Experimental Work and the Teaching of Chemistry at University

Figueiredo, M.R.D.T.[1]; Viana, C. A. N.[2]; Maia, M.E.[2]

[1] Departamento de Química da Universidade de Évora. mtf@uevora.pt

[2] Departamento de Química e Bioquímica da Faculdade de Ciências da Universidade de Lisboa; elisamaia@bigfoot.com

Chemistry, the central science for many areas of knowledge, is a compulsory discipline in several University courses. The teaching of chemistry to non-chemists is a difficult challenge that must be overcome, because Chemistry is often a necessary tool in their future activity. However, the failure in General Chemistry courses is an obstacle in the normal academic lives of students.

Students' difficulties are often caused by poor previous chemical knowledge or by lack of motivation, and represent important factors in the lack of success.

The work here presented is inscribed in a larger study on the role of experimental work in several different first year Chemistry courses. This study intends to propose answers to several questions often raised by chemistry teachers:

1. What "Chemistry" should be taught to non-motivated non-chemistry students?
2. What should be the role of experimental work in the preparation of these students?
3. What is the influence of the involvement of students in practical classes in their academic success?

The study undertaken, along two years, involved about 700 students of General Chemistry I courses (Química I) enrolled in eight different degrees and about 180 students of General Chemistry II courses (QuímicaII) of two different degrees.

A questionnaire aiming at characterizing the students of the different courses was used and analyzed. The success of students in the last two years was also analyzed.

After choosing one of the courses traditionally with very low success rate in Chemistry (Geological Resources Engineering – GRE) a change in the methodologies used in the practical classes was implemented. This change was based on:

- Modification of each practical work that became a proposal of a small research project in an area related to the interests of students (for example minerals and ores)

- Reduction of the number of experiments and increase of the time allocated for each one, so that the students could, working in groups during the classes

i – undertake bibliographic research

ii – elaborate the project

iii- perform the experiment(s) planned

iii – elaborate a small report.

The students allowed the teacher/researcher to tape-record all the discussions involved in the preparation and execution of their work, for further analysis.

For the students of other courses there was no change in the traditional lab classes, with one experiment in each lab period, using a "normal" (routine) protocol.

At the end of the semester a second questionnaire aiming at getting students' opinion about practical classes was applied to all the students of all the courses. The analysis of this questionnaire showed that a smaller number of experiments and the classes of preparation apparently less "fun" and more demanding than the traditional classes did not reduce the motivation and interest of students towards the "new" practical classes.

Besides, the analysis of the analysis of the success rates of the different courses showed a significant increase in the success rate of the GRE students in comparison with the rates in other courses.

<Previous Poster> <View Poster> <Next Poster>