



STUDENT'S MOTIVATION TO STUDY CHEMISTRY: SOME INSIGHTS INTO THE PORTUGUESE CASE

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- ❑ Chemistry is universally assumed as one of the most difficult and demanding science subjects. It is recognized as involving difficult concepts, specialized terminology and mathematics;
- ❑ Some chemistry curricula are considered quite apart from students' interests, everyday life contexts and technological issues.

In this scenario, context-based chemical education approaches and ICT-based teaching resources have emerged as valuable strategies/tools to promote student's motivation.

Summary



In this work an overview of the Portuguese situation concerning student's motivation to study chemistry will be done addressing the following points:

- ❑ Chemistry in the Portuguese educational context;
- ❑ Analysis of national reports/initiatives;
- ❑ Analysis of the Chemistry is all around Portuguese teachers' opinion.

Chemistry in the Portuguese educational context

The pre-university school system in Portugal is organised in three sequential levels:

- ❑ **Pre-primary education** (ages 3 to 5);

- ❑ **Basic education** (typical ages 6 to 15)

Basic education is organised according to three cycles (1st cycle (grades 1-4), 2nd (grades 5-6) and 3th (grades 7-9)).

- ❑ **Secondary education** (typical ages 15 to 18). Grades 10-12.

School is compulsory to 12th grade for any student enrolled in the 7th grade or below as of 2009/2010.

Chemistry in the Portuguese educational context

Main weaknesses:

- ❑ Chemistry has **only one full dedicated subject** (12th grade);
- ❑ Chemistry course curriculum has been reformulated in 2004 (Decreto-Lei N^o 74/2004 (March 26th)) and the **Physics-Chemistry A course was created, substituting Chemistry as the specific course needed to university admission;**
- ❑ Accordingly, Chemistry **became an elective course** during 12th grade;
- ❑ The last curricular organization was performed recently (Decreto-Lei N^o 139/2012 (July 5th)) and **Chemistry weekly teaching time was reduced** from 315 to 180 minutes (two weekly classes of 90+90 minutes).

Chemistry in the Portuguese educational context

Levels	Grades	Age	Chemistry related courses	Typical Weekly time (*)
Basic education	1 st cycle 1 st -4 th	6-10	Environment Study	5 hours
	2 nd cycle 5 th -6 th	10-12	Natural Sciences	(45+90) minutes Two weekly lessons
	3 rd cycle 7 th -9 th	12-15	Physical-Chemistry Sciences	(45+90) minutes Two weekly lessons
Secondary education	Secondary 10 th -12 th	15-18	Physics and Chemistry A (10 th -11 th)	(90+90+135) minutes Three weekly lessons
			Chemistry (12 th - elective)	(90+90) minutes Two weekly lessons

(*) Based on data supplied by Agrupamento de Escolas Abade de Baçal following Decreto-Lei N° 139/2012 (July 5th).

Analysis of national reports/initiatives

- ❑ **The white book of physics and chemistry – Students' opinions 2003 (published in 2005).** Performed by a group of teachers from different educational levels (basic, secondary and higher education) and sponsored by the Portuguese Societies of Physics and Chemistry. The students sample included **7900 individuals**, covering all the continental territory, evaluating the **9th, 11th and 12th grades**, in the year of 2003.
- ❑ **Motivation of Portuguese youth to study science and technology in higher education (published in 2007).** Published by the National Council of Education. Two questionnaires conducted at national level, one to 1000 students from the 1st year of science and engineering university courses, another, to 600 students enrolled in the last two years of the secondary school (11th and 12th years).

The white book of physics and chemistry

Main conclusions:

- ❑ The motivation to study Chemistry was not very high (49%) for 9th and 11th grade students increasing slightly for university students (53%).
- ❑ For secondary students, the main reasons pointed for the lack of motivation to study Physics and Chemistry were: the difficulty of the subjects, the characteristics of manuals, the dependence of these sciences towards Mathematics and the difficulties to apply knowledge in problem solving.
- ❑ In the case of university students, the main reasons for not attending Physics or Chemistry at the 12th year was the fact that these courses were not specific for their career and a potentially low final classification might difficult university access.

Motivation of Portuguese youth to study science and technology in higher education



Main conclusions:

- ❑ Students' performance on Mathematics at secondary level, is important not only for the choice of science and technology careers, but also for the degree of satisfaction felt during their attendance;
- ❑ The instrumentality given to Mathematics is important for the accomplishment of future life objectives in the election of S&T careers.

Chemistry is all around Portuguese teachers' opinion:

Motivation:

- ❑ Motivation to study chemistry in the Portuguese context decreased as a result of the last years curricular reformulations (particularly in the 12th grade, where chemistry become an elective course, with insufficient time to teach contents, particularly the laboratorial ones);
- ❑ Motivation to study chemistry can be improved by implementing laboratorial activities and by using everyday life examples. Moreover it was recognized as crucial to motivate students to have a motivated teacher. The use of ICT-based resources was also considered important.

Chemistry is all around Portuguese teachers' opinion:

School environment:

- ❑ It was consensual that Portuguese schools are generally well equipped as a result of the strong investment carried out by the Ministry of Education according to the **Portuguese Technological Plan for Education**. Nevertheless, some teachers reported a lack of background knowledge to take full advantage of it.
- ❑ Particularly, in the case of primary school teachers, a lack of background preparation to teach experimental sciences was pointed out, as well as to use ICT-based resources. Experimental science teaching training for teachers of these early school levels are recommended and welcome.

Chemistry is all around Portuguese teachers' opinion:

ICT-based resources:

- ❑ Portuguese teachers generally prefer simulations. Ideally these simulations must be accompanied by an orientated guide and final checkout questions. Ideally, simulations should be followed by experimental practice at the laboratory.
- ❑ Phet (<http://phet.colorado.edu/it/simulations/category/chemistry>) was mentioned as one of the most popular digital resources being widely used by teachers of lower and upper secondary school.
- ❑ They seek for validated resources, at least they feel more comfortable to choose resources belonging to well recognized institutions. **In that view the “Chemistry is all around network” project was welcomed.**

Chemistry is all around Portuguese teachers' opinion:

ICT-based resources (cont.):

- ❑ Teaching resources could not be seen as a teacher substitute. It is generally accepted by the Portuguese involved teachers that students like and privilege the direct contact with the teacher;
- ❑ Long movies or other non-interactive resources should be avoided. Short non-interactive resources are only recommended to be used as an introductory motivation element or to introduce a specific subject.



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