

Teacher Training on the Implementation of Science Research Projects In Classroom Context

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Introduction

European Union studies [1] revealed that better results on education lead to a higher economic and social development.

For a better education, it is important to improve not only the initial teachers training but also the training that they should attend during their carrier, lifelong learning [2]. The need to address teachers' training relies on their unique influence on development of innovation and motivation occurring inside classrooms. Therefore, the training proposed to teachers should give them a permanent update to new techniques and methodologies [3].

On some countries, like in the USA, science teaching has changed due the development of the science fairs. Teachers recognize that the development of scientific projects like activities in the context a science fair preparation process promotes an active learning possibility not commonly available on regular classes [4].

The need for the course

The recent Rocard report [5] on science education inside the European Union stresses the declining interest of students on science, pointing the need of a more active, participative and investigative learning. According to the Lisbon report [1], Portugal had to achieve the following goals until 2010:

- Reduce to 10% the number of young people that abandon their studies prematurely;
- Reach the mark of 85% of the people with ages between 20 and 24 years old with the secondary education complete (12 years);
- Obtain a percentage of 12,5% of adults already working (with ages between 25-60 years old) to increase their qualification.

To fight the students lack of motivation, that teachers have been feeling in their classroom, the use of new methodologies to improve the teaching process is needed [5-6].

The Portuguese curriculum is theoretically geared to a learning where students must relate the acquired knowledge with scientific discoveries, technological processes, and their implications to daily life [7-8].

High school science curriculum is oriented to taking into account previous learning' to lead to a more practical and investigative teaching [8]. So, with the implementation of scientific projects as a different introduction of students to science and technology, we expect to increase the motivation of students to these subjects and to science based careers [6] while coping with curricula requirements. To have a fair curriculum is not enough. Teacher's role is fundamental for their development.

Phases	Resume
Presentation of the methodology	Importance of this methodology Analysis of some case studies Analysis of the Portuguese curriculum
The Science Fairs	Science Fairs: definitions A way to present scientific projects developed by students
Organization	How to use in the Portuguese curriculum Calendar Objectives Guidelines and indications to students Rules
Theme choice	What themes can students choose Advices/strategies to project selection Research sources
The development of the theme	Guidelines to help students during the project development How to present a scientific project
The preparation of the presentation	Graphical aspects of the presentation Selection of main ideas and organization
The evaluation of the activity	Parameters to evaluate Construction of an evaluation guide in different contexts
Organization of the science fair	Last details (organization of the space, ...)

Table 1. Phases of the teacher training course

Objectives of the course

The development of scientific projects is a teaching tool with a great relevance since it involves actively the students in investigative and hands-on learning/discovering activities.

Therefore, the main objective of the training course we developed is to provide to the teachers alternative means, in particular ways of implementing scientific research projects to contribute to the effort of motivating students to learn science and technology. This methodology also promotes an improvement on a investigative based education, where students participate learning. A set of guidelines on how to apply the development of scientific projects at the Physics and Chemistry classes, "Área de Projecto" (a "project" discipline with no a-priori defined subject), in the context of a Science Club or as an extracurricular activity, was presented to teachers.

Organization of the Course

The course was planned to allow teachers to lead the student organize a Science Fair by developing science project, with the final aim to expose and present their projects to the school community. The different phases are described on Tab. 1. During the course, activities, projects and moments of reflection were employed for teachers to better promote and apply this methodology.

The course was all trough oriented to implement the scientific projects in the classroom while given to teachers indications on how to organize a science fair (in a way that students could show their work and thus allowing more people to learn from the projects and further recognition of the students work).

Difficulties	Solution
Not enough time at classes	Create partnerships with other teachers that have subjects in common or teachers from "Área de Proyecto"
Lack of skills from students: <ul style="list-style-type: none"> • Didn't know what kind of project they should and/or could choose. • Didn't know where to search for a project. • Didn't know how to conduct a scientific research 	Give to students some examples of projects Recommend them to research in the web, on libraries, or talk with family and friends... Give them some references of websites or books Discuss the results with the students Question them, and lead them to think on what they can/should do within their project

Table 2. Difficulties of implementation felt by teachers and proposed solutions

Results

At the beginning of the course, teachers were a bit apprehensive since they had doubts on the possibility of using this methodology in their classrooms. They all agreed on the advantages of the methodology but express some problems with its implementation (Tab. 2). Despite all the problems that these teachers presented, at the end of the course they were more receptive to the idea and managed to implement with success small projects of investigation with their students. It was also proposed to the teachers to plan a larger scale project to use on next year' classes.

Conclusions

So far we could conclude that teachers should overlook carefully the evolution of the student's scientific projects. Personal experience is fundamental on this task. With time students will also become familiar with this type of projects, and the sooner they start working on it the sooner they develop the necessary skills.

The difficulties encountered along the course revealed the importance of teacher training in this subject. Since it is impossible to ask students to develop these activities alone, teachers have to know what can be done, or how to plan this activity in a way possible to manage within school schedule or even in extra-curricular activities.

Teachers should take the opportunity to develop this kind of projects extra classes and develop the "scientific spirit" into students.

In-service teacher training in the implementation of investigative hands-on type of activities, like students research of scientific projects in the frame of science fairs, is

fundamental to an effective change in the way science teaching occurs in our school.

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