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Methodology for the stimulation of development of the theoretic thought in the professionals in initial formation

Metodología para la estimulación de desarrollo del pensamiento teórico en los profesionales en formación inicial

Metodologia para estimular o desenvolvimento do pensamento teórico em profissionais em formação inicial

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ABSTRACT

To direct, in a conscious way, the development of the thought during the process of teaching learning of the subjects, constitutes a fundamental objective of the Superior Education in Cuba. However, they are not sufficiently taken advantage of the possibilities that offer the same ones or subjects to favor this purpose. In this sense, the investigation tackled the theme of the development of the theoretic thought in the running Bachelor's Degree in Education in Physics at Holguín's University. He was offered of a methodology expedited by a method, once the stimulation of the development of the theoretic thought of the professionals in initial formation of the race was addressed to major's Degree in Physical Education at Holguín's University. I article the objective of the east you are to socialized the research findings developed. The study was accomplished from an investigating descriptive explanatory perspective and the recurrence to methods of the theoretic levels and empiricists, among themselves the historic logician, next to the logical procedures of analysis synthesis, as well as techniques of the scientific investigation like the interview and the opinion poll, in addition to the methods I experiment and longitudinal design panel. The partial intervention in practice revealed a gradual development of the operations and attributes of the theoretic thought once the process of teaching was evidenced in the students' active participation learning of The Physical General discipline. The successful results evidence that it comes in handy to accomplish studies that systematize the roads for the stimulation of the development of the theoretic thought in the students of the educational level considered through the process of teaching learning of the General Physics.

Keywords: process of teaching learning; theoretic thought; methodology; method.

RESUMEN

Dirigir, de manera consciente, el desarrollo del pensamiento durante el proceso de enseñanza-aprendizaje de las asignaturas, constituye un objetivo fundamental de la Educación Superior en Cuba. Sin embargo, no son suficientemente aprovechadas las posibilidades que brindan las disciplinas para favorecer este propósito. En este sentido, la investigación abordó el tema del desarrollo del pensamiento teórico en la carrera Licenciatura en Educación en Física en la Universidad de Holguín. Se propuso una metodología dinamizada por un método, dirigida a la estimulación del desarrollo del pensamiento teórico de los profesionales en formación inicial de la carrera Licenciatura en Educación Física en la Universidad de Holguín. El objetivo del este artículo es socializar los resultados de la investigación desarrollada. El estudio fue realizado desde una perspectiva investigativa, descriptiva, explicativa y la recurrencia a métodos de los niveles teórico y empíricos, entre ellos el histórico-lógico, junto a los procedimientos lógicos de análisis-síntesis, así como técnicas de la investigación científica como la entrevista y la encuesta, además de los métodos preexperimento y diseño longitudinal panel. La intervención parcial en la práctica reveló un desarrollo gradual de las operaciones y cualidades del pensamiento teórico, evidenciado en una participación activa de los estudiantes en el proceso de enseñanza-aprendizaje de la disciplina Física General. Los resultados logrados evidencian que es oportuno realizar estudios que sistematicen las vías para la estimulación del desarrollo del pensamiento teórico en los estudiantes del nivel educativo considerado a través del proceso de enseñanza-aprendizaje de la Física General.

Palabras clave: proceso de enseñanza-aprendizaje; pensamiento teórico; metodología; método.

RESUMO

Dirigir, de forma consciente, o desenvolvimento do pensamento durante o processo de ensino-aprendizagem das disciplinas, constitui um objetivo fundamental da Educação Superior em Cuba. No entanto, as possibilidades oferecidas pelas disciplinas para favorecer essa finalidade não são suficientemente exploradas. Nesse sentido, a pesquisa abordou a questão do desenvolvimento do pensamento teórico no curso de Bacharelado em Educação Física da Universidade de Holguín. Foi proposta uma metodologia dinamizada por um método, com o objetivo de estimular o desenvolvimento do pensamento teórico dos profissionais em formação inicial do Bacharelado em Educação Física da Universidade de Holguín. O objetivo deste artigo é socializar os resultados da pesquisa desenvolvida. O estudo foi realizado a partir de uma perspectiva investigativa, descritiva, explicativa e recorrendo a métodos dos níveis teórico e empírico, incluindo o histórico-lógico, juntamente com os procedimentos lógicos de análise-síntese, além de técnicas de pesquisa científica, como a entrevista e levantamento, além dos métodos de pré-experimento e desenho de painel longitudinal. A intervenção parcial na prática revelou um desenvolvimento gradual das operações e qualidades do pensamento teórico, evidenciado na participação ativa dos alunos no processo de ensino-aprendizagem da disciplina de Física Geral. Os resultados alcançados mostram que é oportuno realizar estudos que sistematizem as formas de estimular o desenvolvimento do pensamento teórico em alunos do nível de ensino considerado por meio do processo de ensino-aprendizagem de Física Geral.

Palavras-chave: processo ensino-aprendizagem; pensamento teórico; metodologia; método.

INTRODUCTION

Improving education is a constant battle, as well as ensuring that all students receive it in accordance with their levels of real and potential development. Knowing what to do to achieve it, not only from a theoretical point of view, but also in practice, should be a permanent goal for everyone.

One of the objectives of University Education is to form theoretical thinking in future professionals, so that they are more efficient in working life, can make logical and productive decisions when face with new situations, and be able to put their knowledge at the service of the community.

Because the development of the human intellect needs to be based on a solid base of scientific knowledge, educators, in an organized and systematic way, have the task of training men of science, due to the importance of preparing students in an integral way.

The development of thought is addressed as an essential objective in the training of students (García, R. 2019; Subrt, J. 2019; among others), although sometimes only its formal logical dimension is addressed.

In other contexts, the teacher's performance is modeled according to the logical result that the student must reach, without considering the process that leads to it. This position generates a perceptible mark in the long term: the marked "development" of students' empirical thinking with the consequent limitation of the development of theoretical thinking. In this event, works aimed at favoring the formation of concepts and the solution of tasks by students are distinguished (Bugaev, A. 1989).

Given the importance of the development of thought in the context of the research being carried out, an exhaustive analysis of this

category is required, beginning with the conceptualizations that appear in classic works. In this regard, it is stated: "Thought is mediate and generalized knowledge of objective reality (the basis for the discovery of connections, relationships and interventions)" (Rubinstein, I. 1977, p.9).

Similar interpretations can be seen in other classic works and in the context of Psychology applied to teaching-learning; they reflect that it is a subjective process that reflects reality in an indirect and generalized way, it is aimed at the search and discovery of the new. It constitutes a complex and superior process due to the deeper results it achieves in knowledge and because it groups and integrates the rest of the cognitive processes. Traditionally, the reasoning process has been considered fundamental in thought, associated with problem solving and concept learning, for which it is closely related to the laws of Formal Logic.

From the above definitions we can conclude that thought is the reflection of objective reality, expressed through language, directed in search of new knowledge through reasoning and operations.

The thought contains operations considered as basic as: analysis, synthesis, comparison, generalization, systematization, abstraction and concretion.

Education is responsible for the development of each of these basic processes of thought, based on the work carried out by teachers in their classes, through different subjects.

To talk about empirical and theoretical thought, and given the proliferation of terms to designate thought found in current literature (empirical, theoretical, rational, physical thought, etc.), many times without a statement of what is the classifying basis of such designations must necessarily refer to the categories of the sensory and the

rational. Empiricism believed that all knowledge of man had a sensitive origin, also limits the sphere of human knowledge to data obtained by direct experience only, an issue that is taken up by modern positivism.

The empirical and the theoretical are linked to the sensory and the rational; the latter is synthesized in autonomous categories that fulfill another function, namely, that of expressing other laws of the process of knowledge of the world by man, the logical development of knowledge from one level and content to another higher level. In this sense, they constitute stages of development of human knowledge and, consequently, of man's thought.

Theoretical thought "collects" and idealizes the experimental aspect of production, assigning it at first the form of cognitive sensory-material experiment, and later as a mental experiment carried out in the form of a concept and through the concept. Considerable time was required for theoretical thought to acquire sovereignty and its current form in the process of the historical development of production and science (Kopnin, V. 1983).

It is necessary to know the particularities of thought, as well as its possibilities and relationships; it is essential to know how far you want students to go.

The highest stage of theoretical thinking is thought experiments. "The mental experiment transforms the idealized object and, in this transformation, discovers its new internal relationships" (Davidov, V. 1988, p. 153).

The thought experiment, guided by the teacher, must be exploited to stimulate the particularities of thought and, specifically, of theoretical thought.

The teaching-learning process is central to the educational task at school. The construction of a conception by the teacher automatically places him on the stage of social change, on the platform of new ways of understanding his daily work and his human dimension. Teach you to direct the activity that produces learning; learning is managing, through cognitive activity, knowledge.

The ideas of developing teaching and learning are assumed, whose essential theoretical support is Vygotsky's historical-cultural approach, as a contemporary pedagogical current, based in turn on the learning theory of the same name.

After the analysis of the previous premises, it is considered that a developing teaching-learning process should be one where the teacher is a facilitator of development and autonomy, educator and director of the process; the student must be an active subject, in relation and social communication, which determines the integral development of his personality, the biological and the social are premises for development, learning conditions development.

In response to the above considerations, the research had as its main objective a methodology energized by a method for stimulating the development of theoretical thinking of professionals in initial training in the Bachelor of Physics Education career, to minimize the limitations to carry out the operations and qualities of thought and that these propitiate a greater participation of the students in the teaching-learning process.

MATERIALS AND METHODS

The dialectical-materialist approach is the guiding principle in the research, as a philosophical basis that allowed analyzing the components of the research design from a scientific-methodological perspective of the educational processes in the new socio-historical contexts.

The historical-logical method was useful for determining the particularities of the initial training process of the Physics teacher. It also allowed to establish the conceptual framework of the investigation, as well as to determine the main manifestations of the investigated object. The analysis-synthesis made it possible to address the object of the investigation.

The use of the empirical documentary analysis method was valid for verifying the current state of the development of theoretical thinking in professionals in initial training of the Bachelor of Education, Physics career at the University of Holguín, through the analysis of sources such as: study and model of the professional of the different specialties that made up the research sample. The in-depth interview was highly useful, since it provided the necessary information for the diagnosis of the research and for the design of the proposed methodology.

From the quantitative research methodology, the survey and the pre-experiment were used; the survey was designed by the authors with the aim of collecting information to verify the mastery of teachers and the guidelines on the development of theoretical thinking and its current state. The pre-experiment was designed with the aim of appreciating the transformations in the field of action of this research during the partial intervention in the practice of the proposal.

From the qualitative research methodology, the longitudinal panel design was used. This method was designed with the objective of knowing the group changes, as well as the individual changes at different moments of the partial intervention in the practice of the proposal. In addition, another objective of the longitudinal panel design is to nullify the insufficiencies of internal validity of the pre-experiment.

The universe of the research was made up of 23 students, from first to fourth year of the Bachelor of Education, Physics career and 14 teachers. The six students of the second-year group of the Bachelor of Physical Education career were selected as a sample.

RESULTS

From the theoretical analyzes carried out and the factual diagnosis applied, it was found that there is an insufficient didactic-methodological treatment of the stimulation of the development of theoretical thought, manifested in the limitations of the procedures used for its development and its incidence in the activity of the student.

A study was carried out in the first-year group of the Bachelor of Education, Physics career at the University of Holguín, through the application of scientific research methods and techniques, among them: interviews with teachers, observation of classes and the application of knowledge test. In this regard, the following regularities are revealed:

- they classify on the basis of non-essential, external and transitory properties;
- when facing the solution of a problem they tend to be uncritical, they focus on looking for a formula that contains all the data, to substitute and calculate, they do not choose the

most rational and economical way to solve the situations raised;

- When faced with semi-open and open tasks, most students become disoriented and begin to apply a trial-and-error strategy;
- They often do not find new problems or get to the essence of the phenomena they study; they also fail to make generalizations.

On the other hand, the teachers:

- they almost always use closed questions that model repetitive situations that lead to rote learning;
- The tasks and problems that are designed frequently have all the necessary and sufficient conditions, limiting the use of hypotheses and the assessment of new alternatives.
- In addition, the objectives that are raised ensure the reproduction of learned responses more than the stimulation of the development of thought.

For the aforementioned reasons, the present work aims to offer a methodology energized by a method that contributes to the stimulation of the development of theoretical thinking of the future professional.

The term methodology is one of the most recurrent in practice and in pedagogical theory; however, the scope of said representation is not always clear, nor is its connotation within the framework of scientific-pedagogical activity to demonstrate theoretical contributions. In the scientific literature, the concept has had multiple definitions that vary depending on the plane from which they are established. There are several authors who present their scientific results in this way, both at a practical and theoretical level; however, there are few who explain its content and characterize its logic.

The term methodology is addressed by multiple authors; among them are distinguished: Alonso Betancourt, LA, Leyva Figueredo, PA, Mendoza Tauler, LL (2019); and Perez, M. (2020). This is identified with a more specific plane, understood as a system of methods, procedures and techniques that, regulated by certain requirements, allow better ordering of thought and the way of acting to obtain certain cognitive purposes.

The first consideration of the author is the general structure of the methodology for stimulating the development of theoretical thinking through the teaching-learning of General Physics. The methodology is composed, in its theoretical component, by: premises, didactic principles and the method of stimulating the development of theoretical thought.

The premises are obtained from the theoretical-practical analysis, in relation to the foundation of the research problem. They are based on the philosophical, psychological, sociological and didactic foundations in relation to the stimulation of the development of theoretical thought.

The contextualization of didactic principles refers to the correspondence of the principles with the practical framework in which the teaching-learning process takes place.

In the theoretical analysis of methods there is a variety of points of view. The position adopted regarding the role of students and teachers in this process is very important. Starting from this, it can be said that the method is decisive for the direction of the cognitive activity of the student; in this, it is necessary to consider the relationship between the guiding activity of the teacher and the active, conscious, independent and creative assimilation of the students.

There are currently several trends in method analysis. This research requires methods that lead to raising the independence and the level of creation of the cognitive activity of schoolchildren. The methods that favor the stimulation of the development of theoretical thought are analyzed.

The teaching-learning methods of General Didactics and Physics Didactics in particular, in their internal structure, refer to logical thinking; that is, to operations, analysis, synthesis, comparison, generalization, systematization, abstraction and concretion. To stimulate the development of theoretical thought, the internal structure of the method must contain, in addition to the operations of thought, its particularities such as: breadth, depth, independence, flexibility, consecutiveness, speed and fluidity. Only by taking into account the operations and particularities of thought will there be no partiality in its development and, in particular, of theoretical thought. It must be flexible and applicable to the introduction of knowledge, the formulation and resolution of problems and the evaluation in General Physics classes.

The method of stimulating the development of theoretical thinking must be developer. The procedures must be of a didactic, psychological and logical-dialectical nature, attending to the operations and particularities of thought.

Within the framework of this research, the *method of stimulating the development of theoretical thought is defined as the way through which the teacher encourages the execution of actions that favor the development of theoretical thought, taking into account the relationship between the different operations and qualities of thought., based on interactivity and the active dimension of knowledge, where reflection, the elaboration of hypotheses and multiple designs prevail.*

Given that the procedures are the links of the method, the procedures of the Method of stimulating the development of theoretical thought are described below.

1. Procedure for analysis, realization and design of physical-mathematical demonstrations. It is revealed that, in the scientific literature, for professional training, basically for the study of mechanics, there are few tasks that require the performance of demonstrations. However, this requires the development of actions that only in an integrated manner, and following a well-conceived strategy, allows the desired result to be achieved.

Skills are required to discern, compare, perform mathematical operations, establish premises, discover the nuclei of knowledge to apply, determine causes and effects, take into account limitations of theories, integrate physical and mathematical knowledge. Then, the design of a demonstration requires full command of these operations based on an end and the particularities of the context.

2. Evaluation procedure and design of mental experiments. The teacher proposes the analysis of a mental experiment given in science or built by the teacher, but then invites the design of mental experiments by setting ideas to defend.

This procedure is a resource where the imagination is activated to investigate or corroborate the nature of things in a hypothetical scenario, which leads to certain reasoning about aspects of objective reality. Although there are methods of mental experiments in the literature, within the framework of stimulating the development of theoretical thought it is a resource, therefore, it unravels a procedure.

Mental experiments are feasible or not in practice, but in any case, the explorations and conclusions are obtained from physical-

mathematical reasoning. The experiment that is designed in the imagination must have enough logic so that it is possible to obtain coherent results that allow explaining a phenomenon or event.

3. Solution procedure and design of open problems. This procedure is occasionally understood as a method in the scientific community that addresses the development of theoretical thought. Although only the issue of the solution is addressed, but given the characteristics of the professional in training that must subsequently direct the teaching-learning process, it is necessary that he learns to design problems and appropriates the various strategies.

These three procedures have common characteristics for which they are considered a system of procedures. The three together are revealing of the operations of thought and its particularities. With the three together you can achieve the breadth of thought and with it the creative potentialities.

When the actions of these procedures are implemented, it is necessary not to offer the student finished cognitive products. It is required to prioritize that the student works on the teacher's guidelines or on the basis of given premises, which serve as a starting point to create the mental experiment, to design the open problem, to formulate working hypotheses and scientific hypotheses.

To assess the relevance and feasibility of the proposal, the use of a pre-experiment inserted in a longitudinal panel design is exposed to validate the relevance and feasibility of the methodology.

For the pre-experiment sample, six second-year students are selected, representing the entire group. This sample is not probabilistic and it is selected in correspondence with the

purposes of the investigation. For the longitudinal panel design, a non-probabilistic sample is also chosen. In this case, we work with the total of the second year of the degree.

Experimental hypothesis: if techniques of different natures framed in the methodology are implemented in the context of General Physics classes; then, the stimulation of the development of theoretical thinking and an adequate development of the teaching-learning process of General Physics, with emphasis on reflection, demonstration and mental experiments, is achieved in professionals in initial training, with students being able to solve and develop new tasks.

Variables

Dependent Variable (VD): stimulation of the development of theoretical thinking.

Independent Variables (VI): application of the methodology.

After carrying out a detailed analysis of the results of the pre-experiment, the following conclusions are reached:

- Among the group's strengths is the ability to correctly extract data to solve tasks, establish relationships between internal and external links, and model.
- Advances are glimpsed in the appropriation of solution strategies, the search for external and internal links in the phenomena, the realization of mental experiments, the adequate development of the different processes and qualities of thought; the revelation of the need to apply methodological actions in interactive situations, as proposed, to enhance group and individual development based on the strengths of the group.

- The existence of the people and the material conditions necessary to implement the methodology and its adequate flexibility when adapting to individual particularities is evident, an issue that facilitates progress.
- Regarding the longitudinal panel design, it should be noted that for the times located in the context of the pre-experiment, and later, observations are added to carry out in the field of General Physics classes, after systematizing the proposal. It is based on the criterion of appropriation as a process that culminates or has its greatest splendor in the possibility of applying what has been learned.

After a few sessions of applying the proposal, no significant changes are observed in the performance of teachers in training. However, after the semester, the professional performance shows progress in relation to the development of thought, which favors the participation of students teaching-learning General Physics.

DISCUSSION

In this research, a study is carried out on the development of theoretical thinking during the teaching-learning process of the General Physics discipline, in the initial training of the Physics teacher.

The results obtained in the research show the current state of development of the theoretical thinking of professionals in initial training of the Bachelor of Education, Physics career at the University of Holguín and, in turn, express the need for the topic to occupy space in the training of future education professionals.

The analysis of the main difficulties detected in the research allows us to assert that the process of developing theoretical thinking in the Bachelor of Education, Physics career at the University of Holguín presents deficiencies in the epistemological and methodological order.

Such results coincide with similar studies, based on the contributions of Juncosa (2020) and Fawcett (2020), who consider that the different ways to promote the development of theoretical thinking have not been exploited in the university environment.

In the epistemological order, the bias in the existing proposals for the development of thought stands out. The complex nature of thought is not taken into account; that is, the internal and contingent relations between all its operations and qualities.

Regarding the bias to develop thinking, there are investigations such as Nieves (2019) and Viel (2020), where they propose the development of logical thinking and flexibility, respectively.

In the methodological order, the existing curricular and extracurricular vacuum is verified due to the fact that there are no forms or ways that intentionally promote the development of theoretical thinking from the courses, programs, methodologies and other proposals from the undergraduate degree in the Bachelor's degree in Education, Physics, at the University of Holguín.

After the theoretical analyzes carried out, the ways through which the development of theoretical thought is intended from an integrative approach, where the needs that are revealed in the educational context are met, are not revealed in the didactic theory.

In this regard, Guerra (2019) states that it is necessary to design different forms that

promotes the development of theoretical thinking.

In the bibliographical study there are methodologies for the development of thought such as Nieves (2019), but in these no methods are proposed that develop theoretical thought as a whole.

For this reason, a methodology invigorated by the method of stimulating the development of theoretical thought is proposed, as a possible solution to the deficiencies detected, in which the development of all operations and qualities is taken into account in an integral way.

During the partial implementation, in practice, of the methodology and its components, the pre-experiment and longitudinal panel design methods are applied. In these contexts, the relevance and feasibility of the proposal given in this research is evidenced.

This proposal shows that it is conducive to developing theoretical thinking through the teaching-learning process of General Physics, generating an active participation of students in said process.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

Authors' contribution

Yunier Ricardo Tamayo González: implemented, collected data and developed the methodology.

Beatriz María San Juan Azze: had her participation in scientific logic to shape the methodology.

Francisco López Roque: statistically processed the data and participated in the scientific logic to conform the methodology.



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