

MATHEMATICS AND A SOLAR ROASTER IN HIGH SCHOOL

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Abstract

High school students course many different science subjects like mathematics, physics, biology, mechanics and they have to practice in physics and biology laboratories, among other subjects. Usually students solve routine problems and exercises like “solve the equation of...” or “calculate the force of...” and the “real world” examples are not interesting for students. We design a didactic activity that needed physics and mathematics to be solved; in addition students had to use their hands to build their final prototype of a solar roaster.

Introduction

In High School students from Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM) must take some science courses like Physics, Mathematics, Biology, Chemistry, Mechanics, and they have to practice in Laboratories. It is hard to say that those courses usually are separated and most students forget many topics of every subject. Our challenge was to design an activity that let students apply globally their knowledge to construct something. We decided to involve mathematics, physics and efficient energy use (as an ecological element) in our project. The main idea of the project was that students could apply parabolas, mirrors and energy concepts to build a solar roaster. They were free to choose the materials and size of their roaster. Students got involved and experienced a different kind of “school mathematics”

Theoretical Framework

We designed our didactic activity using the Constructionism perspective combined with the Project Base Learning (PjBL) technique. Papert (1996) said “Don’t worry if the questions are trivial and repetitive” (p. 38) talking about software and parents and Martin (1996) said

According to constructionist learning theory, people learn most effectively when they are involved in the creation of an external artifact in the world. This artifact becomes an “object to think with,” which is used by the learner to explore and embody ideas related to the topic of inquiry. (pp. 297-298)

PjBL main characteristics can be summarized in a short list as: Lerner-centered environment, Collaboration, Curricular content, Authentic tasks, Multiple expression modes, Emphasis on time management, Innovative assessment.

Our activity encourages students to search, on their own, methods to draw a parabola and find its focus. In addition students have to work together sharing ideas and taking decisions about the best way to work with cardboard or wood or some metal to form the body of the roaster. All these tasks involve the main principles of Constructionism and PjBL.

Activity