

## ENVIRONMENTAL EDUCATION: MOBILE SCIENCE PROMOTING CLEAN ENERGY

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### ABSTRACT

This project aims to promote environmental science in high schools, presenting sustainable solutions of clean energy through workshops and prototypes to be developed in adapted vehicle. Prototypes were built by engineering students for the development of workshops where demonstrations and activities were carried out with high school students, the three prototypes were presented: Biodiesel production; Solar heater and Models with LED lighting generated by mechanical energy. The results showed that 95 % of the students enjoyed participating in workshops involving clean energy; 76 % perceived more easily the relationship between theory and practice in teaching and 52 % felt encouraged to go to college in the environmental sciences, after participating in this project.

**Keywords:** environmental education, clean energy, mobile science.

### 1. Introduction

Environmental issues have been the subject of much debate, which come to discussing comprehensive proposals for the development of a green economy, sustainability and the fight against poverty.

The energy and how it is produced and consumed has been one of the key points discussed, because of its direct impact on the quality of life of society. Topics such as clean energy and energy matrix, universal access to sustainable energy and energy efficiency has been discussed extensively.

Society needs significant changes in the production processes of goods, reduction of energy consumption and new attitudes related to traditional dogmas of the market economy in order to reduce the environmental impacts caused mainly by industry.

Industrial activities based on oil are not self-sustaining and their products do not have features such as biodegradability. The development and the use of biodegradable fuels with low environmental impact and universal access is a worldwide need.

To ensure survival on the planet should focus as much on understanding in clean energy processes, so it is important that these concepts are worked in the children and youth education.

The Brazilian Curriculum Guidelines indicate that high school should provide young people to acquire knowledge related to scientific preparation and the ability to use different technologies. The use of such content is of great importance to the intellectual development of individuals and the social and economic development of the nation. They allow access to different scientific knowledge, developing the student's ability to research, seek information, analyze in themes like clean energy (Brasil, 2002, p.16).

In this way, students who complete high school should master a wide range of knowledge and skills, to be able to actively join the "knowledge society", assume social responsibilities as conscious and ethical citizen, contributing to the development and transformation of society.

This article intends to socialize pedagogical practices developed in public schools in the state of Santa Catarina - Brazil, focusing on high school students. The practices developed aimed to diversify the teaching-learning high school method and show the importance of clean energies for sustainable development of the nation, through the study of environmental prototypes in clean energy and also bring the high school of engineering courses.

## **2. Materials and methods**

The study is characterized as exploratory and descriptive and consists of three workshops with topics relating to the clean energy. The work is itinerant and developed workshops were: biodiesel production, solar heater and models with LED lighting generated by mechanical energy.

**Biodiesel Production:** The students produced biodiesel from saturated frying oil residues and short chain alcohol in a small reactor. In this prototype were worked chemical reactions transesterification leading the transformation of oil, fats and alcohol into biodiesel, were also worked clean energy concepts on the reuse of waste as the saturated frying oil and acid fats into a biofuel, in this case biodiesel, considered a clean energy source

**Solar heater:** the solar panel was built with Tetra Pak milk cartons, 2 liters PET bottles and PVC pipes, was built a solar water heater. The water tank is formed with two "drums" of plastic and has been used rice hulls as thermal insulation. In this prototype were applied physics principles related forms of heat transmission as convection, which is one of the main heat transfer modes and mass transfer, this workshop is worked issues regarding the use of solar energy for water heating.

**Models with LED lighting generated by mechanical energy:** This workshop uses principles of physics and covering the use of mechanical energy to produce electricity, which were worked energy conservation concepts and electromagnetism. The working principle is the same of the hydroelectric plants that use generators to produce electrical energy from mechanical energy by rotating a shaft. In that workshop was coupled a dynamo in the tire of a bicycle and connected to two models with LED lighting, when the dynamo is in contact with the wheel in motion, the magnet fixed on its axis rotates between the coils producing electricity displayed in LEDs present in the models

## **3. Results and discussion**

The pedagogical practices presented in this paper were based on simple solutions to environmental problems in clean energy, looking towards the students equating the problems by developing projects based on theoretical principles that enabled experimentation, simulation and systematization.

Through workshops held in schools, it was noted that each practice has its peculiarities with regard to the involvement of students, requiring them different skills and expertise for each of the themes.

However, the biggest gain with the development of the workshops was related to the theory-practice relationship, which explored a practical way of many of the curricular content matrices, such as mathematics, physics and chemistry, making them most interesting, dynamic content, and especially related to the reality in clean energy.

Thus, at the end of the development of practices, group dynamics was conducted to know the views of students on the validity of workshops in order to check their impact. In group dynamics were assessed student involvement in the proposed activities and their perceptions about the relationship of the workshops with the content taught in the classroom. The results showed that 95 % of the students enjoyed participating in workshops involving clean energy; 76 % perceived more easily the relationship between theory and practice in teaching and 52 % felt encouraged to go to college in the environmental sciences, after participating in this project.

It was also possible to notice that the practices aimed at environmental education should cover both scientific knowledge as the subjective aspects of life, including the social representations.

In this context, it can be concluded that environmental education should not be to transmit truths, information, demonstrations and models, but rather in action-reflection processes that lead the student to learn by itself, to win these truths and thus develop new understanding of reality clean energy strategies.

Another aspect of interest related to environmental education and clean energy, perceived in the implementation of environmental practices is the need for efforts to ensure that the activities undertaken aimed at education and awareness, and not simply training. It is noteworthy that information, without the support and the belief that the effort is being developed jointly by government and society, it is little influence to favor action.

With regard to learning and improvement of teachers, it was noted the need for continuous training and / or participation in environmental education workshops, with the aim of expanding its conception of the environment, since the conceptual approaches of the environment and environmental education should not be restricted to the clean energy, but associated with a contextualized view of the environmental reality, with emphasis on the effective incorporation of ecological aspects.

#### **4. Conclusion**

The application of methodologies worked with clean energy provided the link between knowledge and action; so the knowledge in clean energy guides the action, which, in turn, results in the expansion of knowledge of all participants, assisting in the training of citizens more aware and critical of their reality. Worked scientific knowledge increased the ability to search, seek information, analyze them and select them as well as the ability to learn, create, make, rather than simple memorization exercise in clean energy.

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