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A Proposal for the Chemical and Environmental Education Teaching Through the CTSE Approach: A Teaching Sequence for the Thematic Water

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Abstract: The teaching approach through the movement Science, Technology, Society and Environment (CTSE) is linked to scientific and environmental education and aims to promote a critical and conscious thought on aspects that are taking place around the world. When it comes to chemistry, his teaching is but a stage presentation of science as neutral for an interdisciplinary view, in the context of scientific research and its social consequences. This research aims to develop a didactic sequence with a CTSE approach using the water theme to develop chemical knowledge in high school. Evidenced by developing the activities of this research that the students involved have performed better with contents studied. Working with innovative approaches is important for the development of an innovative practice in teaching chemistry. The results showed that through education using CTSE was possible to create conditions for students to develop skills and expertise, making them able to discuss scientific and technological issues that permeate society.

INTRODUCTION

The approach to teaching Science, Technology, Society and Environment (CTSE) is linked to scientific and environmental education, though the CTSE movement aims to promote a critical and conscious thought on aspects that are taking place around the world. A pedagogical practice based on the use of events of the day-to-day to teach scientific contents can characterize daily life in a secondary role, that is this serving as mere example or illustration to teach chemical knowledge. Thus, the teachings of science progresses from one stage of presentation of science as neutral for an interdisciplinary view, in the context of scientific research and social its consequences, political and cultural rights are striking elements[1].

In this study the STS perspective (Science Technology Society) or CTSE (Science Society and Environment Technology) as an approach to teaching chemistry, aims to prepare students for citizenship and are characterized by an approach of scientific content in their social context. According to Praia, etc., the CTSE relations mark the scientific development, highlighting the impact of all kinds of scientific and technological

knowledge (from the contribution of science and technology for the development of humanity to the serious problems which mortgage its future) allowing the preparation for citizenship in decision-making.

The role of the school which is indispensable should equip teachers on scientific knowledge but as stated Krasilchik and Marandino[1] neither she nor any single institution can afford to provide and monitor the progress of all the scientific information needed for understanding world. Literacy, therefore, citizens in science and technology is now a must in the contemporary world. This is not to show the wonders of science as the media already does but to provide the representations that allow citizens to act, make a decision and understand what is at stake in the discourse of experts[2].

The national curriculum parameters highlight the importance of science education and specifically chemistry teaching, to training of citizens. Therefore it is understood that learning provides students with an understanding of the chemical changes that occur in the physical world in a comprehensive and integrated manner and thus can judge properly the taken place information of the cultural tradition, the media and the school itself and make decisions autonomously while citizens. It is recognized that science teaching and specifically the teaching of Chemistry with CTSE approach requires a different posture of the teacher according to Pinheiro *et al*.[3] is the great articulator to ensure the mobilization of knowledge, process development and the realization of projects.

It is considered that the use of the theme "water" to develop the secondary chemical knowledge allows the inclusion of a greater number of concepts, depending on the availability of time. Moreover, the proximity of the environmental problems of student life is characteristic that favors the work with regard to the formation of the student as a citizen who interacts with the world and is able to transform your surroundings[4] as we have today our disposal the ability to access emplacements inherent in scientific and technological knowledge that allow an initial support on key partner concerns, environmental such as environmental sustainability and ethics.

Pinheiro[3] says there is need for the CTSE approach is introduced already in elementary school in order to form a citizen who has his attention drawn to aspects involving technological and social scientific context. It is important in chemistry teaching one CTSE approach to transmit the student with a social and environmental vision of the medium that is when doing a lesson with this hang him, you have an interest to learn the contents that are being studied because search focuses on reality environmental and social development of each improper.

With the main purpose of education in a CTSE approach is to enable scientific knowledge to the students, helping them to build knowledge, skills and values necessary to make decisions responsible for issues of science and technology in society and act in resolving such issues. The choice of a theme to work the scientific concepts of chemistry is important as it should cover the reality of the students. This work aims to develop a didactic sequence with a CTSE approach using the theme water.

MATERIALS AND METHODS

The survey was conducted with 40 students of 2nd year of regular high school of the State School Orlando Venancio dos Santos in the city of Cuité, state of Paraíba, Brazil. The didactic sequence was constructed from discussions about the CTSE approach to teaching chemistry. Initially it was highlighted the significance of teaching chemistry with the CTSE approach, the break with the simplistic views of the relationship between science, technology and society and the methodological aspects of this guidance from the discussions was chosen the theme water. Because it is a substance of great recycling and good in abundance on the planet that is being wasted, it sought to approximate the chemical concepts through a CTSE approach.

Within this CTSE perspective, methodological educational proposal shifted the main focus of the content to an approach that gave the student some autonomy to position themselves ahead of the social conflicts that will come when the different scientific and technological applications. A proposal for a didactic sequence, related to the proposed theme water consisting of three stages was developed: the first stage consisted of the contact with the subjects, through a qualitative questionnaire in order to investigate the student's opinions by Topic proposed to examine the previous knowledge with the following questions: How can we contribute to water use responsibly? It can be argued that visually the water is fit for consumption? Is there a difference between pure water and drinking water?

The second time happened to exposure of the video: "Cover story-water scarcity and solutions". After exposure of the video it was proposed a debate with CTSE approach with the class which was divided into groups for better socialization of knowledge. In the third phase, there was a lesson showing the main sources of water available in the city where he raised theme of questioning by the students. In this class introduced content such as for example, chemical bonding concepts, starting from the ions present in the soil and the balance of these ions. An introduction to ionic bond was made to be worked ions present in freshwater and saltwater. The subject can be deepened, along with other connections, present in the molecules of H_2O and N_2.

RESULTS AND DISCUSSION

According to Zabala[5], didactic sequences are a set of ordered activities, structured and articulated for carrying out certain educational goals which have a beginning and an end known by both teachers and their students. The didactic sequence was constructed for a class of 2nd year of high school and used a total of three classes of 50 min each on the input content to ionic bonding, types of bonds and molecules.

Began by applying a qualitative questionnaire, it was possible to analyze the student's prior knowledge about the theme. For the development of the research, carried out a diagnosis of previous conceptions of the subjects regarding the CTSE approach. In the questionnaire they were asked three questions. The first question read: How can we contribute to water use responsibly?, whose responses are shown in Fig. 1.

According to Fig. 1 shows that 95% of the answers are correct, i.e., the students respond than for the use of rational water should be avoided water wastage, for example, decreasing the time in the bath and reusing the bath water.

In question 2, 40.05% of students answered that it is not possible to know whether the water is fit for consumption or not only viewing. On the other hand, 59.95% said that it is possible to know whether the water is fit for consumption only viewing the same this clear. Thus it is believed that prior knowledge of the gang is confused about the question (Fig. 2).

In question 3, 93.75% of students said that there is difference between pure water and drinking water and 6.25% said that there is no difference. So, the students surveyed answered the questions satisfactorily (Fig. 3).

In the second moment came the exposure of the video: "Cover story-water scarcity and solutions" and it is desirable that the teacher be prepared to use the audiovisual language with sensitivity and critical thinking in order to develop with his students, an audiovisual literacy. After exposure of the video was held a discussion with CTSE approach. After the lifting of opinions proposed a discussion with the groups on the issues brought by environmental problems facing the region. The students discussed the situation of the water crisis in the region and the effects of drought for the farmer.

The groups draw up a summary of the proposed themes displayed in the video and each group was represented by one member to bounce ideas off. He explored emphatically discussions so that students realize that water shortages in the region is a problem faced by the population and that they are placed in the context, that is a situation faced by all.

In the third phase, a class was developed showing the main sources of water available in the city which rose questioning by students on the subject. In this class

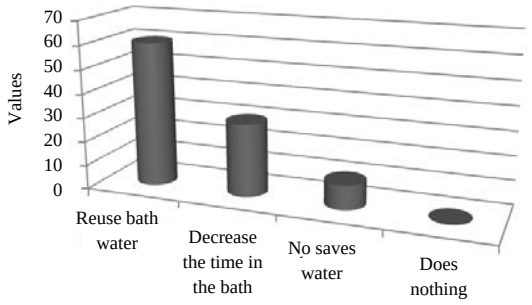

Fig. 1: Responses of students the question: How can we contribute to the use of responsibly water?

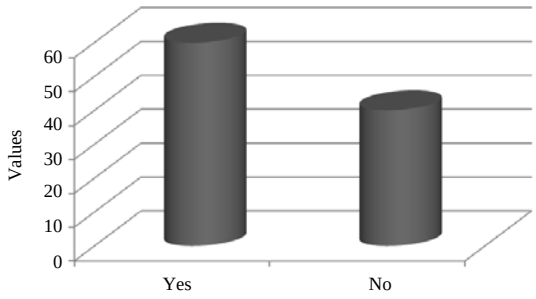

Fig. 2: Responses of students the question: Is it possible to say that visually the water is fit for consumption?

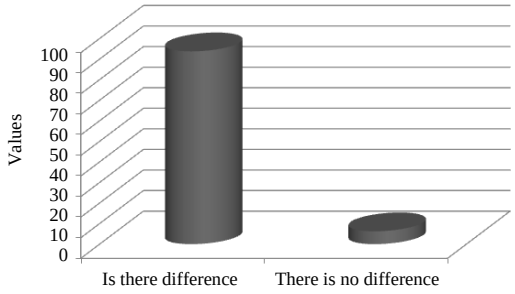

Fig. 3: Students question Replies: Is there a difference between pure water and drinking water?

introduced content such as for example, chemical bonding concepts, starting from the ions present in the soil and the balance of these ions. An introduction to ionic bond was made to work the ions present in fresh water and salt water deepened to other types of binding, present in the molecules of H_2O and N_2.

Finally, held a discussion on the experienced classes during the development of the didactic sequence. However, it is considered that this teaching focused on citizenship, technology, society and environment, it is possible for chemistry teaching from the teacher seek to

upgrade and use the technologies for the purpose of improving the quality of education in public schools in this new approach.

CONCLUSION

It was evident in this study that the uses of innovative approaches are prominent factors in the process of teaching and learning and in particular, the operation of the CTSE education. With the development of this sequence, it showed up the development of the students involved to discuss social problems and at the same time learn chemical content, incorporating them into their daily lives, experiencing the reality of their region and being active subjects in the construction of a better society.

According to the results, it is clear that students involved performed better when the contents were studied by CTSE focused model. It was clear that working with innovative approaches is important for the development of effective teaching practice in chemistry education. Therefore, it is important to take concrete actions, such as the activities carried out in this work, to discover the preconceptions of students and provide them with theories and strategies for a contextualized learning in CTSE approach, construction and reconstruction of knowledge and training of critical and participatory citizen.

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