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La asignatura educación laboral desde un enfoque científico, técnico, tecnológico e innovador en su diseño curricular
The subject labor education from a scientific focus, technician, technological and innovative in their curricular design

Ramón López Cordoví
Esteban Tomás Ramírez Domínguez
Dirección General de Educación, Granma. Cuba
ORCID: https://orcid.org/0000-0002-5087-2582
https://orcid.org/0000-0002-4173-4305

Correo electrónico(s):
rlcordovi73@gmail.com
tomas591018@gmail.com

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RESUMEN: El artículo aborda el diseño curricular de la asignatura Educación Laboral desde un enfoque científico, técnico, tecnológico e innovador, una problemática latente en la actualidad en función de preparar a los educandos para resolver problemas de la vida cotidiana en el contexto social y económico en el que se desarrollan. La investigación se desarrolla sobre la base del Método Dialéctico Materialista, se asumen para el desarrollo de la investigación los métodos: revisión documental, análisis-síntesis e inducción-deducción, sistémico estructural funcional. Como resultado se aportan los elementos esenciales para el tratamiento al contenido compuesto por tres subsistemas: cognitivo-laboral; práctico-laboral; productivo-laboral.
Palabras clave: Educación laboral; Diseño curricular; Ciencia; Técnica; Tecnología; Innovación

ABSTRACT: The article approaches the curricular design of the subject Labor Education from a scientific focus, technician, technological and innovative, a latent problem at the present time in function of preparing to the educating to solve problems of the daily life in the social and economic context in which you/they are developed. The investigation is developed on the base of the Materialistic Dialectical Method, they are assumed for the development of the investigation the methods: documental revision, analysis-synthesis and induction-deduction, systemic structural functional. As a result the essential elements are contributed for the treatment to the compound content for three subsystems: cognitivo-labor; practical-labor; productive-labor.
Keywords: Labor education; I design curricular; Science; Technique; Technology; Innovation

Introduction

The current vertiginous scientific, technical, technological and innovative development influences social and economic policies globally. Its implication is such that it provokes structural changes in the training systems at different levels of education. In this sense, an important role is attributed to educational institutions for the achievement of such purposes; increasing the attention that education pays to scientific, technical, technological and innovative advances that occur in today's world, and that have a

special connotation and significance in the social development in which students are formed; and for the impact they have on the labor and economic sphere of society.

The articulation of science, technique, technology and innovation, a contemporary cultural, universal and global phenomenon, is a pillar of economic and social development contextualized to local problems for the production of goods and services. It is essential support for the determination of the objectives and contents of the curriculum subjects, especially Labor Education. Díaz-Canel (2020), Lage (2018) and Castro Díaz-Balart (2004).

Therefore, the conception of the teaching of the subject Labor Education cannot be far from these purposes, by providing the cognitive development of the learners in a link the labor activities in which they participate in everyday life, where they can verify the usefulness of what they have learned as a result of the integration of science, technique, technology and innovation in the solution of socio-labor problems, related to the context in which they develop, as a way of materialization of the polytechnic principle of education.

Current perspective of the curricular conception foreseen in the III Improvement of the National Education System, which has among its bases the curricular updating of contents, didactics and methodologies, taking into account the most current scientific, technical and technological development, as well as the policy outlined by the country's leadership, based on the application of science, technique, technology and innovation in the search for existing solutions in each territory, cause the need to seek new approaches that dynamize it.

The curricular design is advocated from a scientific conception of the world, which has been at the spontaneity of the teacher. However, the realization of this objective supposes the establishment of a theoretical frame of reference based on a group of theoretical and methodological arguments with a level of flexibility, contextualization, originality and creativity, which allows the teacher to make the corresponding adjustments to maintain the level of updating of the curricular content. In this sense, the proposal offers an approach to this approach, which became a system that argues the components of curriculum design from science, technique, technology and innovation, which is systematized through socio-productive projects.

Development

The curricular design of the Labor Education subject reaches a scientific, technical and technological dimension to the extent that its components are conceived under this approach, and its flexibility and contextualization allow the acquisition, application and permanent systematization of knowledge, skills

and values of the students in the practice of their teaching-learning process. This is the backbone for the process of production of goods or provision of services. It favors the transfer of what has been learned to the solution of problems in the daily life of the learners.

From this perspective, the components of the curricular design of the subject are nourished by the most advanced science, technique and technology, in tune with the characteristics of the integral development of the social and economic context in which the students are formed and develop. Hence, it is essential for students to participate in socio-productive projects that generate problematic situations associated with their community context.

The interconnection between the school context (school curriculum) and the experimental experiences of the learner's social and economic context (institutional curriculum) contains the complex and diverse relationships of the social and labor universe. The teacher as a learning mediator harmonizes the complementarity between the two contexts, enhancing the life skills of his students. In both contexts, the use of current scientific, technical and technological information converges, in constant contradiction with the knowledge or the more traditional or empirical ways of doing of the community.

This is intended to signify the role of science, technique and technology in the structuring and content of the components of the curricular design of the subject to provide the theoretical bases of scientific knowledge for the students, so that they understand and comprehend the complex evolutionary processes of nature and society, and the role that these three elements play in their evolution and development.

In the process of formation of scientific, technical and technological knowledge in students, the learning of concepts, postulates, laws and general or specific principles of specific areas of knowledge or their manifestations of integrality, it is necessary to teach them to assume critical, analytical and reflective positions before natural or man-made phenomena, so that they understand their natural or social essence, and the implications they have in the productive processes and the provision of services. This posture generates investigative concerns and inquisitive curiosity for new learning, and with it, new scientific knowledge arises in science, technique or technology.

For its part, the latter is the core of the technological education of the subject. Through it, students acquire the basic knowledge for the use of machinery, tools, instruments and technological resources with which they can solve or create innovative solutions to everyday problems in different contexts. Technology offers the fundamentals of the work activity and the explanatory arguments of the facts from a

theoretical-practical relationship, which leads to the creation of new forms of action and procedures, new techniques, new results and new arguments.

Thus, innovation is a key element to take into consideration in the structure and content of the subject design components, as it fosters creativity, critical thinking, cognitive independence and problem solving. Students learn to generate innovative ideas and apply them to solve problems in different contexts, which allow them to adapt and respond to technological, economic and social changes effectively.

The above allows arguing the components of the curricular design of the subject Labor Education from a scientific, technical, technological and innovative approach, by understanding it as the vital process of unity and cohesion existing between the objectives, the contents, the forms of organization of the process, the didactic resources and the way of evaluating, focused on the acquisition, application and systematization of scientific, technical and technological knowledge, the formation and development of skills and values in students, which promotes labor competencies to solve problems of daily life, in the contexts in which they develop, as an essential support of their integral formation. López (2023)

All this is part of the structuring of the components of the curricular design of the subject Labor Education, seen as the process of planning and organization of the educational elements that make up the teaching of this subject, whose main objective is to establish the guidelines and contents that guide the learning of students in relation to the world of work.

Therefore, the curricular design of the subject Labor Education is called: system or structuring process of its curricular components that under the conduction of the academic-training objectives for the acquisition, application and systematization of scientific, technical and technological knowledge, the formation and development of techno-practical skills and values of labor content favors the solution of problems of the daily life of the learners, in the context in which they develop. López (2023)

The curricular design of the subject is structured in subsystems that reaffirm its dialectic and contradictory character, generating development from the system of internal relations of the elements that structure them and of them among themselves.

Each subsystem expresses internal contradictions that crystallize the form that the essential contradiction adopts at a certain moment, and that bring as a result successive qualities that arise from their interaction, whose integration becomes an essential and integrating quality of superior order, which are results of

the academic-formative process that is directed and organized from the structuring of the components of the curricular design of the subject Labor Education as a pedagogical process in its totality.

The definition of the categories of the subsystems and their elements is the result of the author's elaboration based on the analysis of the purpose of education, the general objectives of the educational level and of the subject, the characteristics and specificities of the curricular content and its contextualization links, the didactic resources, the forms of organization of the educational teaching process and the forms of academic evaluation, combined with the current demands to the school as a cultural institution of cultural transcendence for the integral formation of the students.

The curricular design of the subject Labor Education is structured in three subsystems: cognitive-labor, practical-labor and productive-labor.

The cognitive-labor subsystem of the curricular design of the Labor Education subject is the theoretical and conceptual part of the academic training that provides students with theoretical knowledge generated by science, technique and technology, the development of cognitive skills related to the world of work and labor activity, and the formation of values, assuming creativity and innovation as indispensable tools to apply and systematize what is learned under the functional mechanisms of the scientific and technological principles that support the development of the processes of production of goods or the provision of services.

It focuses on the development of the students' ability to understand, comprehend and analyze the theoretical conceptual aspects of labor, economic, social and ethical-moral content to explain and argue concepts, ideas, judgments, technological trends, instrumental technique, principles and applied laws of the various sciences that are related to the chemical composition of a raw material or input, the physical mechanism of operation of a machine, a tool, the act of production of a product or the provision of a service, the rules of protection and safety or environmental care, among other elements.

The subsystem is made up of scientific, technical and technological knowledge; which in the form of concepts, postulates, principles and laws support the structural or functional foundations of the objects and processes of diverse nature that surround human beings, in their nexus and relationships, and that determine the varied interconnections of man with nature and society. Necessary and indispensable to live.

Scientific knowledge is the set of fundamental cultural information that sustains the development and progress of society and the improvement of the understanding of the universe. It is the knowledge obtained through a systematic process of research, inquiry and study based on the scientific method.

Among the main scientific knowledge are: the scientific method to learn how scientific research is conducted; ecology and the environment to understand concepts related to environmental conservation, biodiversity, climate change and sustainability; technology to learn the basic technological concepts of how electronic equipment and devices work, their ethical and social implications; critical thinking to teach how to question, analyze and evaluate scientific information, and to be able to distinguish between statements supported by evidence or unfounded beliefs; practical application to assess the relevance of what has been learned for daily life and for the operation of industry, among the most relevant and transcendent, applicable to the development of the activities of labor content of the subject Labor Education.

For its part, technical knowledge is the set of skills, abilities and specialized strategies that are acquired through training, experiential experience that provides technical guidance and the development of skills and abilities with a professional training intention. It is the practical application of theoretical knowledge and technique to execute specific tasks or actions to obtain a product or provide a service. They are the essence of performance in trades, professions and activities of daily life. They are the knowledge that determines the level of competence and the quality or efficiency in the execution of an activity.

Among the most prominent are: the general principles of modern technology and production, practical mastery of technical objects, repair and maintenance of objects, construction of articles, work with instruments, tools, devices, machines, systems, means of control; obtaining, storing and transforming raw materials, energy and information for production and for the satisfaction of the needs of society not related to the productive sphere. They learn basic technical concepts about: electricity, principles of electricity generation, renewable energies and their impact on the environment, carpentry, use of hand and power tools, operation of simple machines, levers and pulleys, sewing and dressmaking, cooking, plant cultivation, garden care, botany, among others.

Technological knowledge refers to the understanding and ability to apply principles, methods and tools related to technology. This knowledge covers a wide range of areas, from the use of electronic devices and software to the understanding of industrial processes and innovation in the creation of new technologies. They make it possible to develop, implement and improve technologies that impact

industry, communication, health, medicine, energy, education, transportation and the environment, among other branches of production and services or people's daily lives.

Among the technological knowledge offered by the subject are: digital literacy, common productivity software, digital communication and computer applications applied to computer drawing (CAD systems). The technological, provides knowledge about basic concepts of the curriculum areas. Concepts of the materials and operators object of study, operations and technological processes, their stages and methodological aspects are acquired. The student learns the theories that explain facts and phenomena that occur when using different types of materials and operators.

From the system of relationships established among the scientific, technical and technological knowledge that support the cognitive-labor subsystem, the internal quality of scientific, technical and technological information is revealed. It is the capacity of the learner to understand, analyze, apply and systematize, in a critical way, the basic theoretical concepts related to work and labor activity. It is the internalization of scientific, technical and technological information for the execution of practical tasks related to daily life or the labor and economic world of the social context in which he/she develops, and which serves him/her to assume positions, make critical judgments, make decisions and participate effectively in the production of goods or the provision of services. (Figure 1).

Figure 1. Structure of the cognitive-labor subsystem

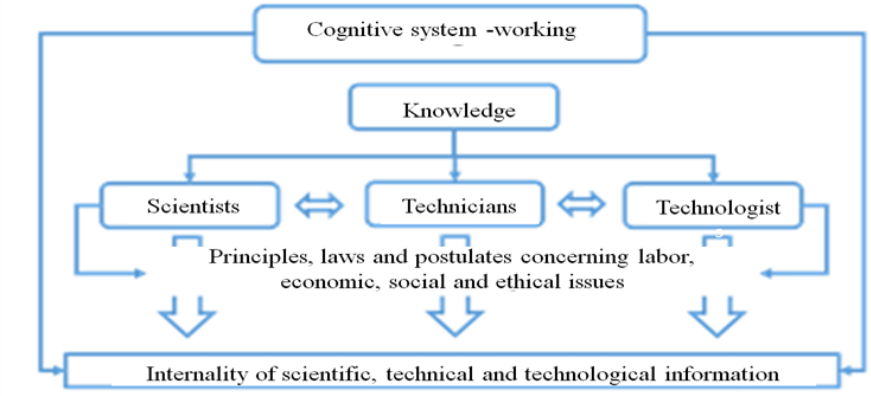

Figure 1. Structure of the cognitive-labor subsystem

Source: Self elaboration

The practical-labor subsystem of the curricular design of the Labor Education subject focuses on the training and development of techno-practical skills and abilities related to daily life, labor activity and the world of work. Its objective is to prepare students to effectively apply scientific, technical and technological knowledge and technical competencies to real or simulated work situations. It involves

teaching and learning of concrete and applicable techno-practical skills that are relevant to the performance of household tasks, work or work-related activities, either for the production of goods or for the provision of services.

These skills include specific skills, such as: the use of machinery, equipment, tools and instruments relevant to certain industrial processes or artisan work, practical manual skills characteristic of repair processes, maintenance or construction of articles with the use of different materials or instruments, such as: measuring, tracing and testing, or basic tools and devices.

Among the most significant of the latter are: measuring, tracing, checking, cutting, smoothing, drilling, joining, finishing, etc., or more general skills, such as: effective communication, teamwork, time management, design, planning, organization of the workplace and collaborating in projects.

In this subsystem, students perform practical activities that allow them to perfect and automate these skills, and thus face academic, social and personal challenges. Undoubtedly, the generalizing technical skill is the construction of articles, by providing a solid base for their growth and development, the focus of which is the systematization of technological knowledge.

The development of work activities related to the repair or construction of articles and participation in socio-productive projects provides students with knowledge, habits and technical and work skills that allow them to deepen their study of technique and technology. This helps them to understand, analyze and execute actions related to planning, organization, control, analysis and evaluation of production or services, developing critical value judgments, reflective thinking, foresight, among other essential qualities to work for efficiency, effectiveness and quality of work.

They learn the practical application of scientific, technical and technological knowledge in natural scenarios, to know the network of relationships established among workers, their sense of belonging and responsibility, their commitment to the result of the work, their love of work, to recognize their own work and the work of others, as part of the training in labor values of the content of the subject.

From the system of relationships of the elements that structure this subsystem, a formative quality is revealed called effectiveness in the application of scientific, technical and technological knowledge, recognized as the capacity of the student to effectively apply the wealth of cultural information contained in the curricular design of the subject Labor Education, updated and contextualized in natural scenarios of the school, family and community environment, in which labor activities and tasks are performed

through the use of specific or general techniques that favor the solution of everyday life problems (Figure 2).

Figure 2. Structure of the practical labor subsystem

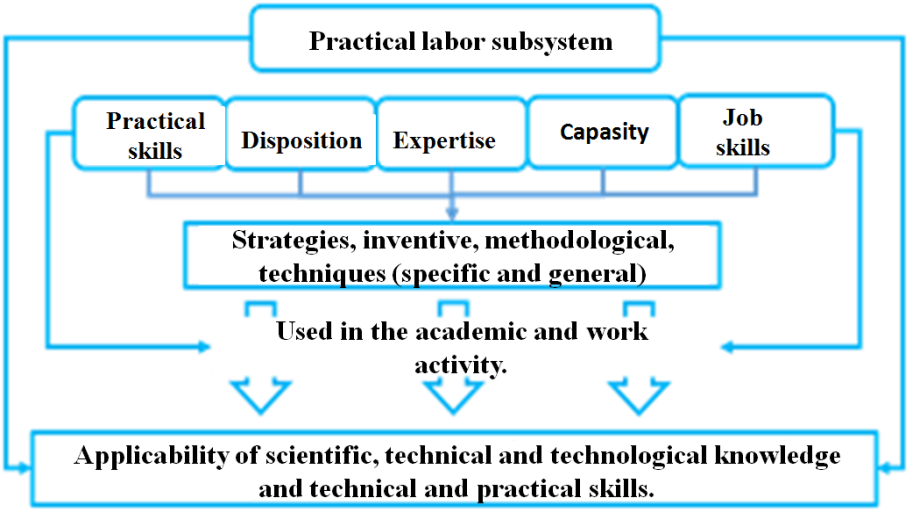

Figure 2. Structure of the practical labor subsystem

Source: Self elaboration

The productive-labor subsystem of the curricular design of the Labor Education subject is the part of the training that focuses on the practical application and systematization of scientific, technical and technological knowledge for the design, planning, execution and evaluation of real or simulated socio-productive projects of the labor activity or the world of work, mainly related to problems of the daily life of the students in their development contexts.

This subsystem allows the application and systematization of different forms of organization, planning, execution, control and evaluation of work. The learner establishes correspondence between the task to be performed and the technical, technological and instrumental requirements to execute it, the materials and means, the organization of the work station, the care, saving, order and cleanliness, as well as the realization of control actions of the operations and actions to make an object, and make critical assessments of their work and that of their peers.

It is a training subsystem that promotes creativity and innovative thinking in the search for creative solutions to work problems. The learner is taught to think critically and to propose innovative ideas.

Innovation involves finding new and better ways to address challenges, and is fundamental to success in a constantly changing and transforming social and work environment.

During the execution of socio-productive projects, understood as the set of tasks for the construction of real or simulated objects inherent to the world of work, through the application and systematization of scientific, technical and technological knowledge, technical skills, critical thinking and problem solving, to address socioeconomic situations of the school, social, family and community environment of the learners, as part of the learning process and their comprehensive training. López (2023)

Among the types of socio-productive projects that students can develop are: the design and construction of models for students with disabilities, toys for children in children's circles or houses, garden design, articles for various uses with recycled materials or from nature, recreational games, puzzles and toys for playgrounds, shelters or huts for animals, small devices or models that use solar or wind energy, basic electronic circuits, construction of rustic community benches and tree planting, among others.

It is important to adapt the content of the socio-productive project to the level of scientific, technical and technological knowledge of the students and the development of techno-practical skills to ensure the fulfillment of its general objectives, both academic and formative, are the means of application of science, technology and innovation for the production or provision of services, as a driving force for development and economic and social prosperity.

From the relationships established among the elements that make up this subsystem, emerges the applicability of scientific, technical and technological knowledge and technical-practical skills, seen as the capacity of students to use, in a creative and innovative way, what they have learned in the execution of various socio-productive projects that solve problems of the community enclaves where they develop, valuing the social importance of work, responsibility and solidarity aid (Figure 3).

Figure 3. Structure of the productive-labor subsystem

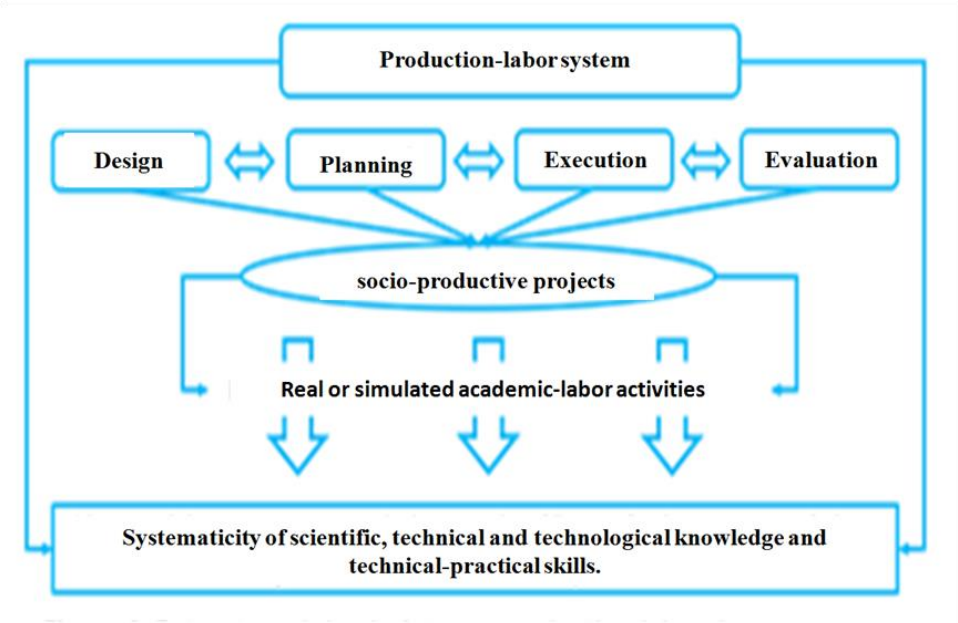

Figure 3. Structure of the productive-labor subsystem

Source: Self elaboration

The integration of the cognitive-labor, practical-labor and productive-labor subsystems in the curricular design of the subject Labor Education implies an educational approach that combines theoretical and practical aspects related to labor activity and the world of work. They are interconnected and complement each other.

In the cognitive-labor subsystem, the student acquires theoretical and conceptual knowledge related to work, understands the economic, legal and ethical concepts, which serve as support for making labor decisions. In the practical-labor subsystem, the student develops and applies techno-practical skills. They learn to use tools, equipment and technology, as well as communication skills, teamwork and problem solving. While in the productive-labor subsystem it effectively systematizes scientific, technical and technological knowledge and skills through the design, planning, execution and evaluation of real labor projects, related to work, which provides significant practical experiences.

The relationship between the cognitive-labor and practical-labor subsystems is one of interdependence. The scientific, technical and technological knowledge of the cognitive-labor subsystem provides the theoretical and conceptual basis for understanding the practical implications of work activity. For example, learning the principles of electricity (cognitive-labor) is fundamental for making electrical connections safely (practical-labor). In turn, practical activities in the classroom, workshop or in a

production or service center provide opportunities to apply and systematize the aforementioned knowledge and techno-practical skills.

The practical-labor and productive-labor subsystems are closely related. The implementation of socio-productive projects related to people's lives in the school, family or community is made possible by the application of theoretical knowledge and techno-practical skills.

Between the cognitive-labor subsystem and the productive-labor subsystem the relationship is supportive. Scientific, technical and technological knowledge provides the theoretical foundation that supports the planning and execution of socio-productive projects. Learners apply this knowledge to make informed decisions, make projections, calculate resources, and understand the technical implications of their work projects. Socio-productive projects represent the culmination of theoretical understanding in a practical experience.

The cognitive-labor subsystem provides theoretical foundations, the practical-labor subsystem enables the application of techno-practical skills, and the socio-productive projects represent the systematization and practical experience as a whole. The latter are the synthesized expression of the academic-training process, of the productive-labor subsystem.

From the unity of the three qualities resulting from the relationships established among the elements that make up the subsystems of the curricular design of the subject Labor Education, a quality of a higher order emerges: problem-solving in everyday life. This is the singularity of the curricular design of the subject (Figure 4).

Figure 4. Subsystem of curricular design of the subject Labor Educación

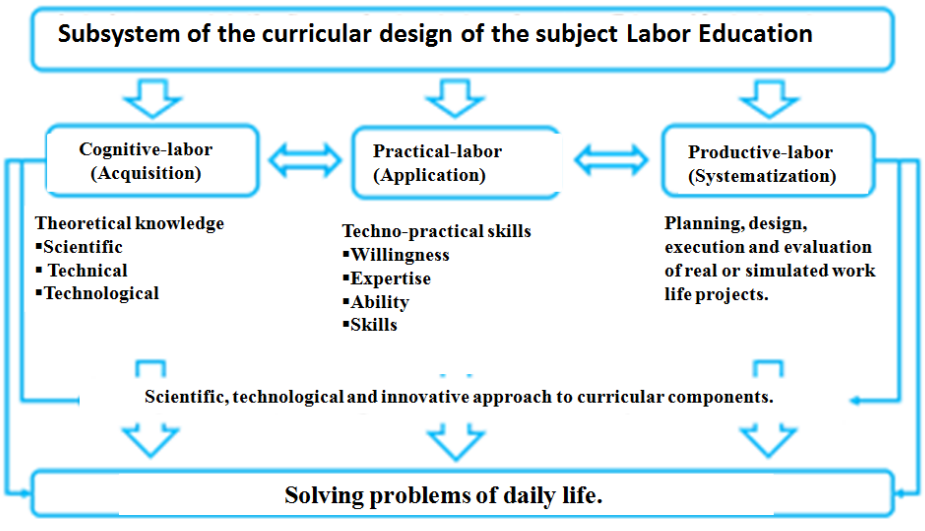

Figure 4. Subsystem of curricular design of the subject Labor Education.

Source: Self elaboration

In general terms, it is the competence of the learner to solve problems that arise in his/her constant interactivity with the subjects and processes in his/her social and economic context of development.

Competence implies not only understanding and comprehending a subject or concept (internality), having the ability to perform specific tasks effectively (effectiveness) and putting this knowledge and skills to use in relevant practical and contextual situations (applicability), but also the ability to combine and use these three qualities in an integral manner to achieve a high level of skills and performance in a specific field or area of scientific, technical and technological knowledge.

In the context of the subject Labor Education, these competencies translate into the students' ability to excel in performing labor and practical activities related to the world of work by acquiring, understanding, applying, using and systematizing theoretical knowledge and techno-practical skills in an effective manner and adapted to a variety and diversity of real or simulated work situations.

Students are able to acquire, apply and systematize scientific, technical and technological knowledge and techno-practical skills in an innovative way to provide solutions to everyday life problems in the various contexts in which they develop through socio-productive projects or construction processes. In them, the knowledge of Natural Sciences, Physics, Chemistry, Mathematics, Computer Science and Robotics, among others, occupies an important place due to their level of applicability, as well as some concepts of engineering, design and architecture.

Conclusions

The curricular design of the subject Labor Education in Basic Secondary Education is the resource for structuring the curricular components with a focus on science, technology and innovation from the subsystems: cognitive-labor, practical-labor and productive-labor, which facilitates the direction and organization of the teaching-learning process aimed at the acquisition, application and systematization of scientific, technical and technological knowledge, the formation and development of techno-practical skills, and labor values in students to solve problems of everyday life in the contexts in which they develop, as an essential support for their integral formation.

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