Abstract

It is a challenge to teach students how to think in chemical terms and to promote their scientific competencies. Fostering students’ activities focused on the development of questions, creation of models and argumentation from the discipline are, specifically, the base for the development of the goals of science instruction for the 21st century. For this purpose, we have developed an activity that requires the students (12-14 years old), to design a new periodic table, which has to keep a logic structure. Besides, the design has to meet other requirements a) it has to keep the principles and rules of the original table, b) its structure has to follow a logic criterion, in other words, the students have to offer a new presentation but it has to be related to the chemical notions studied, c) it has to include the fundamental calculation for the subatomic particles and, also, the symbol and name of the elements, d) it has to be original: each group of students in the class has to show a unique and creative instrument according to its level. The female students made the proposal which resulted in a wide variety of periodic tables, all having a different presentation and based on different strategies; some as games and others as an original presentation and with structures based on the group’s own criteria. After the activity the students showed appropriate knowledge of the subject studied.

Keywords: Competencies, chemistry, periodic table

1. Introduction

Scientific knowledge result of the need of solving specific problematic situations that require particular ideas, approaches and methods to be solved. In the complex and dynamic process of resolution conceptual variations are systematically produced, which makes the diverse theories, procedures, methods and languages of science to change permanently. This reality can also be applied on chemistry teaching to all educational levels. Whether the specialized literature let it sufficiently clear that, in general, students do not learn how to confront problem solving but they mechanize or reproduce some relevant solving processes (Bodner & Herron, 2002). Nowadays, the importance of problem solving as a competence that has to be promoted and developed in chemistry students is reivindicated.

In fact, learning about how to deal with problem solving has been, during the last decades, a renewed realm of interest on chemistry education. For this reason it is very interesting and promising path to study the level of
development reached by the students’ thinking and competencies, and, at the same time, their development regarding the science teaching process (Chinn & Malhotra, 2001; Driver, Leach, Scott, & Wood-Robinson, 1994). In order to implement this idea in the classroom, we have been working for 3 years with students ranging from 12-14 in the design of ‘new’ ways of representing the periodic table as a form to stimulate creativity and develop competencies. In this article we present our proposal and an example of the students’ products.

2. Literature review

2.1. Definition of competence

The notion of competence as developable capacity to detach science-specific cognitive process and knowledge from one situation and apply it to scientific problems in a social setting is described by the OCDE: Scientific literacy is capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural word and changes made to it through human activity. This definition embrace all considerations described earlier and names possible indicators, such as uses knowledge, identifies questions, draws conclusions, and so on, to identify competence by large-scale assessment (Kauertz (Kauertz, Newmann, & Hearting, 2012)

2.2. Periodic table

The periodic table has been, for a long time, way for students to acquire the discipline’s language to learn how to find regularities, as well as a challenge for teachers to search for new ways of teaching (Bonifácio, 2012; Burgener Connors, 2009; He & Li, 1997; Larson, Long, & Briggs, 2012).

3. Methodologies

Our proposal is developed under the framework of a diploma in entrepreneurial management (Diploma Program of Pontificia Universidad Católica de Valparaiso and CORFO), (http://www.emprendeducador.ucv.cl/), and a work initiative regarding the subject of chemistry was implemented in seventh and eighth grade (12-14 años); a new modality of teaching for the Unit about chemical elements and the periodic table.

The objective is also accomplish learning of A, Z, subatomic particles calculation, the chemical character of the elements, technical aspects of the table, such as group and period. The students were proposed to design a unique and original work that would respect all the order principles of the table, and that would show, as well, it is name and zymology, but it would come with a new proposal can order periodic system by using strategies focused on entreprenouring. This means that with their work, besides attaining the technical aspects of the subject, they could design a work plan that would make them teach and learn, at the same time, the contents of the proposed unit. The proposal, at the same time, should be commercial or a very good strategy of teaching-learning.

4. Results and Discussion

Because of the initiative some unique and original ideas were proposed by the students: Science T-shirts, Chemical challenge (a table game proposal with instructions and rules in the card games format and with a very well-structured dynamic), periodic ballon, the chemical roulette (a creative game with an interaction dynamic very similar to casino roulets), Carl’s pirat treasure (design that complements a dramatization of a series of articles inspired by the pirats topic and that represent, with a technical and conceptually correct symbology, the complete periodic system), chemical pyramid, the elements’ wheel, contextualized periodic table (in this design, the complete periodic table is proposed based on the presence of the elements in different ordinary substances which range from food to cleaning and cooking tools, etc., this table aims to the scientific literacy of the community and shows the
complete periodic table in a practical and contextualized way, besides having a very catching and elaborated design), Binquim, “The Big Capital table” (similar to the well known game: The big capital2), athomic roulet (following the same principle of a roulet but with times and rules that make the users interact with the design in a format of question-answer and scoring), chemical fruits, periodic flower, the elements scales, the garden of the elements, chemical building, chemistry elevator, the elements’ box and chemistry pyramid. Each proposal was unique in terms of presentation.

Acknowledgements

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References


2 N of T: Table-dice game which simulates the life in a big city. Each player (normally four) has to throw the dices, and depending on the place they stop, they can start buying companies, building condominiums, renting their properties, etc.