

[Translated article]

Professional guidance towards basic science careers at pre-university level

**La orientación profesional hacia las carreras de ciencias básicas en el
preuniversitario**

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ABSTRACT

Introduction: Professional guidance is a process that plays a transcendental role in the development of interests and vocations of subjects. It helps them to make the best decisions about their professional life.

Objective: To develop a methodology that contributes to the improvement of professional guidance towards basic science careers at pre-university level.

Methods: A predominantly quantitative, explanatory research strategy was followed, applying different theoretical, empirical, mathematical and/or statistical methods: analysis and synthesis, induction-deduction, historical-logical, transition from the abstract to the concrete, scientific observation, survey, interview, experiment, expert judgment and descriptive statistics.

Results: The actions established in each of the stages of the methodology stand out as an element of change within the scientific result.

Conclusion: It is concluded that the validity of the methodology was corroborated both through the expert judgment method, where experts stated that it is very adequate; and in educational practice, through the development of a pre-experiment with the teachers of the Vocational Pre-University Institute of Exact Sciences "Eusebio Olivera Rodríguez". It was demonstrated that professional guidance towards basic science careers is achieved.

Keywords: basic sciences; methodology; professional guidance

RESUMEN

Introducción: La orientación profesional es un proceso que juega un papel trascendental en el desarrollo de intereses y vocaciones de los sujetos. Contribuye a que estos puedan tomar las mejores decisiones sobre su vida profesional.

Objetivo: Elaborar una metodología que contribuya al perfeccionamiento de la orientación profesional hacia las carreras de ciencias básicas en el preuniversitario.

Métodos: Se siguió una estrategia investigativa de tipo predominantemente cuantitativa, de nivel explicativo y se aplicaron diferentes métodos del nivel teórico, empírico, matemáticos y/o estadísticos: análisis y síntesis, inducción-deducción, histórico-lógico, tránsito de lo abstracto a lo concreto, la observación científica, la encuesta, la entrevista, el experimento, criterios de expertos y la estadística descriptiva.

Resultados: Se destacan las acciones establecidas en cada una de las etapas de la metodología como elemento de cambio dentro del resultado científico.

Conclusiones: Se concluye que la validez de la metodología fue corroborada a través del método criterio de expertos, donde estos manifestaron que es muy adecuada; y en la práctica educativa, mediante el desarrollo de un preexperimento con los docentes del Instituto Pre-Universitario Vocacional de Ciencias Exactas "Eusebio Olivera Rodríguez", quedó demostrado que se logra la orientación profesional hacia las carreras de ciencias

básicas.

Palabras clave: ciencias básicas; metodología; orientación profesional

Introduction

The Ministry of Education has had vocational or professional guidance as one of its main objectives, and for its fulfillment has issued different documents that rule 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.

Cuban Pre-university Education covers from tenth to twelfth grades and is the level where young people broaden, deepen and generalize their knowledge, enrich their abilities and general skills to continue university studies. Its mission is the formation of high school graduates, established in its purpose: To achieve the integral formation of young people in their way of feeling, thinking and acting responsibly in the school-family-community contexts, from the development of an integral general culture, sustained in José Martí's study-work principle, which guarantees the leading and unconditional participation in the construction and defense of the Cuban socialist project, and in the conscious choice of the continuity of higher studies in careers prioritized territorially.

Normative documents issued by the Ministry of Education related to the career guidance process in general have been analyzed, such as methodological indications and strategies derived from research carried out in the country.

Regarding the theoretical referents on this subject, several authors stand out, which make an analysis from different psychological and pedagogical positions. These authors emphasize the need to develop a vocational professional guidance in tune with social and economic changes, highlighting the leading role of educational institutions in close connection with the family, organizations and the community, which shows the growing level of topicality and priority given to the treatment of this topic.

In the pedagogical practice, an insufficient treatment to the process of professional guidance towards basic sciences has been verified from the guiding role of the teacher, based on the concrete treatment of the content of the subject taught, aimed at specific careers, which in turn constitutes a deficiency in the theoretical order.

In Cuba, the first manifestations of scientific work on professional guidance appear in the 1940s and with the triumph of the Revolution it becomes a priority task for Education, based on decrees and resolutions that indicate, regulate and guide educational policy. In

these regulations, the school is given the leading role, with the participation and support of institutions, agencies and organizations throughout the country, with emphasis on those located in communities near the school.

In this order, basic science careers have been affected in Cuba. The number of students who choose them from the pre-university level is insufficient, which has a negative impact on the satisfaction of the country's social needs.

The theoretical evaluations carried out and the preliminary results of exploratory character allowed determining the contradictions, in their external form, between the social task of the pre-university and the level of professional guidance that students reach for the selection of basic sciences careers. Hence, it is declared as an objective to elaborate a methodology that contributes to the improvement of the professional guidance towards basic science careers in the pre-university.

Theoretical framework or conceptual references

From a theoretical point of view, professional guidance has been the subject of various studies from different perspectives; both its definition and its functions have been modified throughout history. Generally speaking, it constitutes a technical and professional assistance, although with different nuances and approaches depending on the era.

Some sciences and researchers identify guidance counselors as specialists in psychometric or psychotechnical diagnosis; others assume that the teacher is trained to deal with aspects of personal, social and vocational development. Despite these theoretical and methodological differences, professional guidance has been centered on two essential themes: the choice of profession and professional motivation as a determinant of the quality of that choice.

According to Pérez Gamboa (2022), as cited by Ramírez Echavarría et al. (2024), "one of the main problems in guidance has to do with the way in which it is conceptualized and produced in professional practice" (p. 13).

The researcher Condori Mamani (2023) refers to professional guidance as a process of helping the subject to be able to choose a profession and prepare adequately to perform a particular job, whether technical or professional, trying to integrate personal demands with social needs.

On the other hand, Tintaya Condori (2016) states that "professional guidance should establish the physical and psychological aptitudes required by each profession and guide

individuals in this; likewise, it takes into account the personal, economic and social conditions for exercising a profession” (p. 48).

Professional guidance has evolved from a simple preparation or counseling to choose or enter a profession, to become a preparation for active life, or full insertion or socialization in adult life. For example, Álvarez González (1995) analyzes it as:

A systematic process of assistance, aimed at all persons in their training, professional performance and leisure time, with the purpose of developing in them those vocational behaviors (vocational tasks) that prepare them for adult life, through a continuous and technical intervention, based on the principles of prevention, development and social intervention with the involvement of educational and socio-professional agents. (p. 21).

Mejía et al. (2018), as cited by Ricardo Velázquez et al. (2023), state that “...professional guidance constitutes an information and counseling activity that helps the student to make a coherent vocational decision, a good professional choice” (p. 281).

The researchers Silva Balmaseda et al. (2023) consider that:

(...) professional guidance is based on the active and regulating role of individuals, in correspondence with the development of their personality, the higher motivational formations such as ideals, self-valuation and professional intentions, constitute the representation of the personal sense that the profession acquires for the subject, the professional motive then, becomes the guiding axis of behavior. (p. 2-3).

In this sense, it is a matter of facilitating training for active life, and of extending the incidence to the permanent education of the individual. The leading role must be played by the oriented subject, preparing them for self-reflection, self-knowledge, self-orientation, with the help of the rest of agents and socializing agencies (teacher, school, family and community) that facilitate the process of professional guidance.

The researchers Remón Fonseca et al. (2019) as cited by Delgado Fernández and Mosqueda Mosqueda (2024) consider that:

Professional guidance runs throughout the life of the person, begins from the earliest ages and does not culminate with the student's graduation from a professional center, but extends to the first years of professional life, is reaffirmed systematically and continues during the training in the major being studied; it is therefore conceived as part of the process of the subject's personality education that prepares them for training and responsible professional performance. (p. 2).

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

In these definitions, professional guidance is connoted as a process of assistance aimed at the development of the professional identity of all subjects, of all ages and at all formative moments, and does not neglect the preparation for adult life in general. It is individualized, continuous and progressive, aimed at personal, educational, vocational and professional fulfillment.

An analysis of this definition reveals the following requirements:

- It frames the process in the preparation stage of young people and to the objective of professional self-determination.
- It is integrated in the formative process through the system of social and pedagogical influences.
- It has an individualized character.
- It takes into account the needs and abilities of each young person.

The transit through Pre-university Education constitutes an essential stage to strengthen the work of professional guidance, which should be more differentiated and aimed at preparing students for the act of choosing their future professions, which will allow them to shape their life projects as an essential aspect of their development.

Methodology

The general method used was the dialectical materialist method and a predominantly quantitative research strategy was followed, at an explanatory level, and different theoretical, empirical, mathematical and/or statistical methods were applied, such as: analysis-synthesis, induction-deduction, historical-logical, transit from the abstract to the concrete, scientific observation, survey, interview, experiment, expert criteria and descriptive statistics.

From the research methods and instruments used, it was possible to verify that in this educational institution the teachers have mastery of the content systems concerning the basic sciences and there was evidence of results obtained from the participation in national and international events in these areas of knowledge that constitute a strength for the development of professional guidance.

Results

Based on a detailed study of the professional guidance carried out in the Vocational Pre-University Institute of Exact Sciences and in particular the guidance towards basic science careers, in which the treatment to these contents in the current conditions of the training model is appreciated, as well as the methodological orientations in force for such performance, the authors focused their analysis on the transformations that the Ministry of Education established for the 2022-2023 school year, in order to direct their work with the required level of objectivity.

The definition of methodology given by De Armas (2011), as cited by Castellanos Yero (2022), is assumed:

(...) it is a system of methods, procedures and techniques that, regulated by certain requirements, allow us to better order our thinking and our way of acting to obtain certain cognitive purposes; (...) it is composed of the general objective, the foundation, two structural apparatuses: the theoretical-cognitive apparatus and the methodological-instrumental apparatus. (p. 69).

The general objective of the methodology is to contribute to the improvement of the professional guidance towards basic science careers at the pre-university level.

The theoretical-cognitive apparatus is made up of a categorical and legal body. The categorical body is composed of concepts and categories and the legal body of laws, principles, requirements or demands. The methodological-instrumental apparatus contains stages, actions or procedures for the achievement of the objectives.

The methodology is based on philosophical, psychological, sociological and pedagogical referents; its peculiarity lies in the way of devising the professional guidance from the fundamental possibilities and relationships that should occur in the training process that takes place in the pre-university.

It is also based on a dialectical materialistic conception, which determines the intention of instituting the professional guidance towards basic science careers as a systematic process of help, directed to all people in formative period, of professional performance and free time, with the purpose of developing in them vocational behaviors (vocational tasks) that prepare them for adult life, through a continuous and technical intervention, based on the principles of prevention, development and social intervention with the implication of the educational and socio-professional agents.

From this scientific-philosophical conception, a materialistic approach to social and educational reality is assumed, which implies understanding the dialectical and interactive

unity existing between innate structures and social conditions in the development of personality, in a relationship that ultimately determines the social.

Such a point of view allows considering students as social beings, historically conditioned and locates, both their needs and their potentialities, in correspondence with an epoch, an environment and a certain system of relations, which condition the course of the formation process of which they are the object and subject.

At the psychological level, importance is also given to the interests that must be linked to needs, an essential premise for the subject to be involved in this system of educational influences, since the personality assumes these needs in the motives, and the attitude is the concrete manifestation of the personality, in which the motive is structured.

Consequently, the methodology from the psychological point of view is based on the contributions of the historical-cultural approach. Learning is also conceived as a process of participation, collaboration and interaction. In the group, in communication with others, students develop commitment and individual and social responsibility, raise their capacity for diverse and creative reflection, for critical and self-critical evaluation, for problem solving and decision making, based on the results derived from each activity according to the area or job. Therefore, its assembly and operation must be in correspondence with the scientific-technical-productive requirements, so that it favors the memorization processes.

From the pedagogical axioms, the methodology is based on the theoretical assumptions that the purpose of Cuban education is the integral and humanistic formation of the personality and the establishment of training institutions, conceived as the most important research, service and productive centers of the community.

It assumes in its conceptual framework the laws, principles and categories of Cuban pedagogy, a science integrating the knowledge of other sciences, which has been nourished by the best of national and universal pedagogical thought.

Theoretically, the methodology, from the pedagogical point of view, has been based on the categorical system offered by Abreu-Valdivia et al. (2021), who consider that the categories are not static concepts, but constitute a dynamic system. The aforementioned authors recognize the categories education-instruction, teaching-learning and training-development, without ignoring the role of others, which are closely linked to each other.

The conception of the methodology in stages does not imply a rigid linear structure; the way in which the stages have been organized admits that they can be simultaneous and respond to a circular interactive process typical of a research-action sequence, which, in

the opinion of this author, is of vital importance for the methodology to acquire a sufficiently flexible character; and the evaluation, its systematic and procedural character. The theoretical-cognitive apparatus is made up of the categories, the concepts, the legal body, the principles, requirements or demands. The methodological-instrumental apparatus contains the theoretical and empirical methods, techniques, procedures and actions for the achievement of the objectives.

Taking into account the guidelines offered by De Armas, as cited by Castellanos Yero (2022), for the presentation of the methodology in the research report, it was foreseen that the proposal to be made should specify:

- General objective.
- Foundation.
- Conceptual apparatus that sustains the methodology.
- Stages or steps that compose the methodology as a process and its concatenation and ordering.
- Procedures corresponding to each stage or link. Sequence, specific interrelation between these procedures that allow the achievement of the proposed objectives.
- Graphic representation, total or partial whenever possible, of the proposed objectives.
- Recommendations for its implementation, since the methodology must be accompanied by guidelines that allow its application in different contexts and conditions.

The methodological-instrumental apparatus is made up of the stages that make up the methodology. It also reflects the procedures for each of them and a group of methodological recommendations.

The proposed methodology is structured in four stages, as follows:

- I. Diagnosis and identification of the needs in the process of professional guidance towards basic science careers in the pre-university level.
- II. Projection and organization of the process of professional guidance towards basic science careers at the pre-university level.
- III. Execution to contribute to the improvement of the process of professional guidance towards basic science careers at the pre-university level.
- IV. Evaluation of the evidence of the process of professional guidance towards basic science careers at the pre-university level.

Next, the stages that make up the methodology will be explained, with the objective of unraveling its essence.

Stage I: Diagnosis and identification of the needs in the process of professional guidance towards basic science careers in the pre-university level:

- Analysis of the guidelines and methodological documents of the pre-university level.
- Selection and application of methods, means and diagnostic instruments.
- Interpretation of the results obtained.

Stage II: Projection and organization of the process of professional guidance towards basic science careers at the pre-university level:

- Evaluation of the curricular sequence of the academic activity from the professional guidance workshops.
- Organization of the realization of the professional guidance workshops.
- Determination of the professional skills to systematize in the performance contexts.

Stage III. Execution to contribute to the improvement of the process of professional guidance towards basic science careers at the pre-university level:

- Precision of the organizational and curricular conditions.
- Adequacy and adjustment of the actions projected in the projection and organization stage.
- Orientation of the realization of the professional guidance workshops.

Stage IV: Evaluation of the evidence of the process of professional guidance towards basic science careers at the pre-university level:

- Assessment of the evidence criteria of professional guidance towards basic science careers.
- Systematic, partial and final evaluation of the fulfillment 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. Execution of preparation actions and collective debate among the educational actors to reach consensus on the must be of professional guidance of students towards

basic science careers and how to take advantage of the possibilities of the training process.

The preparation of the pedagogical collective is indispensable to successfully conduct this process and to fulfill its educational function, while generating acceptance among students. The spaces for exchange facilitate the teachers' learning about the process, their responsibility to direct and improve it, about what to evaluate, for what purpose, with what methods and instruments, how, when, and the possibilities offered by the training process.

2. Systematic control of the fulfillment of each of the stages of the methodology.

Among the characteristics an adequate control system must have is its preventive function, hence the importance of not confusing the control of the process of professional guidance with the meta-evaluation because the latter constitutes an evaluative judgment on the development and results of the process. The control is exercised in a systematic way in each of the stages.

3. Systematic improvement of the Information System that supports the process of professional guidance of students towards basic science careers.

In order to carry out the professional guidance process, it is indispensable to have access to valid and reliable information about the students' training towards basic science careers and their results. This can be primary or secondary. The former includes data contained in the teaching reports or records generated by the year group, work-integrated practice teacher, or the teacher of the main integrating discipline subject. The secondary includes data emanating from primary sources and is basically related to the expected indicators.

Discussion

For the validation, by the experts' judgment, two rounds were carried out in which they made their critical judgments about the methodology that contributes to the improvement of the professional guidance towards basic science careers in the pre-university level, which was presented in a questionnaire (accompanied by the methodology). Based on the results obtained from the aspects submitted for evaluation by the experts (methodology 2.^a and last round), the category awarded was "very adequate" and quite adequate. The total votes were 33 ($V_t = 33$), of which 32 were positive, and only one negative ($V_d = 1$); therefore: $C = (1 - 1/33) \times 100 = 96.9\%$, a value greater than 75 %, which is considered to be a consensus among the experts.

With the purpose of verifying in the pedagogical practice the effectiveness of the elaborated methodology, as an alternative for the improvement of the professional guidance towards basic sciences careers, the experimental research design of pre-experiment category was selected, in order to reach the study objectives. Within this typology, the one used by the researchers was a pre- and post-test design with a single group, as shown in the following diagram: G O1 X O2.

The pre-experiment was carried out at the Vocational Pre-University Institute of Exact Sciences "Eusebio Olivera Rodríguez" of Sancti Spiritus. A sample was selected, with probabilistic criteria, made up of 60 teachers who teach in the different academic years.

The analysis of the results of the pre-experiment showed the feasibility of applying the methodology, as well as the problems and limitations that may arise during the process of professional guidance in the Vocational Pre-University Institute of Exact Sciences.

Conclusion

Professional guidance is an important process. It is the sum of planned experiences offered to students, whose task is carried out by professionals, providing them with a set of knowledge, methodologies and theoretical principles that support the planning and application of all the activities to be carried out with pedagogical intent.

In the article, a systematization of the theoretical-methodological, philosophical, pedagogical and didactic foundations of the emergence of professional guidance towards basic science careers is carried out, taking as referents, works carried out by other authors in this line. In order to stimulate the motivation of the students towards the study of basic science careers, with the influence of all the factors that intervene in the development of the students, the starting point were inadequacies found in the diagnosis, which hinder the realization of an adequate work of professional guidance towards basic science careers in the pre-university level.

According to the evaluations made by the experts in terms of: pertinence of the stages and actions of the methodology, applicability and subsequent generalization, it was found to be very adequate and can contribute to professional guidance. To demonstrate its validity, a pedagogical pre-experiment was applied by means of research methods, techniques and instruments, where it was shown that with its implementation, professional guidance towards basic science careers is achieved.

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Conflict of interest

The authors declare that they have no conflicts of interest.

Authors' contributions

Y.T.C.: Wrote the article and compiled the data.

Y.E.C.: Contributed with the structural-methodological requirements of the article, compiled the qualitative and quantitative data of the applied techniques.

D.B.M.: Contributed to the analysis and discussion of the results and to the search and compilation of the bibliography.

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