



The Environmental Dimension in the Teaching - Learning Process of the Technological Media Discipline: A Conception for Change

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Abstract: The importance of the environmental dimension in the teaching-learning process of the Technological Media discipline of the Bachelor of Mechanization Education career responds to the need to take into account environmental content in the curriculum, which can and should contribute to comprehensive training of technical career teachers. A system of theoretical and empirical methods based on synthetic analytics and systematization were applied. It is for this reason that a didactic conception is proposed for the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline, which is built taking into account the insufficiencies detected in this aspect and the use of the potentialities offered by the contents of the subjects that are part of the discipline, to treat one of the environmental problems that exist in Cuba, related to pollution and climate change. It is based on interdisciplinary nodes and teaching-learning situations. The proposed conception is characterized by being educational, flexible and contextualized, responding to the scientific assumptions offered by the Didactics of Higher Education and from the assumption of a structure that includes: general objective, point of view, basic concepts, principles, general requirements, those that through stages with their corresponding actions allow the implementation; all this enables the fulfillment of its objective.

Keywords: Mechanization, Didactic Conception, Interdisciplinary Nodes, Environmental Dimension

1. Introduction

At present, the problem related to the environment is attributed directly or indirectly to the activities carried out by people on the planet, which have global, regional and national effects. In this order of ideas, the environmental situation today constitutes one of the greatest challenges of the new century due to its high incidence in social, cultural, economic, political and legal problems; For this reason, reflection, critical and constructive debate of new actions that promote change are necessary, considering all the knowledge, to which many scholars of the subject have referred. In this regard Leff, E. (1998) states that: "...the environmental crisis is above all a problem of knowledge, which leads to rethinking the being of the complex world, to understand its ways of becoming more complex."

To address this problem, Cuban universities play a

fundamental role aimed at raising environmental culture as part of the comprehensive training received by future professionals; in addition, that they acquire the necessary knowledge that allows them to solve problems in accordance with the purpose of their profession, with sustainability criteria and that in turn develop values, attitudes and a level of participation, involvement, responsibility and behavior that contribute to promoting commitment to protect the environment. [1].

It is necessary to highlight the role of education in the fulfillment of the previous objective because it can and should contribute with the awareness and action that is needed to achieve sustainable and sustainable development, therefore, it is essential to provide the theoretical-methodological tools to the students. teachers so that as a result of their training they influence the new generations, in such a way that the objectives of the Earth summits held by

the United Nations in Rio in year 1992 are met; Johannesburg (2002) and the most current: United Nations Decade of Education for Sustainable Development (2005-2014).

For this reason, it is considered that the General Education System in general and the universities in particular are a feasible educational scenario since education and instruction constitute a dialectical pair that in the transmission of knowledge integrates the economic, social and environmental dimension of sustainable development. Because "guaranteeing the strengthening of the environmental culture in the university community is one of the priorities."

The foregoing is reaffirmed with the education program proposed by UNESCO, which is aimed, among other aspects, at improving the quality of education and the processes and results of learning so that all learners acquire the necessary knowledge and skills for the 21st century.

In this order of ideas, it coincides with Deliz de los Santos, O. in 2005 when he points out that: "Environmental education is then a response to the global demand for a change in the way of thinking and acting of humans, therefore, of the need to prepare man to stop the accelerated process of deterioration of the environment and reverse its consequences, promoting sustainable development". [2].

Based on the previous idea in this research, it is intended to respond to the statement of the World Conference on Higher Education, which calls for training that responds to current demands: "Given the complexity of global challenges, present and futures, higher education has a social responsibility to advance our understanding of multifaceted problems with social, economic, scientific and cultural dimensions, as well as our ability to deal with them Higher education should take social leadership in creating knowledge of global reach to address current challenges, including food security, climate change, water management, intercultural dialogue, renewable energy and public health. [3].

In this sense, the Degree in Mechanization Education trains teachers in different technical subjects, such as: Automotive Transport, Maritime Transport (Naval Operation, Naval Mechanics), Rail Transport (Rail Transport Operation, Traction Equipment), Agricultural Mechanization and Mechanization of Construction for the different medium-level technical specialties. That is why the purpose of the profession is to contribute to the integral formation of the students of the specialties of the Transport and the Agricultural Mechanization of the Technical and Professional Education.

In order to respond to these challenges, Technical and Professional Education (ETP) demands capable teachers from a technical, technological and pedagogical point of view, a professional with an open, flexible, participative mindset, who is capable, with his theoretical and practice of facing the changes of the current world, so that they can act responsibly in the care of the environment, by making use of these means of transport in the different specialties.

In this order, it is stated that "environmental education is

part of the teaching-learning process and contributes to renew it and make it more dynamic, flexible, creative and active, without each subject and each activity losing its object of study and instructional and educational functions., while contributing to the prevention and solution of environmental problems. Likewise, it is important to incorporate the environmental dimension into this process, in order to make education an important tool of environmental management for the protection and transformation of the components of the environment".

The previous idea responds to the mission that Law 81 of the Environment projects in matters of the environment, in Chapter VII article 50, where it is stated that "the Ministry of Higher Education will guarantee the introduction of the environmental dimension, from the models of the professional and the undergraduate and postgraduate study plans and extension and teaching and extra-teaching activities, aimed at the training and improvement of professionals in all branches".

It is important to highlight that, through scientific research and the application of new technologies, it contributes to responding to the demands of the Professional Model of the Graduate in Mechanization Education. However, the teaching-learning process that was being developed in the discipline did not respond to the current demands of the professional model.

In the career, the Technological Media discipline is taught, which prepares future teachers in the contents that are related to the recovery and/or maintenance of the exploitative conditions of the Technological Media, used in mechanized technological operations and processes of transport, agriculture and construction; as well as the methods for its maintenance and conservation.

However, although attempts have been made to systematically incorporate the environmental dimension into the teaching-learning process in the training of professionals in general and of the discipline cited in particular, deficiencies are still noted in this regard. In correspondence with the above, it is evident the need to permanently incorporate and continue the environmental dimension in the training curriculum of future professionals of the Bachelor of Mechanization Education career, to respond to one of the challenges of training of professionals in the 21st century.

Studies related to the incorporation of the environmental dimension in the training of teachers have shown the importance of these aspects for the formation of the qualified force, this is confirmed by the investigative work of authors such as Rosales, C. (1990); Alba, A. and Viesca, M. (1992); Towers, C. (1996); Lopez, C. (2001); Roque, M. (2003); MacPherson, M. (2004); Gonzalez, G. (2006); Vazquez, A. (2008); Deliz de los Santos, O. (2009); Cejas, E and others; (2009), Merino, T. (2010); War, M. (2010); Osorio, A. (2011); Ruiz, L. (2014); Vera, M. (2015); Ezquerro, G. and others (2016); Feijoo, M. E. (2016); Viltres, C. (2016); Perez, R. (2017); Feijoo, M. (2018); Eyebrows, E. (2018); Paez, C. J. (2018); Vera, M. (2018); Bosque R and collaborators (2019); Rubie, A. (2019).

The proposals of the cited authors have been directed, fundamentally, to the study of the abiotic and biotic elements of the environment and its conservation; environmental education in the professional pedagogical process of the subjects; in the training of the average technician and in the integration of the contents of the general training objectives of the pre-university; environmental training in integration with the University of Pedagogical Sciences and Technical and Professional Education; as well as environmental education for sustainable development in professional training. This review enabled the author in 2015 to consider the need to incorporate the environmental dimension in the Technological Media subject taught at the ETP; Therefore, a System of activities is proposed in a first approach to improve the environmental dimension; investigative results that constitute an antecedent to the treatment of this subject in the discipline that is investigated in the context of the training of education professionals in technical specialties.

On the other hand, the analysis of the results of the methodological work carried out in the Mechanics-Mechanization Department in the period between 2015 and 2019; as well as the revision of the study plans and the program of the discipline and its subjects, the observation to classes, and the exchange with the professors and specialists of workshops and transport companies, allowed to identify a set of limitations in the teaching process - learning of the Technological Media discipline related to the treatment of the environmental dimension, which slow down the fulfillment of the demands that are made to the teacher's training of this career.

- 1) Poor use of the potential presented by the contents in the Technological Media discipline of the Degree in Mechanization Education for the incorporation of the environmental dimension.
- 2) Insufficient realization of contextualized teaching-learning situations related to the environmental dimension in correspondence with the real situation of the environment and the profession.
- 3) Difficulties to assume reflective and critical positions on the main environmental problems by students that are generated from the profession.

The problematic situation raised reveals a contradiction that is expressed in that even when there are actions aimed at the development of environmental education in teacher training, an insufficient treatment of the environmental dimension is perceived from the contents of the Technological Media discipline.

Objective: To propose a didactic conception that contributes to the treatment of the environmental dimension in the teaching-learning process of the Technological Media discipline in the Degree in Mechanization Education at the "Enrique José Varona" University of Pedagogical Sciences.

The following research tasks were carried out:

1. Systematization of the background, theoretical references and foundations that support the environmental dimension and the teaching-learning process of the Technological Media discipline in the

Bachelor of Mechanization Education career.

2. Characterization of the initial state of the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline in the Bachelor of Mechanization Education degree at the "Enrique José Varona" University of Pedagogical Sciences.
3. Determination of the components that are part of the didactic conception for the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline in the Degree in Mechanization Education.
4. Evaluation of the results obtained by the implementation of the didactic conception for the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline in the Degree in Mechanization Education.

For the methodological assurance of this study, a system of methods is selected that allows the search for scientific knowledge, which are classified taking into account the theory of knowledge in, methods of the theoretical, empirical level and for the processing of statistical information.

The scientific novelty is that the study of the environmental dimension is contextualized in the teaching-learning process of the Technological Media discipline in the Degree in Mechanization Education. In addition, it contributes to the orientation of the professors of the career by paying priority attention to the treatment of the environmental dimension through a didactic conception containing stages and actions with a systemic, contextualized, flexible and professionalized character, which qualitatively distinguishes it from others.

The topic investigated is current and relevant because it responds to the Environmental Education Strategy of the "Enrique José Varona" University of Pedagogical Sciences, by paying tribute to one of its objectives, which is aimed at updating the environmental dimension in educational programs. teacher training; which corresponds to Guideline 182. "Reorient and strengthen environmental education and information towards sustainable development, at all levels of education in the country and the media, in a harmonious, systematic and coherent manner, incorporating the entire society Cuban".

Operationalization of the variable under study: dimensions, indicators and instruments.

In order to characterize the state of the environmental dimension in the teaching-learning process in the Technological Media discipline, we proceeded to identify, in correspondence with the object and the field of investigation, the study variable, which is the result of the theoretical study carried out in the previous chapter and the experience accumulated by the author in 32 years of work in education.

The variables used in the educational context are generally complex, therefore, it is necessary to break them down into dimensions and indicators.

In general, the procedure followed for the operationalization of the variable was as follows:

1. The study of laws, resolutions and strategies related to the environment, both at the country and institutional levels.
2. The study of the scientific results of educational research related to the object of study.
3. First and second socialization workshop with specialists (assessment and attention to their opinions).
4. Final proposal for operationalization.

Once the theoretical position that was going to be assumed was clarified, a first approximation was made to the proposal of dimensions and indicators, which was submitted to the consideration of specialists so that they could give their opinion about the operationalization that was carried out and assess whether with this proposal the diagnosis could be made. It is important to note that the criteria of the ETP teachers were taken into account because, in the future, this is the work context of the teacher in training.

15 specialists were consulted to whom a survey guide was applied.

100% of the specialists consulted have experience in research related to environmental education or the treatment of environmental content. Of them, 3 are professors of the Degree in Mechanization Education at the "Enrique José Varona" University of Pedagogical Sciences, 3 are professors at the "José Antonio Echavarría" Technological University; 1 is part of the Environmental Education Group of the "Enrique José Varona" University of Pedagogical Sciences; 5 are professors of the Transportation Exploitation course at the "Aracelio Iglesias" and "José Ramón Rodríguez López" Polytechnic Institutes and 3 are officials of the Ministry of Science, Technology and Environment.

The socialization workshop was held in two meetings, one with the purpose of presenting the first operationalization and the second for the presentation of the final proposal, which should take into account their suggestions.

In the first meeting, a cross-presentation technique was used in order for the participants to get to know each other to ensure that teamwork was done in an effective manner. Once the proposed dimensions and indicators had been socialized, a time of 10 minutes was given to that in plenary and using brainstorming as a technique, the suggestions that were made were specified, among which are: to take into account, within the instructional dimension, indicators aimed at the evaluation of environmental contents, to base all the indicators as well as to standardize the number of indicators for better processing.

2. Results of the Specialist Survey Guide for the Assessment of the Operationalization of the Variable

Below is a presentation of the essential results deduced from the data obtained, according to the methods applied:

Related to the coherence of the proposed definition, 10 of the respondents (66.6%) consider it to be very adequate, 4 (26.6%) quite adequate and 1 (6.6%) adequate.

In the case of indicator 1.1 (Orientation of the objective towards environmental content), 10 of the respondents (66.6%) place it on the very appropriate scale, 3 (20.0%) on the quite appropriate scale, and 2 (13.3%) on the appropriate scale.

Indicator 1.2 (Establishment of interdisciplinary relationships with the environment), 8 (53.3%) of the respondents place it on the very suitable scale, 6 (40.0%) on the quite suitable scale, and 1 (6.6%) on the appropriate scale.

Indicator 1.3 (Formulation of professional problems through teaching-learning situations), 7 (46.6%) of the respondents place it on the very suitable scale, 3 (20.0%) on the quite suitable scale, and 5 (33.3%) on the appropriate scale.

Indicator 1.4 (Evaluation of environmental content), 9 (60.0%) of the respondents place it on the very appropriate scale, and 6 (40.0%) on the fairly appropriate scale.

Indicator 1.5 (Command of ways that allow preventing and/or solving environmental problems from the profession), 14 (93.3%) of the respondents place it on the very appropriate scale, 1 (6.6%) on the Fairly adequate scale.

Indicator 1.6 (Presentation of extracurricular work, course work and diplomas with an interdisciplinary approach, in which real or modeled problems are solved with an adequate environmental approach) 14 of the respondents (93.3%) place it on the scale very adequate, 1 (6.6%) on the fairly adequate scale.

In the case of the dimensions, 10 of the respondents (66.6%) think that the Instructional dimension is very appropriate, 3 (20.0%) quite appropriate and 1 (6.6%) appropriate. On the other hand, the educational dimension 14 of the respondents (93.3%) consider that it is very adequate, and 1 (6.6%) quite adequate.

Indicator 2.1 (Critical analysis of environmental problems that arise from the profession), 14 of the respondents (93.3%) place it on the very appropriate scale, 1 (6.6%) on the quite appropriate scale.

Indicator 2.2 (Participation in extracurricular activities aimed at conserving the environment), 13 (86.6%) of the respondents place it on the very appropriate scale, 1 (6.6%) on the quite appropriate scale, and 1 (6.6%) on the appropriate scale.

Indicator 2.3 (Self-assessment of the need for the environmental dimension in training), 10 of the (66.6%) respondents place it on the very suitable scale, 3 (20.0%) on the quite suitable scale, and 2 (13.3%) on the appropriate scale.

Indicator 2.4 (Self-assessment of the need for the environmental dimension in training), 12 (80.0%) of the respondents place it on the very suitable scale, 1 (6.6%) on the quite suitable scale, and 2 (13.3%) on the appropriate scale.

Indicator 2.5 (Assessment of the priority of the environmental educational function of the teacher in training with the community), the 15 respondents (100%) place it on the very appropriate scale.

Indicator 2.6 (Adoption of critical stances towards people who manifest irresponsible environmental behavior), the 15 respondents (100%) place it on the very appropriate scale.

The group discussion technique is used in order to discuss the results obtained in the survey applied to the specialists; the debate takes place in a positive climate.

The importance of the research given in which teachers are told how to incorporate the environmental dimension into the teaching-learning process of the discipline is highlighted. They also point out that the approach is answered by taking into account the environmental objective, also, with the subject of evaluation.

They considered that, in general, the proposed operationalization meets the objective for which it was designed. That is why, based on the results obtained and the opinion of the specialists, the operationalization of the variable is considered between very appropriate and quite appropriate.

Once a consensus was reached, the operationalization of the variable under study is shown in Table 1, as it was finally left.

Next, each of the dimensions is based on their respective indicators:

Instructional Dimension: It includes the orientation of the objective towards environmental contents with the possibility of establishing interdisciplinary relationships and the formulation of professional problems according to new value conceptions, which allows mastery of ways that allow preventing and/or solving environmental problems, from the profession to take a position before the different situations of reality, the elaboration of teaching-learning situations, as well as the design and execution of course work and diplomas with an interdisciplinary approach so that real or modeled problems are solved in a way that can proceed to an evaluation of the environmental contents.

It is made up of the following indicators:

- 1) Orientation of the objective towards environmental content: when the incorporation of environmental content is made explicit from the objective.
- 2) Establishment of interdisciplinary relationships with the environment: when interdisciplinary nodes are established from the discipline with the other disciplines that are part of the study plan.
- 3) Formulation of professional problems through teaching-learning situations: when professional problems are identified that allow the incorporation of the environmental dimension through the proposal of teaching-learning situations.
- 4) Evaluation of the environmental content: it refers to the fact that from the program of the discipline it is made explicit how the environmental content will be evaluated.
- 5) Domain of ways that allow to prevent and/or solve environmental problems from the profession: skills that the student has for the identification of the ways that from the profession can be used to minimize or eliminate environmental problems.
- 6) Presentation of extracurricular works, courses and

diplomas with an interdisciplinary approach, in which real or modeled problems are solved with an adequate environmental approach: the preparation and defense of course works and diplomas with an interdisciplinary approach in national and international events.

Educational dimension: contributes to the teacher in training being able to make a critical analysis of the environmental problems that arise from the profession, participate in activities aimed at disseminating the best experiences and knowledge in favor of environmental conservation.

It can manifest itself in the following indicators:

- 1) Critical analysis of the environmental problems that arise from the profession: it refers to your critical position in relation to the environmental problems that arise from the profession, self-assess and assess the need for the environmental dimension in training, which will allow you to adopt positions criticism towards people who manifest irresponsible environmental conduct.
- 2) Participation in activities aimed at disseminating the best experiences and knowledge in favor of environmental conservation: it is related to the performance of the teacher in training as a speaker at national or international events that allow him to socialize the results of his scientific production.
- 3) Self-assessment of the need for the environmental dimension in training: when they consider that, it is necessary to incorporate the environmental dimension into the teaching-learning process.
- 4) Behavior aimed at conserving the environment at the university, the polytechnic school and in the labor entity: when they consider that from their position as a teacher they can contribute to environmental education at the university, the polytechnic school and in the labor context.
- 5) Assessment of the priority of the environmental educational function of the teacher in training with the community: when they consider that, from their position as a teacher they can contribute to environmental education in the community.
- 6) Adoption of critical stances towards people who manifest irresponsible environmental behavior: this refers to their critical attitude towards any inappropriate act related to the preservation of the environment (example: when water or electricity is not saved).

The proposed measurement scale is as follows: Level 3 (High or Adequate), Level 2 (Medium or Not Adequate) and Level 1 (Low or Not Adequate).

Didactic conception: components

The results obtained in the initial diagnosis evidenced the need for a new way of acting and thinking in the teaching-learning process of the Technological Media discipline and the incorporation of the environmental dimension according to the demands that Cuban society demands of a committed citizen. with the sustainable and sustainable development of the country.

Conception: benchmarks

As a result of the systematization carried out by Valle AD, in 2012, the conception concept is defined as "the set of objectives, essential concepts or starting categories, principles that support it, as well as a characterization of the research object, emphasizing and explaining those transcendent elements that undergo changes, when assuming a point of view to analyze the object or phenomenon under study". The cited author points out that both reflections are aimed at the study and characterization of an aspect of reality, in this case, of the educational reality, which is constituted as a subject of investigation, which can be approached from different angles, in order to enrich it or transform it.

As can be seen, the consulted authors coincide in relating the conception with the ideas, concepts and principles that allow to fulfill a certain objective about the organization, development, control and transformation in the practice of a certain process and its results, in this case the environmental dimension in the teaching-learning process, hence the importance of the need to understand the concept of didactic conception.

However, these important studies and their contributions, the incorporation of the environmental dimension in the teaching-learning process is still insufficient.

In this research, the definition given by Silvestre M. is taken as a starting point, because it responds to its objective, this author points out that a developing didactic conception is to conceive and direct a teaching-learning process in such a way that the integrality of the process is achieved. Expressed in that it instructs, develops and educates the student.

Based on the study of the work of the cited authors, and in correspondence with the interest of the research presented, the author of this research considers that the didactic conception for the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline is the point of view, principles, basic concepts and requirements that from stages make its implementation possible and whose didactic nature allows the achievement of the general objective, given in incorporating the environmental dimension in the teaching-learning process of the discipline Technological Means in such a way that the integrality of the process expressed in the instruction and education of the student is achieved.

To achieve this, the following steps were carried out:

- 1) Systemic analysis of theoretical assumptions based on a dialectical conception of the teaching-learning process and the environmental dimension to establish its theoretical bases.
- 2) Identification of the requirements, stages and delimitation of the actions and methodological procedures necessary for the incorporation of the environmental dimension in the teaching-learning process of the discipline. [4].
- 3) Evaluation of the conception based on the critical assessment of the judgments provided by the specialists and the analysis of the main theoretical and methodological observations made.

3. Components of the Didactic Conception

For the design of the proposal, the components are presented. These are: general objective of the conception, the exposition of the point of view assumed about the environmental dimension in the teaching-learning process of the Technological Media discipline in the Bachelor of Education Mechanization career, the basic concepts, principles of environmental education; as well as the requirements and stages for its implementation.

In the didactic conception that is proposed, the precept is that the student is located at the center of the process, for this reason it aspires to their integral formation in which the ethical-axiological-humanist component is understood with greater force.

Each of the proposed components is further explored below.

1. The general objective is: to incorporate the environmental dimension in the teaching-learning process of the Technological Media discipline in such a way that the integrality of the process expressed in the instruction and education of the student is achieved.
2. The point of view is based on the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline by taking into account the identification of interdisciplinary nodes as meeting points and accumulation of the contents of the environment with those of the Technological Media discipline, based on teaching-learning situations and their evaluation.

It is considered that the basic concept for the proposed didactic conception is a form of human thought that allows capturing the general and essential characteristics that support the integration of the environmental dimension in the teaching-learning process in the Technological Media discipline.

In this conception the following basic concepts are treated:

- a) Teaching-learning process, environmental dimension, environmental education, teaching-learning situation, professional content.
- b) The discipline is understood as a constituent element of the study plans and/or curriculum, and its content is not only restricted to the knowledge system, but also to the set of skills that must be developed for the consistent application of the cognitive aspects already the axiological formation that propitiates its own content to the students, which is to say to those who learn.
- c) Interdisciplinary nodes

This research coincides with the theoretical position of Fiallo, JP (2001), when he points out that interdisciplinary relationships, "are a didactic condition that allows the principle of systematic teaching to be fulfilled and to ensure the consistent reflection of the objective relationships in force in nature, in society and in thought, through the content of the different disciplines that make up the current school curriculum. [5].

This reference is assumed because it is also understood that it is in the group of teachers of the discipline, subject and academic year in which the exchanges, reflection, debate and cooperative work between its members are defined, which starts from the analysis of the contents of the programs of the disciplines and of the subjects.

Interdisciplinary is defined in the National Environmental Education Strategy as a "methodology that characterizes a teaching, research or management process, in which an interrelationship of coordination and effective cooperation between disciplines is established, but also essentially maintaining its theoretical- methodological, however, identifying a process of construction of consensual conceptual and methodological frameworks that fosters the articulation of knowledge around the problem and for its identification or solution". [6].

The interdisciplinary treatment must be carried out gradually, which presupposes the completion of year groups and disciplines, in such a way that the teaching-learning process is organized so that students understand the complexity of the environment, as it results from the interaction of its physical, biological, social and cultural aspects, as well as providing a clear awareness of the political, economic and ecological interdependence of the world.

In this research we refer to the term node since there are several authors who have addressed interdisciplinary relationships through nodes. According to Fiallo, J. P. (2001) in Cuba, the nodes are attempts made in education as a way to achieve interdisciplinary.

The nodes, according to Álvarez, M. (2001) refer that they are "points of accumulation of information around a knowledge that can be recovered, applied, modified or transformed". According to the author, the nodes are essential nuclei of information, about a system of knowledge, skills and values to boost integration between disciplines and/or subjects vertically and horizontally. [7].

Sagó, D. (2006) considers "the nodes, as meeting points and accumulation of content, which can be restructured, enriched and updated." In this sense, the content constitutes the essence to establish interdisciplinary relationships and indicates that the skills, values, of various disciplines and/or subjects are also taken into account, which can be perfected from the interaction, interrelation and integration for the establishment of interdisciplinary relationships.

The interdisciplinarity in the incorporation of the environmental dimension in the Technological Media discipline is proposed to be through the inclusion of environmental content in such a way that the appropriation of correct behaviors towards the environment is achieved, not only knowing it, but also dealing with environmental issues in the classroom or workshop (especially in natural and urban environments), for this, study in the community where the school is located, where they live and where in the future they will practice their profession should be encouraged. This allows the transmission of environmental culture to future technicians and qualified workers and the formation of

positive values and attitudes for the conservation of the natural and/or urban environment.

It should be noted that education and the environmental dimension are essentially interdisciplinary, and this coordination relationship is carried out at the same level as cooperation.

Next, the interdisciplinary nodes that relate the environmental content with the content of the disciplines of the Degree in Mechanization Education are exposed.

The fundamental nodes are evidenced in the exploitative qualities and the methods for their conservation and recovery for loads of products and materials; product carriers, automotive means, aggregates used in railway transport, naval transport, road transport and construction transport, as well as facilities and equipment for the preparation, handling and benefit of product, in addition to the processes in which they are used the aggregates of loading and unloading of products and materials, the efficient exploitation of the automotive means and of agriculture, the work of the aggregates. Fundamental technical and economic indices of transport exploitation and planning of cargo and passenger transportation. Means of transport and traffic safety. [7].

Cooperation is understood as joint and co-responsible actions of educators and students in making decisions related to technical-professional training, based on the help provided by educators, which means a high role of students in the construction of the curriculum and the leading role of educators so that this can be achieved.

That is, a cooperation that allows open communication and exchange of ideas and professional experiences with fluidity, respect and receptivity, the contribution of different approaches to the solution of common problems without underestimating the possibilities of the other and the breadth and flexibility of thought.

The essential condition for this cooperation process to enable the comprehensive education of students is the joint and decision-making participation of students and educators.

Educational guidance is a process that, in the author's opinion, complements the teaching-learning process and is defined as "the helping relationship established by the teacher with the students, with the aim of facilitating decision-making in situations in which they lack resources or possibilities to decide, in order to promote their development". [8].

Educational guidance enables the development of autonomy and self-determination of the student, by providing the necessary resources for decision-making and self-resolution of tasks, problems and conflicts in which they may be involved, it is carried out in spaces of cooperation between students and educators in which help is provided to students, based on their needs and requests. These activities are planned and developed through joint actions of students and educators and their quality depends on the cooperative work of all.

The principles constitute the rules or regulations based on a set of facts and knowledge that make it possible to guide actions in certain situations and specific conditions.

In this research, the educational principles proposed by Roque M. (2003) are assumed because they derive from the "guiding principles of environmental education" approved at the Tbilisi conference; and they were enriched with the experience of this author in the educational and sociocultural context. In addition, they constitute a methodological tool because they guide the focus of the content, the methods, and the evaluation.

General requirements and stages for the implementation of the didactic conception.

- 1) Domain by teachers of the professional model.
- 2) Coordination by the head of the discipline of the educational influences in the different contexts and the direction of the teaching-learning process with the cooperative participation of teachers and students, through joint actions, collective decision-making and responsibility in the achievement of the integral formation of the student.
- 3) Strengthening the work of the pedagogical group so that differentiated attention can be offered to each student and each school group, based on a comprehensive individual and group diagnosis. This diagnosis is the task of the pedagogical group, under the guidance of the teachers and focuses on the study of the interrelationships between the student, the educational contexts and their life history; in order to explain the characteristics and behaviors observed and carry out the necessary preventive intervention. The students and all the teachers involved take a leading role in this process.
- 4) Analysis of the content of the discipline so that the interdisciplinary nodes that allow the incorporation of the environmental dimension to the teaching-learning process can be identified.

This concept is based on the one proposed by Bermúdez Morris, R. and L. M. Perez Martin. [9].

- 1) Selection of active methods and procedures of an interdisciplinary nature so that the student is placed at the center of the process and is the protagonist of their learning.
- 2) Approaching the student to teaching-learning situations that allow him to solve the environmental problems that arise, taking as a starting point the professional problems, directing them towards the transformation of the designs of the professional activity towards sustainable development with the identification of basic contents of environmental knowledge, skills and values.
- 3) Establishment of the necessary coordination to guarantee the permanent training of teachers, in order to prepare them to act successfully in the school, work, family and social context so that they can quickly assimilate the accelerated changes that the constant evolution of science and the technique they generate and their relationship with the environmental contents.
- 4) Promotion of extra-teaching activities that promote reflection and satisfaction of the needs of students.
- 5) Coordination between the university, the polytechnic

school and the labor entity.

- 6) Identification of indicators that enable the evaluation of the environmental dimension.

What has been proposed [10] allows us to consider the following stages for the implementation of the proposed didactic conception:

Stage 1. Methodological preparation of the professors of the discipline.

Objective: Methodologically prepare the teachers of the discipline taking into account the professional model, and the environmental strategy for the incorporation of the environmental dimension in the teaching-learning process of the discipline.

Actions

1. Analysis of the Professional Model, the study plan of the Degree in Mechanization Education and the documents related to the Technological Media that are issued from the Ministry of Transport.
2. Diagnosis of knowledge about the environmental dimension and how to incorporate it into the discipline.
3. Study of the National Environmental Strategy and the Environmental Strategy of the university.
4. Establishment of the relationship environmental problems-professional problems.

Stage 2. Analysis of the program of the Technological Media discipline and its subjects.

Objective: To analyze the program of the Technological Media discipline and the subjects that comprise it based on its objective, content, methods, means, forms of organization and evaluation in a way that favors environmental education.

Actions

1. Determination of environmental content

The content is the didactic category that expresses that part of the culture or branch of knowledge that the student must master to achieve the objectives. Three dimensions that constitute a dialectical unity are revealed in it: knowledge, skills and values. The knowledge reflects the object of study, the skills express the modes of action of man in his relationship with said object, while the values determine the significance of that knowledge.

It is important that the selection of the content is done consciously, so that as a result of the appropriation process a favorable attitude towards the environment is formed.

For the selection of the content it is important to take into account:

The definition of basic nuclei of environmental knowledge.

Determination of the highest priority environmental problems, directly or indirectly related to the career, in the context of the professional field of action.

Identification of the environmental problem-professional problem relationship and from this derive the objective-content-method system through the interdisciplinary nodes.

Coordination of teaching tasks to which different disciplines must contribute, determining in this framework, mainly, the corresponding problems, objectives, contents and methods.

The selected content should facilitate its generalization to

situations other than those learned.

2. Formulation of environmental objectives for years.

It must be taken into account that the objectives constitute the most general purposes of the professional training activity, that is, what the student must achieve as a result of that process, and indicate the general transformations that they must achieve in their way of thinking and acting, so that you can solve the problem. Based on this budget, the environmental objectives will be derived for years of study.

Consequently, the professional problem and the objective are better elaborated, therefore, professional skills are better determined and can also be better operationalized for incorporation into the teaching-learning process.

3. Selection of methods to introduce the environmental dimension in the discipline.

It is necessary to use a system of methods that promote reflection, controversy, debate, the defense of one's own criteria, the search, confrontation and solution of real problems of the profession, in a way that provokes positive experiences and allows taking advantage of the experiences of the students. For this, it is necessary to take into account the conditions- in which the process takes place, either in the university or in the labor entity, which directly influenced the possible use and/or modification of the existing ones or the emergence of new visions on this component, taking into account its development potential previously assumed in the individual diagnosis made to the students.

4. Selection of teaching aids to introduce the environmental dimension in the discipline.

Teaching media become not only ways to obtain broad and up-to-date information, but also means of intellectual and practical work, ways of supporting and expressing individual and group work; therefore, its design, selection and application must comply with the hygienic and ergonomic standards that characterize higher education, avoiding effects on the health and physical development of students.

5. Selection of forms of organization to introduce the environmental dimension in the discipline.

The forms of organization must be flexible, diverse and dynamic, in such a way that it allows the preparation, orientation and performance of tasks based on the achievement of the established objective. The Workshop is privileged as the ideal organizational form.

6. Determination of the evaluation system of environmental education in the discipline.

The evaluation uses forms that bring it ever closer to the assessment of the professional performance of the students and must be inclusive, continuous, systemic and systematic, as it derives from the training objectives to be achieved in the year and in the discipline; taking into account the involvement of the student in this process.

It is convenient to reconcile with the students the parameters and aspects to be evaluated, as well as the types and forms that will be carried out (heteroevaluation, co-evaluation and self-evaluation); In addition, confront the self-assessment, the evaluation of the group, the teacher, the specialist, the instructor and the tutor in the integration of the

university, the polytechnic school, the labor entity and the community. It is important to achieve the consistent and cooperative participation of all subjects during the evaluation process.

In this sense, the evaluation must be educational, evaluative, conscious, flexible, corrective, cooperative, critical, reflective, helpful and regulating; which must be formed by a set of motivating activities that allow students and teachers to move towards a developer teaching-learning process.

7. Determination of interdisciplinary nodes. (In previous paragraphs the identified interdisciplinary nodes are shown).

8. Formulation of teaching-learning situations.

It is important to bear in mind that the teaching-learning situations are the set of real or simulated cases, theoretical or practical, that occur in the different contexts aimed at promoting the organization of the appropriation of the contents of the subjects through cooperation, the self-determination and professionalization of the protagonists of the teaching-learning process to improve the professional training of students in the university-employment entity-community context.

9. Design of extra-teaching activities.

It is the set of training activities that complete, broaden and deepen the formation of the student's personality, which implies variety, richness of options; It can include visits to transport companies where students can identify how the profession affects the environment, which affects the formation of values and an ethical, aesthetic, environmentalist and ecologist attitude.

10. Coordination between the university, the polytechnic school and the labor entity.

Coordination relationships must be established so that the teacher in training has the best prepared tutors to accompany them in their training process.

Stage 3. Evaluation and monitoring.

This action allows contrasting what is being done with what is to be implemented, this offers information on what is happening because it allows knowing and evaluating the ways and procedures used; as well as the results obtained. Monitoring and evaluation are performed using the same methods that were used for the initial characterization.

Objective: Evaluate the actions developed in each stage based on the results obtained for its improvement.

Evaluation can be done in three fundamental ways.

1. The first is to evaluate the didactic conception as a whole, this requires extensive time. For this, each of its components and its dynamics must be monitored. This form is the most complex.
2. The second way is to evaluate the didactic conception as a more immediate and direct result of its application; considering the dimensions and indicators for its evaluation.

For this, observation of classes and visits to methodological preparations are suggested. In this way, it is proposed to systematically check and assess the

implementation of the conception, by carrying out partial cuts to evaluate the changes in the teaching-learning process and, based on this, carry out interventional actions.

These cuts can be made at the beginning of the school year, at the end of the first quarter and at the end; or at the beginning and at the end.

The following actions are suggested:

- 1) Evaluation of teaching activities: it is carried out with the purpose of estimating the effectiveness of the methodological work during the activity in the fulfillment of the outlined objectives, the work of the teachers highlighting the strengths and weaknesses that arise, which will serve to evaluate the effectiveness of the methodological work carried out.
- 2) Evaluation of individual professional development plans and group educational projects of students.
- 3) Individual and group interviews with the agents involved in the comprehensive training of teachers in training.
- 4) Control visits to classes to assess the level of preparation presented by teachers in the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline.
- 5) Verification of the minutes and activities of the group to verify the related agreements with the methodological work system.
- 6) Methodological aids that are carried out with the purpose of suggesting to teachers the incorporation of the teaching-learning process in particular aspects such as the treatment of concepts related to the environment, selection of objectives, forms of organization and evaluation that they have. as a starting point, the positive aspects to highlight them and the negative ones to support the guidelines, in such a way that they guarantee the effectiveness and quality of the results achieved.
- 7) Meeting with teachers in training to assess the level of preparation achieved and recognize the strengths achieved and the weaknesses that persist.
- 8) Presentation of the results of the development of the actions proposed in the group of discipline and of the year so that they assume their execution in future actions to make the necessary adjustments and corrections based on the control and assessment that are carried out.
- 9) The information can be obtained from the application of scientific methods such as observation, interview, document analysis, as well as diagnostic intervention during the development of the teaching-learning process.

Another way to evaluate is to corroborate the development of the proposed conception, based on the results achieved by the students. For this they can use methods and techniques such as: observation, student survey, individual interviews and pedagogical tests.

It is important to highlight that this is a second-order evaluation, that is, it is a deeper evaluation of the process, since it is an alternative to verify the final result. This makes

it possible to infer the transformation of the teaching-learning process.

In this order, the follow-up allows specifying the considerations and alternative proposals for decision-making in the next actions and thus minimizing or eliminating the weaknesses found and favoring the strengths.

4. Dynamics of the Didactic Conception

The system of relations between the components of the didactic conception is constituted by its structural relations of hierarchy that determine the subordination and coordination of each one of its parts as a whole. External relations are expressed from the educational practice in correspondence with the educational agencies that intervene in the teaching-learning process.

The main relationships that are established in the didactic conception for the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline are centered on the hierarchization of the component: general objective, to which the basic concepts are subordinated, the principles, the point of view, the demands and their stages; but in turn, coordination relationships are established between these.

One of its characteristics is the systemic and systematic character from all the actions that are conceived, which allows evaluating how the participants appropriate knowledge, skills and values that influence their behavior. This means that they are readjusted or modified taking into account the context. They have a systemic character to the extent that the stages present essential relationships of interdependence with each other, which favor the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline [11].

Cooperative because it allows the harmonious and cooperative performance of actions and joint decision-making among all those involved, this enables the appropriation of the contents of the profession, as well as personal and group growth.

Flexible as it manifests itself in the ordering and dynamic sequence of all the actions carried out and their content. It is susceptible to changes according to the results of the diagnosis applied, the needs and characteristics of the context.

Contextualized as it is conceived within the planning of the system and work structure of the university and the faculty, as an objective response to the demands and particularities of the education system. The contents of the actions take into account the actors and scenarios that intervene in the teaching-learning process. In order to achieve this characteristic, it is necessary to take into account its flexibility, possibilities of adaptation to continuous change.

Professionalized because from the conception a continuous and permanent change is promoted in the process of student training by favoring the mastery of environmental problems

of the disciplines of the profession, as well as the interdisciplinary relationships that occur in them, which allows the assumption of ethical positions in the face of the environmental situation.

In general, the didactic conception for the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline must be made more dynamic in correspondence with the needs of the students and the corresponding contexts, the environmental problems, and the updating of the environmental content; All this must be consistent with social demands.

Once the proposed conception was elaborated, its application was carried out.

Evaluation of the results obtained by the implementation of the conception.

In order to assess the theoretical validity of the didactic conception for the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline, a survey guide was applied to the specialists to then discuss the results in a socialization workshop..

The modifications made to the proposal after evaluation by the specialists consulted made it possible to work on the following aspects:

- 1) Adjustment of the stages, which initially corresponded to the requirements, now some of these are included in it.
- 2) Accuracy of the actions for their implementation according to requirements.

The criticisms and suggestions made by the participants offered valuable elements about the understanding of the proposed didactic conception, as well as its relevance and feasibility.

The results obtained place the evaluation of the specialists between the categories C1: Totally adequate (TA) and C2: Very adequate (MA).

Once the suggestions of the specialists and the reflections made in the socialization workshop were addressed, the proposed didactic conception was implemented.

The results obtained were presented as follows:

Firstly, the results obtained in the initial diagnostic stage were analyzed, then those obtained in the final diagnostic stage and finally the comparison between them was made.

The proposed instruments were applied and the results obtained showed that the indicators moved from the inappropriate category to be located between the inappropriate and appropriate categories, as shown in the results of the triangulation of instruments after applied. the didactic conception.

The results related to the calculation of the general index of dimension 1 allow determining the behavior of the indicators; In this order of ideas, it is specified that the indicators 1.1, 1.3, 1.4 are located in the adequate category, while 1.2, 1.5, 1.6 were located in the inappropriate category. A representation of the behavior of the indices achieved in this dimension compared to the results obtained in the diagnosis is presented in figure 1. [12].

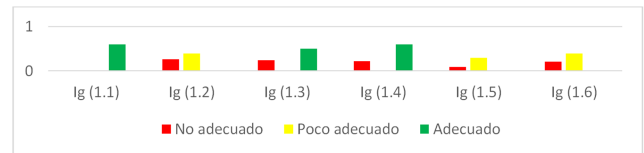


Figure 1. Comparative dimension 1 diagnosis.

For their part, the indicators that are part of dimension 2 had the following behavior: indicators 2.1, 2.3, 2.6 were located in the appropriate category and indicators 2.2, 2.4, 2.5 were located in the inappropriate category, as can be seen in figure 2 these indicators moved from the low category.

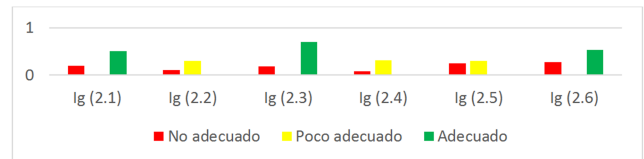


Figure 2. Behavior of the indicators after applying the didactic conception according to the general index.

Once the results of the application of the proposal were analyzed, a comparison was made between the weighted indices, which allowed us to appreciate the changes that occurred in the dimensions: Instructional and Educational, the progress of these is evidenced in figure 4 (Ig=0.5).



Figure 3. Behavior of the dimensions after applying the didactic conception according to the general index.

The results obtained place the variable in the high category (Ig=0.75), as shown in figure 4.

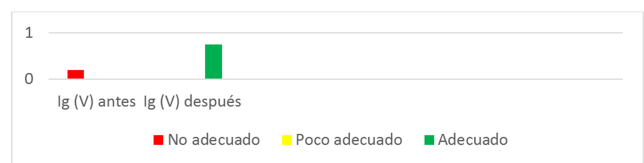


Figure 4. Behavior of the variable after applying the didactic conception according to the general index.

These results allow us to substantiate the way in which the progress of teachers and students is achieved, as well as all those aspects that, from the proposed actions, need to be adequate. In this dialectical procedure, the evaluation becomes a continuous activity of knowledge, those who work with them and those who teach learn about the successes and mistakes made. [13].

5. Conclusions

The results obtained in the final diagnosis allow us to state that all the indicators of the two dimensions of the studied

variable are located in the appropriate and inappropriate category.

The didactic conception for the incorporation of the environmental dimension in the teaching-learning process of the Technological Media discipline starts from a systematization of the state of the art of the object of investigation, of the results of the diagnosis and from the assumption of a structure that includes: general objective, point of view, basic concepts, principles, general requirements which, through stages with their corresponding actions, allow implementation; all this enables the fulfillment of its objective.

The results obtained by the evaluation of the specialists to the components of the proposal, as well as its application in the Faculty of Education in Technical Sciences at the University of Pedagogical Sciences "Enrique José Varona" allowed to endorse its adequacy by verifying its relevance and offer a positive response to the scientific problem that mobilized this research.

References

- [1] Leff, E. Environmental knowledge: Sustainability, rationality, complexity, power. Mexico: Editorial Siglo XXI; 1998. p. 285.
- [2] Deliz de los Santos, O. Methodological strategy for the treatment of the environmental dimension in the first year of the Agricultural Technical Bachelor. [Thesis in option to the title of Master in Higher Agricultural Teaching]. Center for Studies of Higher Agricultural Education. Havana, Cuba: Agrarian University of Havana; 2005. p. 13.
- [3] UNESCO. Draft medium-term strategy 2014-2021 of UNESCO. Paris France; 2013 (Document 37C/4).
- [4] Valle, A. D. Pedagogical research. Another look. Havana, Cuba: Editorial Pueblo and Education; 2012. p. 130. ISBN 978-959-13-2263-0.
- [5] Fiallo, J. P. Interdisciplinarity in the school: a challenge for the quality of education. Havana, Cuba: Central Institute of Pedagogical Sciences; 2001. p. 10. (On digital support).
- [6] Álvarez M. Interdisciplinary in the teaching - learning of Mathematics in basic secondary education. Paper presented at the International Pedagogy Congress 2001. Havana, Cuba; 2001, p. 5.
- [7] Sagó, D. A methodology for the evaluation of learning with an integrative approach in the General Chemistry discipline in the training of teachers with a degree in Chemistry Education. [Doctoral thesis] Havana, Cuba: Central Institute of Pedagogical Sciences; 2019. p. 31.
- [8] Collective of authors. Curriculum design proposal for experimental schools. Havana, Cuba: Central Institute of Pedagogical Sciences; 2014. p. 130. (On digital support).
- [9] Theoretical-methodological conception of educational guidance. In Caballero Delgado, E. et al. "Educational orientation and personal growth in the universities of pedagogical sciences". Havana, Cuba: Cuban Education Publisher Seal; 2013. p. 36.
- [10] Vera, M. The environmental dimension in the Technological Media discipline. Doctoral Thesis, University of Pedagogical Sciences "Enrique José Varona Havana, 2022 p 99.
- [11] Vera, M. The environmental dimension in the Technological Media discipline. Doctoral Thesis, University of Pedagogical Sciences "Enrique José Varona Havana, 2022 p 111.
- [12] Vera, M. The environmental dimension in the Technological Media discipline. Doctoral Thesis, University of Pedagogical Sciences "Enrique José Varona Havana, 2022 p 116.
- [13] Vera, M. The environmental dimension in the Technological Media discipline. Doctoral Thesis, University of Pedagogical Sciences "Enrique José Varona Havana, 2022 p 120.