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Pedagogical strategy for professional improvement in environmental education of the teacher of the Agronomy specialty

Estrategia pedagógica para la superación profesional en educación ambiental del docente de la especialidad Agronomía

Estratégia Pedagógica para Aperfeiçoamento Profissional em Educação Ambiental do Professor da Especialidade Agronômica

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ABSTRACT
In Cuba, the process of overcoming the professional of the Agronomy specialty in Technical and Professional Education constitutes a priority, which has generated a variety of investigations in the search for novel ways to be able to respond to the needs in the formation of the Middle Technician in Agronomy in the scientific-environmental, technical and practical order in correspondence with the demands of this education and Cuban society. The objective of the research was to socialize a pedagogical strategy for the professional improvement in environmental education of the teacher of the Agronomy specialty of Technical and Professional Education in the Pilón municipality, Granma province. In its preparation, theoretical methods were used, such as analytical-synthetic, inductive-deductive and the system approach, and among the empirical methods, document analysis, participant observation and interview. The results of the application of the pedagogical strategy in practice demonstrated its validity, applicability and relevance, as well as high levels of satisfaction in teachers for the preparation received in environmental issues. In conclusion, the proposal allowed addressing theoretical, methodological and conceptual aspects to overcome the insufficiencies diagnosed in teachers regarding their environmental pedagogical professional performance in the various contexts of action.

Keywords: Professional performance; Advanced professional; environmental education.

RESUMEN

En Cuba, el proceso de superación del profesional de la especialidad Agronomía en la Educación Técnica y Profesional constituye una prioridad, lo que ha generado variedad de investigaciones en la búsqueda de formas novedosas para lograr dar respuesta a las necesidades en la formación del Técnico Medio en Agronomía en el orden científico-ambiental, técnico y práctico en correspondencia con las exigencias de esta educación y la sociedad cubana. La investigación tuvo como objetivo socializar una estrategia pedagógica para la superación profesional en educación ambiental del docente de la especialidad Agronomía de la Educación Técnica y Profesional en el municipio Pilón, provincia Granma. En su elaboración se emplearon métodos teóricos como el analítico-sintético, inductivo-deductivo y el enfoque de sistema y entre los métodos empíricos el análisis de documentos, la observación participante y la entrevista. Los resultados de la aplicación de la estrategia pedagógica en la práctica demostraron su validez, aplicabilidad y pertinencia, así como altos niveles de satisfacción en los docentes por la preparación recibida en temas ambientales. A modo de conclusión, la propuesta permitió abordar aspectos teóricos, metodológicos y conceptuales para superar las insuficiencias diagnosticadas en los docentes respecto a su desempeño profesional pedagógico ambiental en los diversos contextos de actuación.

Palabras clave: Desempeño profesional; superación profesional; educación ambiental.

RESUMO

Em Cuba, o processo de superação do profissional da especialidade de Agronomia no Ensino Técnico e Profissional constitui uma prioridade, o que gerou uma variedade de investigações na busca de novos caminhos para poder responder às necessidades na formação do Técnico Médio em Agronomia na ordem científico-ambiental, técnica e prática em correspondência com as demandas desta educação e da sociedade cubana. O objetivo da pesquisa foi socializar uma estratégia pedagógica para o aprimoramento profissional em educação ambiental do professor da especialidade Agronomia de Educação Técnica e Profissional no município de Pilón, província de Granma. Na sua elaboração, foram utilizados métodos teóricos, como analítico-sintético, indutivo-dedutivo e a abordagem sistêmica, e entre os métodos empíricos, análise documental, observação participante e entrevista. Os resultados da aplicação da estratégia pedagógica na prática demonstraram sua validade, aplicabilidade e relevância, bem como altos níveis de satisfação dos professores pela preparação recebida em questões ambientais. Em conclusão, a proposta permitiu abordar aspectos teóricos, metodológicos e conceituais para superar as insuficiências diagnosticadas nos professores quanto à sua atuação profissional pedagógico ambiental nos diversos contextos de atuação.

Palavras-chave: Desempenho profissional; aperfeiçoamento profissional; Educação ambiental.

INTRODUCTION

In the current historical circumstances that the world faces, when there is an increase in environmental risks on a planetary scale, science has to respond to social demands, while the teacher cannot ignore the problems that humanity faces today derived from of the interaction between man, society and nature, as one of its main causes, and the problems inherent in the exercise of their profession.

By virtue of the foregoing, in order to achieve a high and up-to-date preparation of teachers, postgraduate education must be used, which is governed by Resolution 140/2019. Regulation of Postgraduate Education of the Republic of Cuba (MES, 2019) that responds to the training demands of professionals who work in the entities (Pérez, *et al.*, 2021), as well as Law No. 16, "Labor Code", which according to the Ministry of Justice of Cuba (2014), from the Sixth Section provides the general regulations related to the training and improvement of workers, and has as essential characteristics the flexibility and rigor of the quality of the programs.

Similarly, in Decree Law N.350 "On the training of workers" of the Ministry of Justice of Cuba (2018), and in the Guidelines of the Social Economic Policy of the Party and the Revolution for the period 2016-2021 (Communist Party of Cuba, 2017), special attention is paid to the improvement of the education professional; in this sense, the professional improvement of the teachers of Technical and Professional Education (ETP), regardless of the transformations that occur (Herrera, *et al.*, 2018).

What was expressed above has brought with it a significant number of investigations on the improvement of teaching staff. Around this theme, the studies of authors such as: Almeida, *et al*. (2009), Rodriguez, *et al.* (2017), Mena (2017), Teresa, *et al*. (2019), Pérez, *et al.* , (2021), among others, who have provided theoretical elements and practical suggestions on the subject from different angles and agree on the need to update and renew scientific knowledge in teachers, develop professional skills and attitudes, aimed at improving compliance with their functions and raise their professional environmental pedagogical performance in the various contexts of action, so that they can influence more effectively the environmental training of the middle technicians of the Agronomy specialty.

However, the initial diagnosis made by the authors in the 2018-2019 school year to the process of professional improvement of the teachers of the specialty of Agronomy of the ETP in two technical schools of the Pilón municipality, in the province of Granma, as well as the experience of the researchers as part of their professional performance, allowed us to verify some regularities of a factual nature, highlighting, among the most significant, the following:

- limitations in the knowledge by teachers of environmental problems focused from the global to the local and, consequently, the impact caused by the use of chemical products such as fertilizers and pesticides, to obtain better yields in the agricultural production of the territory;
- insufficiencies in the use of the potentialities of the content addressed by the different subjects of the Agronomy specialty, and of the extracurricular and extracurricular activities that are carried out in the institutions, to address the treatment of the environmental dimension in a systematic, reflexive and contextualized way;
- The problem of the environmental dimension oriented to sustainable

development has not been sufficiently treated since the projection of the professional improvement of the teachers of the Agronomy specialty in the ETP in the Pilón municipality, where projects of improvement are revealed decontextualized from the environmental reality and with a limited articulation of the different forms of professional improvement;

- Technical teachers and students in Agronomy show marked interest in delving into the environmental problems of their territory and willingness to participate in actions aimed at mitigating the negative impacts that some agricultural practices cause on the soil resource and the use of water.

These results are consistent with the criteria of Teresa *et al*., (2019), when they state that unfortunately, these problems are manifested at all levels of Cuban education, including ETP, where there is only an incipient pedagogical movement aimed at promote such education in the middle technicians, when in truth, this branch should be the leader in this type of educational activity, since it welcomes the social group that causes the greatest impact on the environment. To the above, they add that the current state of environmental education in the training of intermediate technicians in Agronomy, encourages the professor of Agronomy to treat the environmental dimension, only when it is indicated in his subject program; therefore, it is limited to treating it from the cognitive point of view and not from the practical point of view.

In this same direction, we also find that the results presented coincide with the contributions of Ávila, *et al.* (2019) and Pérez, *et al.,* (2021), who refer that the environmental training offers are not diverse, courses predominate and, to a lesser extent, specialized conferences; ignoring other organizational forms such as training, workshops and debate, and that currently the subject of environmental education is spontaneously addressed in some processes of professional improvement.

In this way, the analysis of the deficiencies detected, essentially in the process of professional improvement of the teachers of the Agronomy specialty of the ETP in the Pilón municipality, indicate that its main cause is centered on existing theoretical and methodological deficiencies on the foundations of environmental education from a perspective of sustainable development, which limit the environmental training of the average technician in Agronomy and the demonstration of how to improve the environmental pedagogical professional performance in the different contexts of action, in correspondence with the current demands of this educational level and the improvement of the National Education System (SNE).

Hence, the objective of this research was to socialize a pedagogical strategy for the professional improvement in environmental education of teachers of the Agronomy specialty of Technical and Professional Education in the Pilón municipality, in the Granma province, in a way that allows to improve their performance. environmental pedagogical professional, in the different contexts of action, and in this way, ensure that the average technician in Agronomy acquires and strengthens the qualities that allow him, from the exercise of his profession, to contribute to harmonize, as far as possible, the agricultural activity that it develops with the conservation of biodiversity in general, with emphasis on the care and protection of soil resources and the rational and sustainable use of water.

MATERIALS AND METHODS

The research was part of the thesis project to obtain the scientific degree of Doctor of Educational Sciences, which was developed by the main author. The proposed pedagogical strategy was applied in the 2018-2019 school year, on Saturdays of methodological preparation of the teaching group in two schools belonging to the Pilón municipality, Granma province.

During this course, we worked with a population made up of 21 teachers of the Agronomy specialty from two technical schools; the sample was determined through a non-probabilistic sampling of an intentional type that was made up of 13 teachers who teach the subjects of the Agronomy specialty; The directors of the technical schools and the methodologist who work in the institutions of this educational level were included. The following inclusion criteria were taken into account: belonging to the Agronomy specialty in the ETP and being willing to collaborate with the development of the activities. The research had an explanatory character and assumed an integral or dialectical approach.

In that order of ideas, methods of the theoretical level and the empirical level of knowledge were used. Among those who classify in the first of the mentioned groups, the analytic-synthetic, the inductive-deductive, the historical-logical and the functional-structural systemic. Of those belonging to the second, the analysis of normative documents, study programs and methodological work, participant observation of the teaching-educational process and the development of methodological activities, the recording of experiences and the interview with specialists were used, which provided the necessary elements for the analysis of the object of the investigation and the systematization of the information on the subject.

The consultation method was used by applying the criteria of experts and users. For the analysis of the information obtained, the advantages of methodological triangulation were used as an effective technique to find the points of coincidence, in the validation, security, and reliability of the results of the applied instruments. Descriptive statistics techniques were used to process the information, which made it possible to process and analyze the data, which made it possible to characterize the process studied by analyzing the percentage calculation.

Three dimensions are established: cognitive, procedural and behavioral, with their respective indicators. These were formed after contrasting conceptual aspects and characteristics of the activity (cognitive, practical, evaluative and communicative) of the teacher of the Agronomy specialty with respect to the environmental pedagogical professional performance to evaluate the transformations achieved.

cognitive dimension

The following indicators were taken into account:

- Knowledge of environmental problems at the global, provincial and local levels.
- Mastery of the environmental educational potentialities offered by the subjects of the Agronomy specialty in the ETP.
- Knowledge of the causes and consequences of degrading processes in agriculture, including soil erosion, depletion and salinization.
- Knowledge of the environmental issues prioritized by the Ministry of Science, Technology and Environment and the National Strategy for Environmental Education (ENEA 2016-2020) and the Sustainable Development Goals

(SDG) 2030 of the United Nations, as well as the indications of the improvement of study plans and transformations in pedagogical practice, according to the Agronomy specialty.

procedural dimension

The following indicators were taken into account:

- Development of methodological and investigative skills.
- Skills for critical interpretation and decision making in the face of environmental problems.
- Skills for the search and processing of information with the use of new information and communication technologies.

behavioral dimension

The following indicators were taken into account:

- Motivation for overcoming environmental issues, diagnosis and solution of environmental problems.
- to project teaching, extra -teaching and extracurricular activities in order to promote in students the rational use of soil and water in agricultural processes.
- Dissemination and promotion of the importance of professional training in environmental education for sustainable development.

RESULTS

The professional improvement in environmental education of the teachers of the Agronomy specialty, was conceived as a permanent, continuous and systemic training process, which is distinguished by systematization, planning and is based on real needs and perspectives to achieve the acquisition of knowledge. , skills, values, the updating, expansion and/or deepening of the current trends that support environmental issues, which will enable better preparation to effectively carry out their professional and academic functions, as well as the enrichment of their environmental culture. .

The pedagogical strategy for the professional development in environmental education of the teacher of the Agronomy specialty, was conceived as a viable theoretical-practical instrument, which guides its implementation from a system of actions, which, conceived from the initial diagnosis of the needs and potentialities of the teachers of the Agronomy specialty of the technical schools in the Pilón municipality, and of the contexts of action, contribute to their professional improvement in environmental education oriented to sustainable development, which is articulated in a coherent way in stages for the improvement of their environmental pedagogical professional performance. This was classified as pedagogical, as it assumes improvement as a fundamental category within the qualitative change that is intended to be achieved in the teachers of the Agronomy specialty of the technical schools of the Pilón municipality.

Thus, at this point, the general objective of the pedagogical strategy was to offer actions that constitute pedagogical tools for the professional improvement in environmental education of the teacher of the Agronomy specialty of the ETP in the Pilón municipality, in the Granma province, Cuba, in such a way that it would allow him to improve the

professional environmental pedagogical performance in the fulfillment of his functions in the different action contexts. In this way, the proposed strategy sought to resolve the existing contradiction between the demands contained in the professional improvement of the teacher of the Agronomy specialty of the ETP, aimed at giving treatment to the environmental dimension oriented to sustainable development from the current programs and the extracurricular and extracurricular activities, and the existence of individual educational needs revealed by the diagnosis related to the limited environmental preparation to carry out their professional activity in the various contexts of action.

Consequently, the pedagogical strategy was based on the dialectical materialist method of knowledge and on the cultural-historical approach, and from the pedagogical point of view on the development of an educational process that promotes the formation of convictions, attitudes, habits, skills and values. From this perspective, it was based on the system approach, present in each of its stages and actions, in the relationships established in the process, as well as in the following principles: the unity of the instructive, the educational and the developer. in the training process, the principle of unity between the affective and the cognitive, the dialectical unity between the actions that make up the strategy, the collective and individual nature of education and respect for ETP professionals in the Pilón municipality to whom the improvement actions are directed.

Among the qualities that characterized the strategy and that enhanced its use value in practice, are:

- The objective character: part of the knowledge that teachers have about environmental education for sustainable development, so that the diagnosis and characterization of them are necessary to achieve the proposed objectives.
- The systemic character: expressed in the dialectical interrelation that is established between the preparation actions planned to be carried out in a period of time.
- The gradual character: it is manifested in the progressiveness of the actions in correspondence with the initial diagnosis and the results achieved at each moment and the changes in the context.
- The systematic nature: it is evident in the frequency of the actions based on the fulfillment of the proposed objectives, in such a way that they allow progress and, from consolidating what has been achieved, proposing new goals that guarantee constant improvement.
- The interdisciplinary nature: provided by the interdisciplinary content of environmental education, which covers content from different subjects and disciplines.
- The differentiated character: requires actions for each grade, department and teacher based on the differences between each of the instances and people towards whom the actions are directed.
- The flexible and dynamic character: it is expressed in the possibility it offers to face changes in an open way, based on the historical conditions - concrete and objective of its participants based on the specific conditions of the contexts where it is applied.
- The problematizing character: the problematization is present in all actions for the improvement of teachers, in such a way that their involvement in the determination and solution of the problems that arise in environmental education is guaranteed, both at the

methodological level and the investigative.

- The contextualized character: it is due to the effectiveness with which it is conceived, executed and controlled for the professional improvement of teachers in environmental education, as well as its harmonious adjustment with the sociocultural context.

The conception of the pedagogical strategy was formed in four stages: sensitization and diagnosis, design and planning, execution and evaluation that allow to fulfill the objective proposed in the investigation, that demonstrate what to do in each of the actions to be implemented, workshops to perform, and procedures for its realization by the teachers of the pedagogical group, based on the general guidelines that are offered.

In this way, the stages of the pedagogical strategy were conceived in an orderly, coherent manner, it does not imply a rigid linear structure and they are related with a certain independence; It has a systemic structure and interrelation between the four stages that compose it, due to its comprehensive and systemic nature, due to the active and communicative role that it facilitates among all the participants in the process.

Then, in the following paragraphs, each of the stages and actions of the strategy are detailed, which were applied in the short, medium and long term in order to improve the environmental pedagogical professional performance of the Agronomy specialty teacher.

Stage I: Sensitization and diagnosis of individual and collective needs and potentialities of teachers in environmental education.

Objective: To diagnose the needs and potentialities in environmental education of the teachers of the Agronomy specialty of the ETP, to improve their professional environmental pedagogical performance.

The actions carried out by the teacher in this stage are described below:

1. Sensitization of the pedagogical group about the need to face the existing problem that affects the middle technical students in Agronomy, through a methodological meeting with the directors and teachers of the technical schools.

2. Compilation, review, study and analysis of the documentary sources related to the methodological work plan, the center's improvement strategy, the professional model and its specificities for the training of the intermediate technician in Agronomy.

3. Determination of the extent to which the potentialities of the contents of the subjects are exploited for the treatment of environmental education oriented to sustainable development in the teaching-educational process.

4. Diagnosis of the initial state to identify the needs and potentialities in environmental education of teachers, in terms of theoretical knowledge they possess, professional skills, aptitudes and values.

Procedures used to develop this action:

- Select those responsible for conducting the process of applying the initial diagnosis, based on their willingness to carry out the activity, an adequate capacity for expression and responsibility for motivating and mobilizing the participants, being aware of the importance of the activity and adequate preparation. for the organization and development of the diagnosis

- Sensitize and prepare the people who will apply the instruments.
- Coordinate actions in schools and teaching departments for the processing and delivery of results.
- Guarantee the necessary material support.
- Application of participatory observation guides to classes and other extra- teaching activities, as well as surveys and interviews with teachers and managers.
- Qualitative analysis of the results of statistical processing.
- Determination and classification of the main individual and collective needs derived from the analysis carried out.
- Assessment of the results of the techniques and instruments used in the initial diagnosis to delve into the causal manifestations that limit the professional environmental pedagogical performance of the teacher.
- Carrying out a closing methodological workshop with the teaching group for the socialization of the results of the diagnosis.

Stage 2: Design and planning.

Objective: To plan the professional upgrading in environmental education of the teachers of the Agronomy specialty, based on the assurance of the previous conditions for its design, based on the potentialities of each sociocultural context to be used, as opportunities to achieve professional pedagogical performance. desired environment.

The actions carried out by the teacher in this stage are described below:

1. Preparation of the professional improvement program, based on a system of workshops.

2. Analyze and coordinate in the teaching department the actions to be carried out from each subject for the treatment of the environmental dimension in a systematic and intentional way.

3. Analyze and approve in the department the pedagogical strategy oriented to the professional improvement in environmental education of the teacher of the Agronomy specialty.

4. Organization of the structure of the workshops that are proposed where the title, objective to be achieved, content, method, means, the objective, forms of evaluation, among others, are properly explained.

5. Selection of the types of evaluation for each workshop, according to the material conditions, the forms of control and the measurement indicators.

6. Determine the participatory techniques to apply for animation and construction of knowledge to restore the ability to work, the attention of teachers and that promote individual work and group dynamics.

7. Determination of material resources (securing premises, computers, printed or digital bibliography related to environmental documents and strategies, virtual learning environments), as well as human resources (selection of responsible teachers, schedules and place for development of the activities).

8. Analyze the objectives to be achieved and the themes that are considered invariant for the preparation of teachers in environmental education, where they become aware of what they aspire to achieve.

9. Location of bibliographic materials by content for the self-preparation of teachers.

10. Plan the methodological preparation of the teachers of the Agronomy specialty of the

ETP, to evaluate the implementation of the pedagogical strategy during the initial training of the middle technicians in Agronomy, as well as the orientation, execution and control (periodic and final) of environmental preparation.

11. Plan improvement actions for teachers, aimed at supplying insufficiencies detected in the diagnosis.

12. Introduction of the strategy in the annual activity plan of the teaching departments of the ETP in the municipality of Pilón, after discussion with the participants and their directors, based on the control and evaluation carried out by the cadres at that level.

Next, the structure of the workshops elaborated as a modality of overcoming is presented:

Workshop No. 1. Introductory. Topic: Analysis of the reality of the ETP context, with emphasis on the third improvement.

Objective: To analyze the results of the initial diagnosis related to the environmental preparation of the teachers of the Agronomy specialty in the ETP of the Pilón municipality.

Proposal of methodological guidelines for the development of the workshop.

In this workshop, an analysis of the results of the initial diagnosis was carried out and the bases for the environmental preparation of the teachers were created, based on the debates and reflections carried out as part of their professional experience. This first topic, being introductory in nature, served as an initial framework to work on some general concepts related to the environment and environmental education, which were the subject of deepening and systematization in later topics. In this sense, it was necessary for the teacher to take into account the importance of environmental education as the fundamental instrument to promote social participation and its relationship with the quality of life of human beings, and therefore with their health.

Consequently, this activity was complemented with the study of different normative documents of the ETP, such as study programs and textbooks of the subjects of the Agronomy specialty, with the aim of determining the potentialities they possess for the contextualized treatment of the topics. environmental. As self-preparation for the next workshop, teachers were guided to study the National Strategy for Environmental Education 2016-2020, with emphasis on the concepts of environmental education, sustainable development, environmental culture, climate change, as well as the study of the Improvement Project of environmental education for sustainable development in the National Education System, the guidelines related to the State Plan to confront Climate Change (Life Task), as well as the identification of the environmental problems of Cuba and the locality, in a particular way .

Workshop No. 2 Topic: Approach to environmental problems in Cuba and in the locality. The importance of knowledge and use of environmental language and environmental terms inherent to the professional technical profile.

Objective: To identify environmental problems in Cuba and the locality for their subsequent treatment in the teaching-educational process.

Proposal of methodological guidelines for the development of the workshop.

The workshop began with the observation of a fragment of Fidel Castro Ruz's speech at the United Nations Conference on Environment and Development, held in Rio

de Janeiro in 1992, better known as the Earth Summit, and then a video that brought to the participants in the main environmental problems of the world, Cuba and the particularities of the Granma province, the Pilón municipality, within the framework of the Life Task. In this way, the participants were instructed to make notes regarding the topics addressed, and then provoke a collective debate aimed at identifying the causes and consequences that these problems cause in biodiversity and particularly in agriculture, based on the man-human relationship. nature and how these influence the balance of life on earth.

In this workshop, the impact of chemical substances in agriculture was also addressed from their impact on the environment, the importance of sustainable agroecological agriculture and some of the affected areas in the province, the municipality and community; Various measures will be developed to minimize them, based on their professional activity. Finally, we worked on the implications caused by climate change and natural disasters to agriculture, on the scope and relevance for life on earth, as well as the actions to be carried out for adaptation and mitigation from schools and towards communities, within the framework of the Life Task. As self- preparation for the next workshop, the study of the article entitled: "Transversality of environmental education for sustainable development" by the authors Simões, *et al.,* (2019) and its contextualized treatment in the contents of the subjects of the specialty was oriented. Agronomy of the ETP.

Workshop No. 3 Topic: The treatment of environmental education as a transversal axis in the teaching-educational process.

Objective: To determine the value of the teaching content of the subjects of the Agronomy specialty in the ETP, for the treatment of environmental education as a transversal axis in the teaching-educational process.

Proposal of methodological guidelines for the development of the workshop.

The workshop began with a recount of the workshops carried out previously, as well as the documents consulted in the self-preparation, related to the content of environmental education and its legal framework. Then the group of teachers was divided into three work teams and the textbooks and programs of the subjects of the Agronomy specialty were used as a bibliography, to determine the potentialities of the teaching content and its relationship with the environmental content. Finally, the opinions of the teachers were heard regarding the ways they use to incorporate environmental education in the objective of the classes, the content, the teaching tasks and in other forms of organization, in a way that allows the students to develop of new knowledge, professional skills and values. As self- preparation for the next workshop, the study of the article entitled: "The integration of contents in permanent training" by the authors Montero, Almenares & Martínez (2018) was oriented.

Workshop No. 4 Topic: The integration of environmental content in the curriculum of the Agronomy specialty in the ETP.

Objective: Assess the integration of environmental issues and environmental problems to the environmental content of the subjects of the Agronomy specialty in the ETP.

Proposal of methodological guidelines for the development of the workshop.

The workshop began with a consolidation of the environmental issues addressed in the previous meetings and how these had implications in the framework of the

teaching-educational process of the ETP. Consequently, during the development of the activity, some questions were asked that favored debate and reflection on the part of the teachers involved: Why do you consider it necessary to integrate the contents of the subjects of the Agronomy specialty with the environmental contents? From your point of view, what are the problems that most affect the teacher to treat the environmental content in the subjects he teaches?

Then, it was oriented to divide the group into four teams, according to the subjects of the specialty they teach, to exchange ideas and expose among them the ways they use to integrate the contents in the teaching activities they develop. Subsequently, the debate focused on the potential of the subjects for the integration of environmental content with conceptual, procedural and attitudinal content, and its practical exemplification. Finally, as self- preparation for the next workshop, the study and deepening of the topics addressed in the previous workshops for their subsequent evaluation was oriented.

Workshop No. 5, control and final evaluation. Topic: Systematization of work experiences with environmental education in the subjects of the Agronomy specialty.

Objective: To discuss the different experiences of working with environmental education and its contextualized treatment in the subjects of the Agronomy specialty.

Proposal of methodological guidelines for the development of the workshop.

The workshop began with a systematization of the contents addressed in the previous activities. The participatory technique "The Cathartic Space" was applied to assess the impact of the experiences experienced by all the participants in the work sessions carried out; For this, three chairs, sheets of paper and a pencil were needed. In this activity, the participating teachers expressed their opinions and experiences since, in the first chair, there was a poster that expressed: how did I get there? in the second chair: how did I feel during the work sessions? the third chair: how do I go? Once the conditions had been created, and the objective of the participatory technique had been declared, the participants sat on the three chairs that were located in the center of the classroom and expressed the experiences previously recorded on the sheets of paper.

Stage 3: Execution of professional training for environmental education.

Objective: To implement the pedagogical strategy for the professional improvement in environmental education of the teacher, in order to transform the environmental pedagogical professional performance, according to the needs determined through the initial diagnosis made. This stage was developed in accordance with the planning carried out to allow the achievement of the objectives gradually, by enabling the transition from the real state to the desired state and in such a way that the pedagogical group socialized some proposals and, at the same time, suggested others.

The fundamental actions carried out by the teacher in this stage were:

1. Creation of the material conditions for the implementation of the strategy, taking into account the dosage of the contents of each improvement activity, the schedules, places, participants, dissemination, the characteristics of the methodological activities and the study guides.

2. Preparation of the teachers who facilitate the activities to carry out the improvement workshops in environmental education, based on a methodological meeting to assess

the form of improvement and the methodological activities designed.

3. Create a climate of mutual trust between the people involved in the process, which favors communication, free of tensions, and fully manifests the level of development among the participants, as well as the level of commitment of the teacher during the development of the activities. planned activities.

4. Selection of the facilities where the methodological workshops will be held.

5. Carry out the methodological preparation of teachers through the different methods of methodological work.

6. Select and properly guide the subjects for the treatment of environmental education.

7. Determine the time for carrying out and systematizing the workshops based on an interdisciplinary approach.

8. Execute the actions planned in the pedagogical strategy during each of the planned stages and offer follow-up to the initial diagnosis.

9. Execute the methodological workshops with the participation of the teachers involved.

Stage 4: Systematized evaluation of the results achieved in professional development.

Objectives: To assess the results of the actions applied in practice and the level of preparation reached by the teachers of the Agronomy specialty of the ETP, during the different stages, as well as the transformations, above all, in the domain of knowledge, skills and acquired values.

- Evaluate the pedagogical strategy, with a view to its improvement.

This stage was carried out before, during and at the end of the proposed pedagogical strategy, so it is considered as the collection and assessment of the necessary and sufficient information for its improvement. Thus, the evaluation of the impact of the process of professional improvement in environmental education of the teachers of the Agronomy specialty, was assessed based on the following actions:

1. Systematic evaluation of the impact achieved by teachers regarding the preparation received on environmental education (achievements and difficulties).

2. Analysis of the implementation of the pedagogical strategy, based on the delimitation of the achievements and difficulties reached.

3. Evaluation of the indicators that assess the impact of professional improvement, taking into account the selected criteria.

4. Promotion and use of criticism and points of view, as well as the compilation and evaluation of written memories and self-criticism about the work carried out.

5. Closing meeting with the directors and teachers of the technical schools of the ETP, for the analysis of the final report of the results achieved, with the application of the pedagogical strategy in practice and specify the criteria on the redesign, modifications and adaptations necessary to the actions of the strategy and the methodological workshops for its improvement in the next stages.

DISCUSSION

Assessment of the transformations achieved with the application of the strategy

The evaluation of the strategy is presented through the triangulation of the methods and techniques used. In general, transformations in the theoretical, methodological and conceptual order could be observed in teachers, which allow asserting the validity, applicability, relevance and feasibility of the strategy in educational practice based on the following results:

High levels of motivation, satisfaction, active participation and good attendance and punctuality in the developed workshops are shown. Likewise, significant advances in relation to the disposition and awareness of the teaching group, for the introduction of the proposal in practice, in a way that allowed them to influence more effectively the environmental training of future middle technicians of the Agronomy specialty.

Postgraduate training in environmental matters was improved in the technical schools of the Pilón municipality, based on an improvement aimed at equipping teachers with agrotechnical knowledge, skills, values, methods and procedures, which guaranteed a more effective influence on training. environment of its intermediate technical students in Agronomy, not only in the technical schools of the Pilón municipality and its environmental surroundings, but also in other spheres of its action, such as the family and the community. These results are consistent with what was stated by Rodríguez, Mena & Lazo (2017), when they refer that this type of conception of territorial improvement has a developing and problematizing approach to the school educational reality of the ETP.

Consequently, advances are revealed in the use of an interdisciplinary environmental language and the environmental terms inherent to the professional technical profile. Consequently, greater knowledge of the theoretical and methodological foundations of environmental education oriented to sustainable development and its particularities was achieved, for its treatment in the different teaching, extra -teaching and extracurricular activities in the context of ETP. Significant progress was made in preparing teachers to reduce the environmental impact generated by some agricultural cultural practices in the territory related to the use of chemical products such as pesticides and herbicides, based on the use of agroecological methods.

The establishment of interdisciplinary relationships with other subjects such as Chemistry was achieved in a significant way, at the same time, the environmental preparation of the teacher had a favorable impact on the middle technicians in training of the Agronomy specialty, from the appropriation of new knowledge. agrotechnical and agroecological, the development of habits, practical skills and values, which had a positive impact on the care and conservation of biodiversity, with emphasis on the soil resource and the rational use of water during the agricultural activities carried out, all which is consistent with the results found by Núñez & Martínez (2022), when referring to the interdisciplinary vision that every professional in agriculture needs.

It was possible to improve the quality of the methodological activities developed in the departments, in addition to the different methods of methodological work, where teachers were able to demonstrate the environmental knowledge acquired as part of the preparation, results consistent with the criteria of García, Guzmán & Manuel (2019), referring to the fact that it allows them to

judge their own preparation and professional practice from higher reference points, enriched in the process of improvement. On the other hand, it was found, a greater development of methodological and investigative skills, as well as preparation for the integration of conceptual (know), procedural (know how to do) and attitudinal (to be) contents in the subjects of the Agronomy specialty curriculum, with the environmental contents, to contribute to the environmental training of the average technician of the Agronomy specialty that intervenes in the agricultural processes of the country.

Some fundamental generalizations derived from the research carried out are presented below by way of conclusion:

- The results obtained through the application of different research methods allowed us to verify that in the teachers of the Agronomy specialty of the ETP, in the Pilón municipality, there were difficulties in the theoretical and methodological order that limited their environmental pedagogical professional performance and the formation of the Technician. Medium in Agronomy in the scientific-environmental, technical and practical order.
- The systematized theoretical and methodological conceptions allowed corroborating the need to pay special attention as part of the professional improvement of the teacher of the Agronomy specialty of the ETP to the environmental dimension from the perspective of sustainable development, so that it can be incorporated into the different curricular activities. and extracurricular activities, accompanied by educational and communicative processes as a contribution to the achievement of the Sustainable Development Goals (2030 Agenda) of the United Nations (2020), and in correspondence with what is established by the Ministry of Education, within the framework of the improvement in the study plans, of the transformations in the pedagogical practice in the ETP, and the National Strategy for Environmental Education (ENEA 2016-2020), according to the complexities and challenges that arise in the 21st century and the demands of the current Cuban school .
- The pedagogical strategy designed constitutes a pedagogical tool that allowed, in the context of the technical schools in the Pilón municipality, the preparation of the teacher of the Agronomy specialty from the scientific-environmental, technical, practical and methodological point of view, as a contribution to the enrichment of the didactic theory of the subjects with an agricultural profile in the ETP, which make it possible to establish relationships between the contents of the different subjects of the aforementioned specialty, based on identifying those subjects that favor articulation with the environmental contents.
- Finally, the system of methodological workshops developed as an improvement modality, contributed to solving the individual and collective needs diagnosed in the teachers of the Agronomy specialty in relation to environmental education oriented to sustainable development, its potentialities and the characterization of its main competences and professional problems, according to the demands of the current curriculum of the subjects of Agronomy and the context of professional performance, as a novelty of the investigation. But the

above, although necessary, is not enough, since it was also possible to address, among other things, the interests, motivations and concerns of teachers regarding the treatment of the environmental dimension in the teaching-educational process.

BIBLIOGRAPHIC REFERENCES

Almeida, A., Bosques, R. & Duarte, J. (2009). Impacto social de un sistema superación ambiental dirigido a profesores de Construcción para la formación de técnicos medios. Revista de Didáctica Ambiental, 6(8), 1-12. Disponible en: http://www.didacticaambiental.com/revista/numero8/1-ABEL%20G.pdf

Ávila Rabaza, M. E., Santos Abreu, I., Mederos Piñeiro, M., & Espert Castellanos, B. (2019). La superación del maestro primario: vía para el mejoramiento de su desempeño profesional pedagógico ambiental. Universidad y Sociedad, 11(5), 89-98. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_abstract&pid=S2218-36202019000500089

Cuba. Ministerio de Justicia. (2014). Ley No. 116 Código de Trabajo. Gaceta Oficial de la República de Cuba. Ministerio de Justicia. La Habana: MINJUS.

Cuba. Ministerio de Justicia. (2018). Decreto Ley No. 350 "De la capacitación de los trabajadores". Gaceta Oficial de la República de Cuba. La Habana: MINJUS.

García, A. M., Guzmán, R., & Manuel, C. (2019). Estrategia de superación para la preparación científico-metodológica de los metodólogos provinciales de las escuelas técnicas. Revista Electrónica Formación y Calidad Educativa, 7(3), 29-43. Disponible en: https://refcale.uleam.edu.ec/index.php/refcale/article/view/2769/1840

Herrera Lobo, C. R., Díaz Ercia, B. C., & Stable Chacón, S. H. (2018). La superación profesional de los docentes en la educación técnica y profesional para el tratamiento de los contenidos de la Especialidad Contabilidad. Revista Conrado, 14(63), 177-183. Disponible en:http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1990-86442018000300177

Mena, J. A. (2017). La superación profesional en el desarrollo de la cultura ambiental de los docentes de especialidad agronomía. IPLAC, (2), 44-59.

Ministerio de Educación Superior (MES) (2019). Resolución Ministerial 140 / 2019: Reglamento de la Educación de Postgrado. República de Cuba. La Habana.

Ministerio de Ciencia, Tecnología y Medio Ambiente. (2016). Estrategia Ambiental Nacional 2016-2020. La Habana: CITMA.

Ministerio de Ciencia, Tecnología y Medio Ambiente de Cuba. (2020). Plan de Estado para el enfrentamiento al cambio climático (Tarea Vida). La Habana: CITMA.

Montero-Silveira, E., Almenares-Atencio, D., & Martínez-Roselló, M. (2018). La integración de contenidos en la formación permanente de los recién graduados en las ciencias pedagógicas (Revisión). Revista Científica Olimpia, 14(46), 14-26. Disponible en: https://revistas.udg.co.cu/index.php/olimpia/article/view/182

Organización de las Naciones Unidas (2020). La Agenda 2030 para el Desarrollo Sostenible en el nuevo contexto mundial y regional: escenarios y proyecciones en la presente crisis. Libros de la CEPAL-Naciones Unidas: Santiago de Chile. Disponible en: https://repositorio.cepal.org/bitstream/handle/11362/45336/6/S2000208_es.pdf

Partido Comunista de Cuba. (2017). Lineamientos de la política económica y social del partido y la revolución para el período 2016-2021. La Habana: PCC. Disponible en: http://www.granma.cu/file/pdf/gaceta/01Folleto.Lineamientos-4.pdf

Núñez Coba, N., & Martínez Arsola, Y. (2022). La química y la protección del recurso suelo en la formación de técnicos medios en agronomía. Mendive. Revista de Educación, 20(2), 355-368. Disponible en: https://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/2571

Pérez, Alí., Hijuelos, N., & La Rosa, R. (2021). Preparación en educación ambiental para el desarrollo sostenible del profesor de Educación Técnica y Profesional (Revisión). Roca. Revista Científico - Educacional De La Provincia Granma, 17(2), 245-262. Disponible en: https://revistas.udg.co.cu/index.php/roca/article/view/2340

Rodríguez Gil, A., Mena Lorenzo, J., & Lazo Llorente, A. (2017). La superación en directivos y reservas de Educación Técnica y Profesional: evaluación de su impacto. Mendive. Revista de Educación, 15(2), 173-183. Disponible en: https://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/1063

Simões Cacuassa, A. S, Yanes López, G., & Álvarez Díaz, M. (2019). Transversalidad de la educación ambiental para el desarrollo sostenible. Universidad y Sociedad, 11(5), 25-32. Disponible en: http://rus.ucf.edu.cu/index.php/rus

Teresa, L., Buchaca, D., & Rodríguez, R. (2019). Una necesidad en el proceso de formación: La educación ambiental. Dilemas Contemporáneos: Educación, Política y Valores, VI(2). Disponible en: http://www.dilemascontemporaneoseducacionpoliticayvalores.com/

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