedagogical positions. These authors emphasize the need to develop a professional orientation in tune with social and economic changes, highlighting the leadership role of educational institutions in close connection with the family, organizations and the community, which shows the increasing level of relevance and priority given to the treatment of this subject.

Researchers Balmaseda *et al.* (2023) consider that professional orientation is based on the active and regulatory role of the individual, in correspondence with the development of his personality; higher motivational formations, such as: ideals, self-esteem and professional intentions, constitute the representation of the personal meaning that the profession acquires for the subject, the professional motive, then, becomes the guiding axis of behavior.

Vocational orientation has evolved from simple preparation or advice for choosing or entering a profession, to becoming preparation for active life, or for full insertion or socialization in adult life. In this sense, it is about facilitating training for active life, and extending the impact to the individual's ongoing education. The focus should be on the individual being guided, preparing him or her for self-reflection, self-knowledge, self-orientation, with the help of the other agents and socializing agencies (teacher, institution, family and university) that facilitate the process of vocational orientation.

With the current rapid changes in technologies, processes, and societies, which are adapting to new times, it is about helping the subject to plan their own strategies to face any type of situation.

Career orientation has been recognized by Martínez (2022) as one of the most important objectives of educational work and is aimed at ensuring the students' preparation, related to their incorporation into the complex world of production and services, so that they are capable of making a conscious professional selection, based on their interests and real possibilities and in accordance with the needs of the country; hence, this process must be conceived with a proactive character, not only aimed at specific action in the final years, but as a continuous process of accompaniment and mediation.

For González (2013), providing career orientation involves designing learning situations that stimulate the formation and development of the subject's inclinations towards a profession or another, as well as their capacity for professional self-determination. In this case, it refers to the creation of the learning conditions necessary for the development of the student's potential that facilitate responsible action in the process of professional choice.

For his part, Matos (2004) states that the process of professional orientation must start by promoting motives towards different professions, as a basis for interests and intentions, facilitating the subjects' instruction, education and development.

This definition connotes vocational orientation as a process of assistance aimed at developing the professional identity of all subjects, of all ages and at all formative moments, and does not neglect preparation for adult life in general. It has an individualized, continuous and progressive character, aimed at personal, educational, vocational and work-related fulfillment.

We agree with Castellano *et al.* (2022) that there are several aspects within the field, around which there is controversy, which must be the subject of analysis and a position taken if we intend to integrate professional orientation-curriculum, so that it develops and consolidates professional motives in students.

In this regard, basic science courses in Cuba have been affected. The insufficient number of students who choose them from senior-high level has been noted, which negatively affects the satisfaction of the social needs of the country.

The general objective of this article is to propose a methodology that contributes to improving professional orientation towards basic science courses in senior-high education.

## **MATERIALS AND METHODS**

The methodology used is based on the dialectical-materialist approach, which constitutes the foundation of the research based on its principles, laws and categories, and sets the guidelines for all investigative operations. Some methods were used at the theoretical, empirical and mathematical-statistical levels, which can be summarized as follows.

### *From the theoretical level*

Historical-logical: it allowed us to delve into the different stages that the career orientation process has gone through, as well as the elements that have characterized such process in Senior-High Education and the particularities that it has had according to the specific historical context.

Analysis and synthesis: it facilitated the development of the methodological justification of the research, penetrating into the essence of each of the parts that make up the methodology of professional orientation towards basic science careers in senior-high students, establishing the links and discovering essential relationships to reach the conclusions.

Induction and deduction: provided the integration of each component of the professional orientation methodology towards basic science careers in pre-university students from its parts to the whole, and vice versa, to identify regularities and particularities of the field being investigated.

System approach: it favored the study of professional orientation towards basic science courses in pre-university students, as a systemic process that involves multiple systems of relationships. Its consideration leads to specifying the conception of the methodology of professional orientation towards basic science courses in pre-university students, based on its components in interaction and the integrated structure as a consequence of the order established by their relationships.

Modeling: facilitated the structuring of the methodology of professional orientation towards basic science careers in pre-university students. Based on the characterization of the object, the principles that have logical-gnoseological and practical functions to explain the new knowledge related to professional orientation towards basic science careers in pre-university students are revealed.

#### *From the empirical level*

Classroom observation: allowed us to assess whether professional orientation is encouraged during the experimental intervention in the classes taught by teachers at the Eusebio Olivera Rodríguez Senior-High Vocational Institute of Exact Sciences.

Document analysis: This led to the analysis of different documents related to the career orientation process and its particularities in the profile of basic science courses in senior-high education.

The survey: was applied to students and other participants in the process to determine the main characteristics and opinions regarding the process of professional orientation towards basic sciences careers in senior-high education.

The interview: allowed us to learn how the process of professional orientation is projected from school, as well as the causes that prevent the successful development of this in the senior-high level.

The research took as a universe the 210 students who constituted the twelfth-grade enrollment of the "Eusebio Olivera Rodríguez" Vocational Senior-High Institute of Exact Sciences.

## RESULTS

As a result of the methods used in connection with the vocational orientation process, it was possible to develop a methodology with the aim of improving the vocational orientation process in senior-high education and to satisfy the scientific problem stated in the research.

The objective of the documentary analysis was to determine how the normative documents reflect the aspirations and treatment of the vocational orientation process and the results obtained. This analysis included a review of the senior-high model, the study syllabuses with their respective methodological indications and the ministerial resolutions that govern the work related to vocational orientation.

27 educational managers were surveyed and the study revealed positive elements that reflect the commitment of methodologists, managers and teachers to give priority to the process of career orientation towards basic sciences careers. They also demonstrated their commitment to the priority given to the creation of scientific society programs and educational projects, as well as the establishment of agreements with organizations and institutions to promote this process.

According to those interviewed, the main problems currently existing in vocational orientation are related to the poor development of an integrative concept, the lack of teachers' adequate preparation and the lack of precise methodological guidelines.

Limitations in the development of professional interests were evident in the students, expressed in:

- The establishment of immediate professional goals and objectives.
- The fulfillment of isolated volitional efforts, characterized by pessimism and insecurity in achieving the objectives set for accessing the career.
- The low level of reflection on professional problems, with little significant personal elaboration.
- Insufficient commitment and social responsibility expressed in the sense they give to the performance of tasks with a professional focus.
- Poor motivation and interest in developing the different career paths towards basic science careers.

- There is insufficient orientation for continuing studies in basic sciences, expressed in erroneous interpretations about them.

The main causes of these limitations are focused on the insufficient work of the process of vocational orientation towards basic sciences courses, taking advantage of the potential of the diversity of vocational orientation pathways and taking into account the integration of the training contexts in the senior-high institute, family, community and university, as well as the inadequacies that are evident in the theoretical-methodological order. The methodological projection of the actions refers, fundamentally, to those carried out by the senior-high institute in isolation.

Based on a detailed study of career orientation, which is carried out at the Eusebio Olivera Rodríguez Senior-High Vocational Institute of Exact Sciences and in particular the orientation towards basic sciences careers, in which the treatment of these contents is appreciated in the current conditions of the training model, as well as the current methodological guidelines for such performance, the authors focused their analysis on the transformations that the Ministry of Education established for the 2023-2024 academic year, in order to direct their work with the required level of objectivity.

Once the student's needs regarding professional orientation towards basic sciences courses have been diagnosed, the methodology is designed to contribute to the improvement of professional orientation towards basic sciences courses in senior-high education.

#### **The proposed methodology is structured in four stages:**

- I. Diagnosis and identification of needs in the process of professional orientation towards basic sciences courses in senior-high education.
- II. Projection and organization of the professional orientation process towards basic sciences courses in senior-high education.
- III. Execution to contribute to the improvement of the professional orientation process towards basic science courses in senior-high education.
- IV. Evaluating the evidence of the career orientation process towards basic science courses in senior-high education.

The stages that make up the methodology will be explained below, with the aim of unraveling its essence.



**Stage I.** Diagnosis and identification of needs in the process of professional orientation towards basic sciences careers in senior-high education

#### **Actions**

- Analysis of the normative and methodological documents of the senior-high.
- Selection and application of diagnostic methods, media and instruments.
- Interpretation of the results obtained.

**Stage II.** Projection and organization of the professional orientation process towards basic science courses in pre-university education

#### **Actions**

- Assessment of the curricular sequence of academic activity, based on professional orientation workshops.
- Organization of the implementation of career orientation workshops.
- Determination of the professional skills to be systematized in the contexts of action.

**Stage III.** Execution to contribute to the improvement of the professional orientation process towards basic sciences courses in senior-high education

#### **Actions**

- Precision of organizational and curricular conditions.
- Adaptation and adjustment of the actions planned in the projection and organization stage.
- Guidance on conducting career orientation workshops.

**Stage IV.** Evaluation of the evidence of the career orientation process towards basic science courses in senior-high education

#### **Actions**

- Assessment of evidence criteria for career orientation towards basic science careers.
- Systematic, partial and final assessment of the completion of the activity (achievements and difficulties).

## Requirements for the implementation of the methodology

To implement the methodology in pedagogical practice, the following requirements are proposed:

1. Implementation of preparatory actions and collective debate among educational actors to reach a consensus on the students' vocational orientation towards basic science careers and how to take advantage of the possibilities of the training process.
  - It is essential that the teaching staff be prepared to successfully lead this process and fulfil its educational function, while generating acceptance among students. Exchange spaces facilitate teachers' learning about what the process should be, their responsibility to direct and perfect it in terms of what to evaluate, why, with what methods and instruments, how and when, as well as the possibilities offered by the training process.
2. Systematic control of compliance with each of the stages of the methodology.
  - Among the characteristics that an adequate control system must have, there is its preventive function; hence the importance of not confusing the control of the professional orientation process with meta-evaluation, because the latter constitutes a value judgment on the development and results of the process. Control is exercised systematically at each stage.
3. Systematic improvement of the information system that supports the process of students' professional orientation towards basic science careers.
  - In order to implement career orientation, it is essential to have access to valid and reliable information about students' training in basic sciences and their results. This can be primary or secondary. The first includes data contained in teaching reports or records generated by the year group, work placement teacher, and teacher of the main integrating subject. In junior-high schools, data from primary sources is included and is basically related to the indicators provided.
4. Improving the motivation system for students towards basic science careers

## DISCUSSION

Career orientation in senior-high education plays a crucial role in the young people's training, providing them with tools that allow them to make informed decisions about their academic and professional future. However, the criteria around this topic have not sufficiently delved into the

necessary content to establish the essential coordination in the direction of the career orientation process towards basic science careers. This process must be managed effectively to meet the demand for labor in the territory.

The results obtained in the diagnosis and what has been presented in the theoretical field show the urgent need to improve the professional orientation towards basic science courses in senior-high education. It is essential to take into account the systemic sequence of the functions of this process, ensuring the mastery of knowledge, the formation of skills and the development of capacities. Only in this way will the success of the process be guaranteed, facilitating the progressive transfer of actions between the personal and practical components, which will directly affect the choice of course and the continuation of studies at university.

The implementation of the proposed methodology allowed the fulfillment of the stated objective: to improve the professional orientation towards basic science careers in senior-high students. The elements contributed by authors such as Fonseca *et al.* (2019), Velázquez and Hernández (2020), Soto and Capetillo (2020), Díaz (2021) and González and González (2023) were vital, since they conceive professional orientation as an essential process in the formation and development of motives towards the profession or working life.

It was confirmed that the result is consistent with what was proposed by Aparicio and Sepúlveda (2023), where they indicate that science careers have an essential contribution to achieving this goal. The general objectives outlined include:

- Demonstrate the appropriation, expansion, deepening and application of the contents of the professional orientation process.
- Interpretation of facts, objects, processes and natural phenomena with a scientific conception of the world.
- Strengthening interdisciplinary and transdisciplinary links and familiarization with scientific research.
- Consolidation of theoretical thinking and self-determined, independent and creative behavior.

These aspects were considered essential elements for the analysis of the problem addressed, as they allow us to explain the nature of career orientation as a process and to delve deeper into its particularities towards basic science careers.

The methodology must be implemented with a clear educational intention and is conceived as a scientific result, to stimulate the motivation of senior-high students towards the study of basic sciences careers, based on the inadequacies found in the diagnosis, which limit the fulfillment of an adequate work of professional orientation in this field.

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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.



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