

# Academic experiences of workshops of Natural Sciences aimed at teachers of junior high schools



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## Abstract

In our country, the results of indicator exams, as it is the case of PISA (Program for International Student Assessment), has led to some institutional concerns. Such tests applied to young people of 15 years of age, reflect the level of the education systems of the countries members of the OECD (Organization for Economic Cooperation and Development). The Secretary of Education of Guanajuato State, supported by the Council of Science and Technology of Guanajuato, has recently proposed a strategy to improve the quality of the education of basic level in the State of Guanajuato. Statistics that showed results of evaluations in natural sciences (physics, chemistry and biology) applied to students at the secondary level were used for this purpose. These evaluations detected items of greater problems in each of these sciences under institutional programs of study. Based on the thematic issues proposed, workshops separated by discipline (physics, chemistry and biology) were developed to support teachers of junior high school. The objective was that at the same time they initiated their students in the knowledge of these sciences. The aim of improving the quality of education interacting with teachers active in the educational system is not a novel idea. However, these workshops were intended to encourage the teacher to acquire competencies and skills needed to develop scientific projects at the level of their knowledge, and to convey motivation and enthusiasm for the study of science. Themes were exposed in several workshops, under a different approach for each discipline. In the case of physics, two workshops were proposed which addressed to physics from an everyday perspective and another from applications in engineering. Dropping out of the workshops was practically non-existent. The quality of the projects was very acceptable. Participation and motivation of the teachers of junior high education in the physics workshop was excellent. They developed by way of professional practice some projects in classroom with their own students in this form of learning.

**Keywords:** Workshops, Projects, Natural sciences.

## Resumen

En nuestro país, los resultados de exámenes indicadores internacionales como es el caso de PISA (Programa Internacional para la Evaluación de Estudiantes) ha provocado algunas preocupaciones institucionales, ya que tales exámenes aplicados a jóvenes de 15 años de edad, reflejan el nivel de los sistemas educativos de los países miembros de la OCDE (Organización para la Cooperación y Desarrollo Económico). La Secretaría de Educación de Guanajuato apoyada en el Consejo de Ciencia y Tecnología de Guanajuato han propuesto recientemente una estrategia para mejorar la calidad de la educación de nivel básico en el Estado de Guanajuato y para lo cual utilizaron las estadísticas que arrojaron resultados de evaluaciones en Ciencias Naturales (Física, Química y Biología) aplicadas a alumnos del nivel secundaria, bajo las cuales detectaron los temas de mayor problemática en cada una de estas ciencias conforme a los programas de estudio institucionales. En base a las temáticas problemáticas se propusieron talleres separados por disciplina (Física, Química y Biología) para apoyar a los maestros de secundaria para que a su vez impulsaran a sus alumnos en el conocimiento de estas ciencias. El propósito de mejorar la calidad de la educación interactuando con los maestros en activo del sistema educativo no es una idea novedosa, más sin embargo, estos talleres fueron pensados para propiciar que el maestro adquiera las competencias y habilidades necesarias para desarrollar proyectos científicos al nivel de sus conocimientos para transmitir motivación y entusiasmo por el estudio de las ciencias. Se desglosaron las temáticas en varios talleres bajo un enfoque diferente para cada disciplina, en el caso de física se propusieron dos talleres que abordaban a la física desde una perspectiva cotidiana y otra de sus aplicaciones. La deserción a los talleres fue prácticamente nula, la calidad de los proyectos fue muy aceptable, y en particular la participación y motivación de los maestros de secundaria en el taller de física fue excelente ya que además desarrollaron a manera de práctica profesional algunos proyectos en aula con sus propios estudiantes bajo esta modalidad de aprendizaje.

**Palabras clave:** Talleres, Proyectos, Ciencias naturales.

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## I. INTRODUCTION

Based on the Reform of Secondary Education, a major focus of scientific formation is based on a methodology called "projects" aimed at teens choose their thematic work, a process in which the teacher has the role of being the facilitator and generator of cognitive challenges associated with the proposal developed. The secondary teacher proposed to work with themes of science should encourage curiosity and motivation of the student with a clear understanding that will guide the student to the academic autonomy.

Use the projects as part of classroom learning is not a new concept, and teachers often have incorporated them into their academic work in the classroom with their students. Project work is important in the learning process, and builds on individual strengths of students allowing them to explore in a tangible way results and concepts related to science.

The incorporation of projects into the curriculum is not new; however, the project approach officially in Mexico has been implemented a few years ago. Confusion still exists in its implementation and methodology by some secondary teachers in our country. In particular, in the State of Guanajuato, the implementation of project work in secondary schools has been gradual using technological tools such as sophisticated sensors, unfortunately teachers have devoted their efforts to learn how to use the software corresponding to these electronics; seeing it as an end and not as a tool.

## II. SCIENCE WORKSHOPS FOR PROJECT BASED LEARNING IN THE STATE OF GUANAJUATO

For several years, the state government of Guanajuato, in Mexico have, expressed concern on the results of national assessments such as ENLACE and international like PISA applied to children and youth These assessments are used as indicators of the development of a country or state in terms of their educational policies. In an attempt to improve the quality of education. Primary institutions, SEG and CONACYT joined forces and called on researchers from the University of Guanajuato and other research centers in the region to propose schemes to improve our educational system. Therefore, from February to May 2011, a workshop entitled "Ciencia a la carta (Science a la carte)" began in which enrolled a total of 18 researchers selected to support CONCYTEG, They worked as advisers of 245 primary education teachers in the proposed workshops.

Workshops offered to teachers on elementary level.

1. From the first living beings to human beings.
2. The human body and adolescence.
3. Environmental Education.

Workshops offered to Secondary Teachers.

1. The physics in our everyday experience (Physics Course).

2. The chemical reactions and transformation of matter (Subject Chemistry).
3. My body and my health (Subject Biology).

The workshops were organized in the scheme of 8 Saturday sessions with 5 effective hours per session, considering that the two initial sessions would lead to an understanding of counselors and teachers to work in teams under the project scheme. The remaining sessions would be to the implementation of projects and the last was dedicated to one evaluation. Teachers should make as professional practice in their classrooms with their students carrying projects under the same methodology. In particular, the present authors participated directly or indirectly in the physical shop with 17 teachers at the secondary level.



FIGURE 1. Close of workshops.

Before starting the project a number of specific skills or concepts that teachers should learn were identified, formulating clear academic goals based on a schedule of activities for each team.

We considered three elements posed by learning objectives:

- What important cognitive and metacognitive skills should be developed?
- What kind of problems they must be able to solve?
- What concepts and principles they will be able to apply?

Once formed the team was very important that participants had clarity on the objectives of their project. The workshop adviser told them some of the key approaches to consider:

1. To describe the problem that the project seeks to address or resolve.
2. To understand the fundamental purpose of the project.
3. To establish a schedule of activities for each of the members with defined goals.
4. To consider all the important elements found, addressed and discussed during the project development process and to defend their conclusions against the group in their final evaluation.

Particularly during the workshops conducted with secondary teachers, some discussions were generated about how to increase the commitment of students in their own learning. In this regard, it was agreed, at the start of the workshops, that teachers should work in the classroom with their own students using the same methodology of project work in parallel, and the results are evaluated at the end of the workshop sessions.

More important was that junior high school teachers worked on the proposed projects understanding them as a motivating strategy that would allow them to develop an active role in their own learning from the outset in its planning to completion and presentation of results.



**FIGURE 2.** Projects by teachers.

The projects proposed by each of the teams composed of teachers, met to:

- They had a significant content of their environment.
- They had a direct problematic relationship with observed natural phenomena.
- They were linked to objectives in line with official high school programs.

Evaluation of Teachers projects were done through a presentation to the group, they showed the details from start to finish of their project, defended its findings, and arguments against their colleagues questions. In this way teachers reflected measuring meaningful showing learning analysis capabilities based on learning and understanding of the observed phenomena.

The projects were evaluated using the following criteria:

- The quality and clarity of their oral presentation.
- The defense of their arguments against the group.
- The quality of the finished project.

### **III. BENEFITS OF THE WORKSHOP AIMED AT TEACHING IN THE LEARNING PROJECTS FOR HIGH SCHOOL STUDENTS**

The project-based learning offers a real opportunity for teachers to introduce into the classroom a wide range of

opportunities for effective learning in science, because it can motivate students to work together, incorporating their actual experiences with their problems and experiences.



**FIGURE 3.** Projects developed by students in the classroom under the teacher's guidance.

The Teacher prior to class facilitated discussion and brainstorming prior to the execution of the project. In the process, the primary task of the students was focused on experimentation and reflection of their results, were suggested to use their creativity and inventiveness to build simple devices that could be used for their project. This construction required, in most cases, simple and very affordable materials.

The experiences reported by teachers in the developed projects with their students were:

- 1.- The students cultivate skills and competencies such as project planning, team cooperation and decision-making.
- 2.- The students retained a greater amount of knowledge to perform tasks set by their own interest and responsibility.
- 3.- The students used their skills of reflection and analysis.
- 4.- The collaborative learning allowed students to express opinions and respect their peers and share ideas and consensus solutions

### **IV. CONCLUSIONS**

We consider it important to mention that the project work has strengthened attitudes of high school students through the guidance of their teachers who took the workshop of Sciences, which are:

1. The motivation to discover through experimentation
2. Perseverance, patience and reflection.
3. The thoroughness that must have on the realization of their projects.
4. The confidence and respect for the opinions of their peers.

This time in putting Workshop "*Ciencia a la Carta*" in the State of Guanajuato have had some more than satisfactory results under this method of learning, but the subsequent success of this initiative will be in terms of giving continuity to the successes and learn to correct operational errors in its implementation. We are waiting under that continuity to observe an improvement in the indicators of

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the evaluations given to children and youth of our State internationally and domestically.

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