

Batteries as technological contaminants waste: a challenge for environmental education

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Abstract

This research article presents the development of an environmental education strategy oriented to the responsible management of the most frequent technological waste in two educational institutions of Boyacá. This research is developed under a preventive approach around the problems in the market of technological equipment: such as laptops, tablets and cell phones in Colombia which has grown rapidly, with the subsequent production in quantities of discarded batteries, which contain high concentrations of metals such as gold, silver, nickel, cadmium and mercury, among others, which, when disposed of improperly, affect water resources, air and soil. In addition, the Colombian market does not show clear controls for the disposal of technological waste, which makes it necessary to develop an environmental education strategy for the disposal said elements, based on action research under a mixed approach. The survey, the focus groups and the semi-structured interview are used as information gathering techniques. Through research groups, these workshops are developed to strengthen the implementation of strategies in environmental education with respect to the disposition of the batteries of technological equipment, in order to promote knowledge, attitudes and habits that minimize the environmental impact generated by technological waste. The survey, the focus groups and the semi-structured interview are used as information gathering techniques through research groups. These workshops are developed to strengthen the implementation of strategies in environmental education with respect to the disposition of the batteries of technological equipment, in order to promote knowledge, attitudes and habits that minimize the environmental impact generated by technological waste.

Keywords: Strategy, environmental education, batteries, technological equipment, technological waste.

Introduction

Colombia has made significant legislative efforts around environmental education reflected in the National Code of Natural Renewable Resources and Protection of the Environment, which has limitations because it insists only in the implementation of environmental education through courses in ecology, preservation of natural resources and ecological projection seminars in educational institutions.

Under the framework of environmental education and as a result of reflection born at different times during the Master's in Environmental Education program, concern arises regarding the behavior of educational communities against the proliferation of technological devices and practices related to the disposal of waste they generate, particularly the batteries of the equipment used. This shows that students tend to deposit technological equipment batteries in the trash or stored them at home due to lack of collection points. This is worsened by the lack of educational activities

to promote knowledge about substances that compose them and the effects they cause in the environment, despite the benefits of recycling technology and certified sites responsible for their treatment. It seems that it is still usual, that since we do not directly experience the consequences of inadequate management of resources, to opt for a reactive education rather than seek to develop a culture of prevention.

An environmental education strategy is understood by Mora, Quitiaquez & Rengifo (2012, p.5) as know-how, reflecting on the relationship that teacher and student and participant develops; and between teaching and learning; This look entails the promotion of values and clarification of concepts focused on the development of attitudes, skills, abilities and skills needed to understand and appreciate the interrelationships between humans, culture and nature.

The intervention project is done in several phases from diagnosis of reality, then the design, implementation, evaluation and dissemination of an environmental education strategy aimed at promoting knowledge about proper disposal of technological equipment batteries most commonly used, its effects on the environment and the importance of developing good habits and practices for the preservation of the environment.

Methodology

This research aims to promote a process of environmental education to achieve adequate battery of technological equipment available. It is developed from a mixed approach, with an emphasis on action research and involves students in social service of two Educational Institutions of Boyacá. To fulfill its objectives, the following techniques and instruments were used: the survey to establish the diagnosis, the focus group for the development of workshops that make up the strategy and the interview that aims to evaluate this strategy.

From the results obtained three categories of analysis are established: knowledge, attitudes and habits that guide the essential aspects to be taken into account in promoting education for proper disposal of batteries of technological equipment. In accordance with the above, knowledge allows us to envision an environmental reality, assimilate and create solutions that are subject to continual reinterpretation, and through a full knowledge about the need for a proper disposal of the batteries of technological equipment, a change of behavior and attitude occurs. Thus, prior knowledge of the students is the necessary foundation for building a critical and reflective awareness of environmental issues. In addition, the development of attitudes understood as states of mind that have a motivational role of action orientation, which helps influence the perception and thought for recognizing the importance and need for proper disposal of batteries is promoted for the purpose of acquiring a technological responsibility facing the consequences are already dormant for the preservation of resources that are still preserved. Together, the strategy strengthens the adoption of habits that refers to the behavior of people which causes an increase in the severity of the environmental problem. For this reason, it is important to mention the impact of the disposal of batteries in landfills, incineration or storage in homes, in order to contribute with a solution proposal to the environmental problem arising from technological waste that affects the welfare of living beings and the environment in general.

Population and Sample

They are members of two public educational establishments, located in Boyacá: "Colegio de Boyacá" located in the city of Tunja and "Panamericano Puente de Boyacá" school belonging to the urban area and located in the municipality of Ventaquemada. These institutions are interested in environmental

research, something supported by the guiding principles of the PEI to build teaching strategies conducive to the care and conservation of the environment.

The sample is chosen for convenience, each institution involved 60 students from seventh to eleventh grade in the diagnosis and 25 from grade eleventh for the design and implementation of the strategy who do social service and 64 ninth graders distributed in the two educational institutions as recorded in table 1.

Table 1. *Description of Educational Institutions of Boyacá*

| | Panamericano Punto de Boyacá | Colegio de Boyacá |
|-----------------------|---------------------------------|----------------------|
| Population | 650 | 4500 |
| Sample surveyed | 60 | 60 |
| Focus group | 8 | 17 |
| Application workshops | 30 | 34 |

Note: Self-elaborated.

Results

Diagnosis

Development of the strategy on environmental education, as mentioned began with the implementation of a survey of twenty closed questions to twelve students from each grade (seven to eleven), two educational institutions of the Department of Boyacá: "Colegio de Boyacá" and "Panamericano Punto de Boyacá" school. It was applied to 60 students per institution for the purpose of identifying their habits, attitudes and knowledge.

The interpretation of the answers given to questions in the diagnosis allows to establish three categories of analysis: knowledge, attitudes and habits (see Table 2); they guide the design of the strategy from observation, thought and action.

Table 2. *Categories of analysis established in diagnosis*

| Category Analysis | Subcategory | Situation |
|-------------------|--------------------------------|--|
| Knowledge | Technological equipment | RAE unawareness, composition batteries, proper disposal and cedars appropriate collection. |
| | Regulations | Unawareness about extended producer responsibility and the law of WEEE |
| Attitude | Technological responsibility. | Recognition of the risk that batteries could cause to the environment. |
| | | Identify that incineration and landfill disposal is not adequate for handling batteries at the end of their life cycle option. |
| | | Interest in the knowledge of the proper provision that batteries must receive. Why they want to participate in environmental education strategy. |
| Habit | Indifference against pollution | Disregard for the effects that improper disposal of batteries can generate. |
| | Proper disposal of waste. | Very few students know the collection centers and make use of these. |
| | Improper disposal of waste. | Batteries at the end of their useful life are stored in homes or thrown away. |

Note: Self-elaborated.

Environmental Education Strategy

According to the results of the diagnosis, there is a need to develop a strategy that allows the generation of knowledge, habits and attitudes around a proper disposal of batteries, since there is ignorance about its composition, regulation, proper management, environmental impact, certified collection centers for disposal, consequences and responsibility towards technological advancement.

This strategy is based on the planned development of workshops that allow reflection and commitment that must be undertaken against technological waste to meet the needs of the context. So the strategy is welcomed under the seventh principle established by Morin, for the education of the future, which refers to the formation of ethical beings and active citizens with political consciousness toward the earth and others (Avendaño, 2013, p. 3). In addition, it is directed through the theory of Modifiability Structural Cognitive (MEC) since its integrative and inclusive approach, favoring mediation according to the needs and from under criteria that allow the subject to learn and modified if desired.

From the theory of Cognitive Structural Modifiability (MEC) that illuminates the environmental education strategy, we take into account the pedagogical model self-structuring related Mediated Learning Experience (EAM) raised by Zubiria, defined as device for real modifiability of the subject, which must address certain characteristics to achieve interaction, such as the intent and reciprocity mediating the meaning and significance (Avendano, 2013, p. 6).

According to the auto-structuring pedagogical model, components that are part of the workshop: purpose, introduction, methodology and feedback are oriented primarily on the purpose of an education that allows the construction of attitudes and habits from each student. Likewise, knowledge, as a key criterion of this pedagogical model, helps

promote strategies for discovery and invention from the key concepts and methodology that make up each workshop, focusing on the dynamics and interest of the student, taking into account the methodology that guides the workshop is combined in activities such as individual and group work, for analysis and developing solutions. It offers advantages such as the development of judgment and mental ability to understand processes, determine causes and practical solutions to choose from. It encourages cooperative work, it exercises creative activity and initiative, it encourages participation and promotes sharing and application of what they have learned.

By its very nature, the workshop allows the application of the knowledge acquired about the disposal of batteries as technological waste with the aim of preventing their environmental impact, since it is established for experience, reflection, conceptualization and action, as a synthesis of thinking, feeling and doing under a constructive activity of the participant.

So the workshop has been chosen as a means to an integrated approach to situations and their transformation through work plans derived from the result of the diagnosis and engage various actors in educational institutions –eleventh grade students directly who are currently doing social service- who, in turn, replicate each workshop with fellow nine-graders. Table 3 shows the four workshops are registered with their respective purpose, key concepts, methodology; guiding concepts for strengthening the construction of attitudes and habits, and the results of its assessment.

Table 3. Description of environmental education workshops

| | | | | |
|---|--|---|---|--|
| Taller | 1. Technological development, generation and disposal of electronic waste | 2. Compromise with the proper disposal of batteries technological equipment | | |
| Purpose | Recognize the risks posed by improper disposal of e-waste, including batteries | Identify the effects caused by the batteries as technological waste in the environment | | |
| Key concepts | WEEE Batteries Metals Plastics | Metals Incinerations Landfills | | |
| Methodology | Video Forum | “Electronic waste, environmental change” | Video Forum | “Technological Waste: Silent poisoning” |
| | Individual work | What is the responsibility that must be undertaken to minimize the environmental impact caused by technological development? | Individual work | Reading images to describe the effects of batteries. |
| | | How obsolescence is related to electronic waste? | | Outline the consequences of consumerism on the accumulation of technological waste. |
| | Dissemination of the results | Why are batteries contaminants? Reading images to identify urban mining | Dissemination of the results | How does traditional mining serious affect the environment? |
| | | Debate among participants on individual work, reinforcing key concepts. | | Dialogue among participants versus individual work, reinforcing key concepts. |
| | Recommendations | Analysis of the situations established to allow deep reflection. | Recommendations | Analysis of the situations established to allow deep reflection. |
| | Rapporteurship | Establishment of work groups, who perform the description of the exercise developed, the subject and commitments arising from the workshop. It is read at the start of each workshop, starting from number 2, with the aim of establishing relations continuously. | Rapporteurship | Establishment of working groups, who perform the description of the exercise developed, the subject and commitments arising from the workshop. It is read at the start of each workshop, from number 2, with the aim of establishing relations continuously. |
| | Evaluation | Technological development is a responsibility of both consumers, producers and the government. | Students agree that improper disposal of batteries affect resources such as water; contaminating the soil; causing infertility and even affects the health of people causing vomiting, diarrhea, kidney and lung damage and cancer. | |
| Students acquire knowledge about the different types of obsolescence, which represent the main cause of accumulation and growth of technological waste. Batteries are identified as major pollutants, because of the metals that are part of their composition and because they are disposed of inadequately, causing bad effects on the environment. | | It is known that technological consumerism is mainly produced by the induced obsolescence, where consumers tend to switch gadgets for their continuous supply and because they want to be at the forefront of technology. | | |
| Urban mining is taken as the main solution to change habits, and thus contribute to minimizing environmental impact, as it allows the extraction of metals through recycling of WEEE, to develop new technological equipment. | | Students are concerned about the environmental impact generated by traditional mining, allowing the extraction of metals, which affect natural resources, causing high levels of pollution and thus the loss of living things that are associated with the ecosystem. In this way it seeks to correct habits, where they point toward sustainable mining. | | |
| Workshop | 3. Apply what has been learned about battery technology equipment | 4. Assume a responsible behavior | | |
| Purpose | Develop activities that engage members of the educational community with proper disposal of batteries of technological equipment considering their features. | Assume responsibly the proper disposal of batteries of technological equipment, as a way of contributing to the reduction of pollution in the environment. | | |

| | | | | |
|--------------|--|--|--|--|
| Key Concepts | <ul style="list-style-type: none"> • Collection centers • Reuse • Recycling | | <ul style="list-style-type: none"> • Environmental responsibility • Environmental Commitment | |
| Methodology | | Problem shooting | Video Forum | Call for attention! Consumerism. Planned obsolescence. Program to collect hazardous waste. Problem shooting |
| | Individual Work | Design of the battery collection point. Creating the slogan of the collection center. Choosing the date of recycling technology. | Individual Work | Phrase directed at the inhabitants of the planet to raise awareness about e-waste. Development of a cartoon proposing a solution regarding the improper disposal of batteries. |
| | Dissemination of results | Presentation of the collection centers and slogans established to choose from and make improvements | Dissemination of results | Dialogue among participants versus individual work, reinforcing key concepts |
| | Recommendations | Include instructions for disposal of technological waste. | Recommendations | Analysis of the situations established to allow deep reflection. |
| | Rapporteurship | Establishment of work groups, who perform the description of the exercise developed, the subject and commitments arising from the workshop. It is read at the start of each workshop, starting from number 2, with the aim of establishing relations continuously. | Rapporteurship | Establishment of work groups, who perform the description of the exercise developed, the subject and commitments arising from the workshop. It is read at the start of each workshop, starting from number 2, with the aim of establishing relations continuously. |
| Evaluation | | Review the knowledge acquired and put it into practice for the design of the collection center, which takes into account the instructions for proper disposal, a logo and slogan. | | The phrase shows concern about the effects of batteries and consumerism. The environmental attitude that must be undertaken regarding liability as consumers in recycling technology and commitment to the care of the planet is highlighted. |
| | | Students reflect on the importance of promoting technological recycling, by raising slogans alluding to technological pollution, care and responsibility of humanity regarding the care of the planet, assuming responsibility for recycling technology. | | Establish solutions for proper disposal of batteries, which allows modification of habits, where existing collection centers are used. |
| | | Interest in promoting technological recycling campaign, putting into practice the knowledge acquired, where it was decided that the suitable option for collecting batteries during the month of April. | | Emphasis is given to information which needs to be acquired regarding technological recycling, the composition of the batteries, the implementation of urban mining, corporate responsibility, minimizing technological consumerism –associated with obsolescence- for modifying habits. |

Note: Self-elaborated.

Due to the lack of knowledge, attitudes and habits that allow proper disposal of batteries – which contain the greater amount of toxic components- which was detected in the diagnosis, an environmental education strategy is designed and implemented based on the development of four workshops covering: technological development and disposal of waste, environmental impact of

batteries, knowledge of batteries and analysis on the assumed environmental performance regarding the disposal of technological waste.

Sharing knowledge about the importance of recycling batteries of technological equipment is done through workshops, where students have spaces that allow them to observe, discuss, analyze and reflect from different situations through videos, images

and phrases which allow the approach to an environmental problem that lacks information and commitment.

At the same time, there are spaces established through workshops that promote action-oriented motivation, which emphasizes the importance of acquiring a culture of technological recycling, allowing the adoption of a committed attitude, according to rational thought and care for resources, starting from a coherent categorization of the world, satisfying the need for a clear and meaningful picture of the problem of handling technological waste. Attitudes help the student organize, understand and assimilate information that can be complex and unpredictable and achieve the desired goals.

According to the results obtained in each of the workshops we can see that the responsibility towards technological development is general: the government, producers and consumers, taking into account the political principle called: Extended Responsibility of the producer (REP), which proposes reducing the environmental impacts on the initiative of manufacturers, to improve returns, recycling, disposal of waste, offering consumers the possibility of handling waste properly. In this perspective, the need for a technological responsibility incumbent on all is recognized, directed towards the proper disposal of waste to ensure recycling.

While we reflect on the consequences of the types of obsolescence, which are a major problem in the accumulation of technological waste because of a lack of commitment between manufacturers and consumers, obsolescence is perceived as the desire of the consumer to own something a little newer and better. It is no longer about forcing consumers to buy a product, but to entice them to buy it. So the strategy allows the student to recognize the value of technological equipment and the responsibility to be acquired at the continued supply of products.

The problem of improper disposal of batteries requires the acquisition of knowledge for the development of attitudes and habits to ensure proper management. The benefits that help to promote the importance of appropriately handling such technological waste come across in urban mining, with the purpose of reducing the exploitation of natural resources, since it has a double positive impact: first, it allows to retrieve metals or materials that are becoming increasingly scarce and whose mining generates a high environmental and social impact, and second, it stops the impact that these residues generate in the atmosphere by decomposing in dumps or landfills, contaminating water, soil and air.

To promote proper disposal of batteries, collection centers were designed in each educational institution, which have instructions to deposit only items indicated in container. They point to the collection of batteries, cell phones, tablets and laptops, also highlighting the submission of the equipment, in the event that the battery is built. At the same time, it has a logo and slogan: "Recycle your battery and reconcile with the planet", as illustrated in Figure 1.

Figure 1. Logo of the collection center of technological equipment battery



Note: Investigation project. Batteries as polluting technological waste. Investigation project. Department of Boyacá.

Students are aware that batteries are components with high pollution potential in technological equipment. These contaminants go uncontrolled, concentrating in dumps and landfills, with very serious and poorly documented consequences. Once the useful life of the batteries –and they are not harmless waste- the need for them to be treated and recycled in collection points is recognized and this opens the possibility to separate them from the flow of completed common household waste and disposed of them safely. This shows that actions related to the disposal of such waste in the trash and accumulation in homes are unsafe and environmentally irresponsible solutions.

Workshops allowed developing solutions and institutional commitments, in promoting environmental awareness to the need for technological recycling, which enabled the collection of batteries, cell phones, tablets and laptops in each institution. Table 4 shows the amount of batteries collected during the month of April.

Table 4. *Number of batteries collected*

| Institution | Batteries of Technological Equipment | | |
|-------------------------------|--------------------------------------|---------|---------|
| | Cellphones | Tablets | Laptops |
| Colegio de Boyacá | 180 | 8 | 5 |
| Panamericano Puente de Boyacá | 154 | 2 | 1 |

Note: Self-elaborated.

Colegio de Boyaca is an institution that carries out various educational projects, sees the need to link students in solving environmental problems and decides to continue the environmental education strategy proposal with the participation of social service students who extend the invitation to other students, with the support of teachers of natural sciences in order to contribute to the establishment of a culture of recycling technology.

Similarly, in Panamericano de Boyacá school, actions are guaranteed to the sustainability of the strategy, through its inclusion through the Natural Sciences area plan, where teachers establish a compromise that would encourage the student's research spirit, interest and curiosity to solve environmental problems by developing environmental education strategy.

Evaluation of Environmental Education Strategy

Environmental Education Strategy for disposal of batteries technological equipment is evaluated by a semi-structured interview conducted with 20% of the selected sample, taking into account both the focus groups and ninth grade students of each educational institution.

The evaluation of the strategy is done using the Atlas 7 program and results, to identify situations that demonstrate achievements in each of the categories of analysis resulting from the diagnosis, such as: knowledge acquisition, development of attitudes and habits, which are illustrated in table 5.

Table 5. *Evaluation of Environmental Education Strategy*

| Category Analysis | Situation |
|-------------------|--|
| Knowledge | Recognize the composition of the batteries. |
| | Know the consequences of technological consumerism. |
| | Interpret the need to develop urban mining as the main solution to minimize the environmental impact originated by traditional mining in the excessive use of resources. |
| | Identify the different types of obsolescence that promote consumerism and accumulation of technological waste. |
| | Environmental responsibility necessary towards the proper disposal of batteries, making use of collection centers. |

| Category Analysis | Situation |
|-------------------|---|
| Attitude | Assume responsibility towards batteries as contaminants technological waste. |
| | Students care about making proper disposal, making use of collection centers to promote the benefits of recycling. |
| | Reflect on the effects that batteries cause in the environment. |
| | Worry about the environmental impact generated by batteries, which most people do not perceive. |
| | Interest in solutions regarding technological development. |
| | Responsibility necessary by both producers and consumers in terms of waste produced. |
| Habit | Realize the importance of urban mining project as the main sustainable solution for the protection of natural resources. |
| | Students make use of collection centers for disposal of batteries. |
| | Actions are corrected for disposal of these wastes in landfills and at home. |
| | Interpret the importance of making use of collection centers, in order to minimize environmental impact and progress towards sustainable development. |

Note: Self-elaborated.

The answers given by students demonstrate the advantages of the strategy in building environmental knowledge about the importance of proper disposal of batteries to ensure technological recycling and prevent environmental impact, where the benefits promote urban mining and technological consumption is avoided.

Through reflection spaces that provide the strategy, students change their thinking to better understand the need for collection points to ensure adequate collection and therefore better use of the raw material that is part of the composition of the batteries.

According to the results described above, the environmental education strategy promotes knowledge, habits and attitudes for proper disposal of batteries as technological waste contaminants, since depicting an action plan before a task that requires a cognitive activity highlighting the procedural nature that all learning has. It lets you choose, coordinate and implement skills, linking them with significant learning and learning to learn. (Monereo, cited by Gonzalez & Diaz, 2006, p. 9).

Adopting an environmental education strategy for proper disposal of batteries contributes to the generation of changes and commitments regarding the sustainability of the environment. Everything revolves around the idea of progress, especially technology where this progress moves between two infinities: the infinite resources of the Earth and the infinite future. It was thought that the planet was inexhaustible in its resources and that we could move indefinitely in the direction of the future. Crisis consciousness recognizes that resources have limits because they are not all renewable; the indefinite future growth is impossible, because you cannot universalize the growth model for all and forever (Boff, 2002, p. 25).

Disclosure of Environmental Education Strategy

Disclosure of Environmental Education Strategy aimed at responsible management of the most frequent technological waste was carried out by the Radio Station of Colegio de Boyacá, 102.6 FM, where students doing social service are actively involved in the preparation and recording of different radio shows, addressing the key topics on the importance of proper disposal of batteries. This medium reportedly motivates and invites both the other sites that belong to each institution and the region, to be part of this environmental campaign, with phrases allusive to technological recycling and concepts of

interest, taking into that the station has a wide coverage in the city of Tunja and municipalities nearby.

There are eight radio programs that address the issues underlying environmental education strategy illustrated in table 6.

Table 6. Description of the radio

| Radio show | Fundamentals |
|--|--|
| Environmental education for disposal of batteries of technological equipment | This first program seeks to present the purpose of environmental education strategy developed in the two educational institutions of Boyacá, and communicate generally the topics covered in the various programs |
| Characteristics of technological advancement | Cell phones, tablets and laptops, taking into account the lack of accountability towards the waste that technology produces, due to the continuous change of equipment: the constant evolution of technological equipment. |
| WEEE | Through this program, the meaning of WEEE is explained, as well as the type of equipment that is part of this group of waste. Furthermore, their characteristics are disclosed and their implications for the environment |
| Characteristics of batteries | Explain the toxic components of the batteries that make major pollutants and waste classification according to their chemical composition. Likewise, the importance of recycling batteries is explained taking into account their metal content. |
| Effects of technological equipment batteries | How technological equipment batteries become major pollutant residues that affect natural resources because of their composition. |
| Urban mining | Exposes the main solution to minimize the environmental impact that traditional mining, where metals of batteries disused advantage as raw material for the development of new equipment. |

| Radio show | Fundamentals |
|---|---|
| Battery disposal of technological equipment | Specify the importance of the collection centers for proper disposal of technological waste and show the collection centers in Colombia and where collection sites that are arranged in the two educational institutions of Boyacá. Extend the invitation for people to become part of this campaign. |
| Commitment as a person and as a society | Share reflections about the importance of adopting attitudes and habits about recycling batteries, which is conceived in urban mining. Show the main advantages that recycling technology brings. |

Note: Self-elaborated.

Conclusions

Diagnosis for strategy development helps identify the lack of knowledge about what should be done with batteries as technological waste at the end of their useful life, which causes them to be disposed in the trash or stored at home without perceiving the effects caused on the environment.

The environmental education strategy understood as an action plan before a task requiring cognitive involving learning activity, can promote knowledge to change attitudes and habits about proper disposal of batteries, since they represent a focus of contamination due to the metals part of their composition.

The methodological design that guides the environmental education strategy is based on action research. This involves the transformation and improvement of reality, based on the development of workshops that allow reflection and commitment assumed regarding waste technology, to ensure proper disposal and avoid the development of planned obsolescence. To achieve this goal, aimed at a suitable waste disposal, we require the

acquisition of knowledge for the development of habits and attitudes in students that allow them to understand the importance and necessity of making use of collection centers, to assume a responsibility for batteries as technological waste contaminants and correct actions regarding the disposal of this waste.

The analysis of qualitative data using the Atlas.ti 7 software allows coding to organize, regroup and manage responses given by students and the capacity and quality of the analysis is potentiated.

The workshops are the basis of the strategy on environmental education and through these knowledge the development of good habits and attitudes is promoted by familiarizing the student with the advantages of battery recycling to visualize the resource they mean. It provides raw material used for the development of new technological equipment. We contribute to technological recycling from the use of collection points which ensure proper handling of batteries to prevent the effects they may cause in the environment.

The implementation of the strategy for environmental education permits the acquisition of knowledge for understanding the problems caused by the improper disposal of batteries and the development of attitudes and habits related to responsible management of this type of waste, taking into account the role of environmental ethics to treat, from a rational point, problems related to the environment. The capacity of intervening the environment is strengthened with a rational basis for making environmentally sound decisions.

The use of radio for disseminating the strategy, sharing information about the importance of ensuring adequate treatment and disposal of batteries. At the same time motivates and invites the community to be

part of the solution of this problem, where habits are adopted to ensure the sustainability of the planet.

Promoting collection points for disposal of batteries, changing habits that benefit the exploitation of raw materials contained in batteries, with environmentally sound management. Project environmental liability to technological waste in order to prevent the consequences that would improper disposal cause.

The guiding principles of the strategy favoring each school. Colegio de Boyacá: the ability to learn and improve the world and skills training, where the strategy is strengthened through a cross project. In the Panamericano Puente de Boyacá school the principles that strengthen the strategy are: teamwork for the preservation of the environment and the conscious use of technology, where the Transversal Environmental Education Project is welcomed.

The two participants are committed to contributing to the culture of technological recycling, Panamericano Puente de Boyacá adopts the strategy, including it in the plan area of Natural Sciences and Colegio de Boyacá, has an environmental project that requires the participation and support of students doing social service and teachers of Natural Sciences

Promotion and adoption of this strategy is necessary for society to be educated at the level of knowledge and environmentally responsible behavior sustainable with the environment, which minimizes the environmental impact generated by improper disposal of batteries since it increases the destruction of natural resources. Technological waste should be contemplated as a main source of raw material needed for continuous technological development.

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