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Teaching Chemistry with a New Cooperative Model in the Classroom

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Abstract

In the last few years, there has been a decrease in the number of Science students as well as in students´ interest in Chemistry and Physics. As a result, teachers have started to use different methodological strategies in the classroom aimed at improving academic results and students´ motivation. Two of the most well-known approaches are "contextualized Science" and cooperative learning. This paper offers a brief review of the afore-mentioned approaches and of those projects related to such approaches that have been developed in Spain and the new mass media techniques used.

1. Introduction

Despite the overall consensus on the importance of Scientific education, in the last few years it has been observed a decreasing interest in Science studies on the part of students. The number of students who have chosen a degree related to Sciences has decreased and it seems that this fact is directly related to the way Science is taught.

In some European countries, students and teachers complain about the current Sciences curricula. On the one hand, students consider that scientific subjects are difficult, remarkably theoretical and scarcely connected to real life [11], [16]. Regarding teachers, it is difficult to get them involved into innovation and research in Science didactics due to lack of time, education and interest, as they do not consider educational research as part of their duties.

It is becoming increasingly clear that one of the main reasons for the lack of interest on the part of our students is the teaching approach used in these subjects since it shows 1) a formal, academic and self-centered image of Science; 2) a lack of connection with the kind of Science present in daily life and mass media; 3) a lack of account of aspects related to Science´s nature [4].

In this context and with an educational environment increasingly involved in ICTs, there is a renewed interest in some of the Science teaching methodologies and approaches aimed at solving these problems. We will deal with two of these approaches.

2. Contextual Science

Contextual Science has acquired in the last years a very important role in Science teaching. It consists of establishing relations between Science and students´ present and future daily life. Contextual Science is closely related to the STS Science teaching approach and the Scientific literacy of citizenship. Nevertheless, we should distinguish between two different CTS perspectives of Science teaching: one of them starts from concepts to then interpret and explain the context, while the so-called contextual Science starts from the context to explain the contents [7].

Daily life is also present in school texts. In fact, some pieces of research highlight the role of contextual Chemistry in school textbooks. In traditional and modern teaching, as part of theory or just

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as a motivating element, the inclusion of everyday life is useful; it brings theory closer to reality and it also helps to erase the false idea that Chemistry only exists in laboratories [5].

The appearance of examples and experiences of everyday Chemistry and even recreational Chemistry in the classroom is not new, though it is getting a major role recently. Since the early 1980s, there have been resources based on contextual Science such as the courses for High School students called “Salters Advanced Chemistry” and “Salters Horners Advanced Physics”. These books were published in Britain seeking to make these disciplines more appealing for students. Research shows that contextual Science and the implementation of CTS contents in the classroom foster positive attitudes in the students towards Sciences. They also demonstrate that the development of the levels of understanding of Scientific ideas can be compared to that obtained by means of conventional approaches. The longevity of these projects proves that their inclusion in the curricula has been successful. [1].

Since transversals suggestive contributions to the Salters projects complied with curricular proposals for A-levels in Spain and the CTS contents resulted to be an interesting contribution, a group of secondary education teachers and University lectures from Barcelona, Madrid and Valencia adapted this project to the teaching of Chemistry in Spain in the time span from 1995 to 2000.

Among the objectives of this project, which presents Chemistry in a contextualized way for the A-levels, we can highlight the following ones: showing methods used by Science as well as the most important research areas, emphasizing the relationship between Chemistry and daily life and broadening the range of learning activities that are used in Physics and Chemistry teaching provided that these activities are implemented in a rigorous way as to provide with the necessary basis to successfully follow University Studies [14], [2].

However, some authors claim that, taking into account the complexity of many daily life events, context may not be enough. Therefore, they suggest combining contextual Science alongside with Scientific school methods. Such models can be defined as the group of symbols or key ideas, which can be used to explain some observable phenomena and enable transfer to new situations [8]. In this sense, the learning process in the classroom should consist of the elaboration of a series of mental models of students who will approach scientific school methods progressively [3].

The presence of ICTs in a contextual Science approach is usual nowadays. The use of computers to recreate chemical transformations or visualize materials and their atomic-molecular structure is fairly common in the classroom. On the web, we can find blogs and websites on Chemistry sharing news, educational experiences and explanations for daily life phenomena with plentiful audiovisual contents. Such resources update and contextualize those contents offered by school textbooks. Teachers in service or group of teachers elaborate most of these contents. These resources enable constant exchange of information and experiences among teachers and constitute a useful guide for new teachers.

3. Cooperative work in the Science Classroom

Cooperative work is considered as an essential tool for a constructivist orientation of Sciences learning and it is a well-established learning approach among pedagogical renovation movements. Cooperative work is based on the formation of heterogeneous groups, positive interdependence among members of the group and individual responsibility, which causes that the work of the group depends on the individual work of each member [9]. In the Sciences domain, this type of work is usually based on the study of problematic situations, the elaboration of hypothesis, their testing and subsequent discussion of results obtained. This approach allows several things: students´ activities

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are closer to the scientific activity, meaningful learning is achieved, and students' interest in the scientific culture grows.

Cooperative work also contributes to the auto regulation of learning and to the improvement of communicative abilities [17]. However, it is essential to carefully design the working plan if we want such work to contribute to the building of Scientific knowledge. Teachers have to assume that their role will determine if the group works appropriately as well as the appropriate achievement of objectives. Therefore, adequate education of prospective teachers including the methodological bases of cooperative learning in their initial training is crucial [10].

In the last few years, this type of methodology has found in the use of ICTs a new learning environment. On the one hand, virtual classrooms based on platforms such as Moodle enable teachers to provide students with information in different formats and facilitate cooperative work on the part of students who actively participate in the building of their own knowledge [6]. On the other hand, the implementation of social networks is becoming increasingly frequent and it is resulting in a new learning chance which is familiar to them.

At University level, there are projects such as the so-called "GNOSS University 2.0" which offer the possibility of applying cooperative learning methodologies, building shared knowledge and applying active methodologies such as students´ participation in the elaboration of contents and the assessment of resources provided by their peers. [12].

4. Conclusions

The use of daily life in the classroom and the realization of cooperative experiences are increasing in our schools in the last few years. Probably, one of the main the reasons for such an increase is teachers´ interest in bringing Science closer to students and searching for new approaches that can make Science close and appealing for students. However, we must bear in mind that the role of teachers remains essential to get students involved or interested in Science. Enthusiasm, human quality, social abilities and the creation of a favourable atmosphere in the classroom will probably continue to be essential elements to achieve students´ motivation in the future.

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