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## The Problems of Chemistry and Science Teaching in Spain

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### Abstract

*In recent years, we have observed students' low motivation towards science subjects, while we have been proving the need for scientific literacy in our society. This is reflected in the reduced number of students enrolled in science and the negative view they have on this issue. The solutions provided by experts and teachers include an increasing number of contextualization of science subjects through experimentation and inclusion of ICT in teaching and learning processes.*

### 1. Introduction

Nowadays, our society is experiencing a very quick change in technology and science. Development in technology, materials or genetics requires a continuous update of teachers on science contents. At the same time, we live in a society based on knowledge acquisition that needs changes in the way we teach.

Moreover, some EU researches like "Rocard report: Science Education Now: A New Pedagogy for the Future of Europe" show a decreasing interest of young people on science. Due to this situation, a change in science-teaching methodology is urgent, in a moment in which we have to solve the need for scientific literacy in our society.

### 2. The problem of science education

The current system of education in Spain is based on LOE (Fundamental Law of Education). This system consisted of four levels. Pre-school (Educación Infantil, segundo ciclo) - 3 to 6 years old, Primary School (Educación Primaria) six years of schooling - 6 to 12 years old, Compulsory Secondary Education (Educación Secundaria Obligatoria, ESO) four years of schooling - 12 to 16 years old. Post-Compulsory Schooling (Bachillerato) two years of schooling - 16 to 18 years old, a non-compulsory education divided into three options: Arts, Science and Technology, and Humanities and Social Sciences.

Students study Physics and Chemistry as a compulsory subject in 3rd of ESO (2 hours/week), and as an optional subject in 4th of ESO (3 hours/week) and 1st of Bachillerato (4 hours/week). In 2nd of Bachillerato most of science students have to choose between Physics (oriented to Technical Sciences) or Chemistry (oriented to Health Sciences) in a 4 hour-week subject.

In Spain, Physics and Chemistry (as a single subject most of the years) is not considered a basic subject like Mathematics or Spanish Language. Students can study it instead of studying other subjects like Music, Drawing or Computing. Laboratory practises are not always included in official curriculums and are not compulsory. The presence of STS contents (Science, Technology and Society), like Science History, is increasing in the last years but it is still insufficient. A large proportion of Teachers teach Physics and Chemistry in a very formal and quantitative way, and it is reflected in many textbooks. In this way, the institutional exams, like access to University are oriented in the same





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formal way. Particularly, chemistry formulation is presented like a terminological language and not as an interpretative language (Solbes, 2007).

These facts make students not to be aware of how important science is. While most of our students consider Physics and Chemistry boring and difficult subjects, they, at the same time, believe them to be very theoretical subjects with little chance of success due to their difficultness. They do not feel attracted to scientific work together with a clear disregard of the role of women in science.

Recent studies show that the number of students in sciences, in particular the number of girls is getting low. Some authors defend the hypothesis that young people think of science subjects like something unattractive and their disinterest in science is higher than in other subjects and them agree that it is a complex phenomenon with multiple causes (Solbes, 2011).

### 3. Looking for a solution

The recommendations suggested by experts include the change of teaching approach based on research, promotion of practical work, and group projects. We also need to support, train and motivate teachers through the development of teachers' networks. They also ask for the involvement in this process of cities, local communities, and A European Science Education Advisory Board which involves representatives of all stakeholders (Rocard, 2007).

Some authors support the hypothesis that student's motivation should be integrated throughout the teaching-learning process including CTS, technological applications of science and its relationship to the environment, paying particular attention to Science History and to the process of knowledge construction. (Furió, 2006).

Moreover, everyone agrees that Science teachers must take the main role of this change. They are now engaged in the development of basic skills and have to overcome the difficulty of contextualizing subjects such as Physics or Chemistry. It is increasingly clear the need for methodological approaches based on modelling, collaborative learning, peer education or experimental learning. The affective motivation is another factor whose value is increasing, and it is important that educators transmit their own enthusiasm to their students.

But today's Science Teachers and educators are unsatisfied. They claim for a higher number in the number of hours of basic Science matters in the curriculum, and look for a solution to the motivation through the use of new technologies (ANQUE, 2005). They complain because they have no time, special training, or institutional support for all the new methodological approaches and the incorporation of ICT resources to the classroom by training programs, promoting and teaching of laboratory experiences and social aspects of science that don't forget the role of women in science throughout history.

With the commitment of governments, and the update of educators, we will get a more contextualised and attractive Science teaching which will open communication channels between scientists and schools and a permanent exchange of ideas and resources through cyberspace. Projects, in which we use all the possibilities that the Internet offers to us, will provide us with a more attractive view of Science to our students and the best channel for teaching Science.

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