

The Physics and the Chemistry of Michael Faraday to form for citizenship

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Abstract. In this paper we present a teaching-learning strategy based on the life of Faraday to provide knowledge of Physics (electromagnetic induction) and Chemistry (chemical bonds) and a wakening to citizenship. The strategy combined a film screening with experimentation and was applied with 4 classes of the first-grade secondary school in 2014 and 2016. In all classes the discussions about the movie and the student's reports showed that they appropriated the specific concepts, they got enchanted by Faraday's life and became aware of their own capacity to build their future.

1 Introduction

The official documents about the Brazilian education [1,2] establish that the basic education must form people completely able to citizenship and that all the curricular components must contribute to form citizens. Brazilian Government created many programs to guarantee that these goals were achieved through the national territory, by including the ProEMI (Programa Ensino Médio Inovador), which seeks the improvement of the education's quality through a restructuring of the curriculum and increasing the student's residence time at school [3]. The curricular restructuring requires, necessarily, the inclusion of Scientific Initiation discipline. However, there's no guarantee that this discipline might awake the students for science, neither to develop critical thinking about the scientific knowledge applications or for a better education. Not even is ensuring that scientific knowledge contribute to the formation of conscious citizens.

In this paper, we report a strategy developed with undergraduated students in Physics and Chemistry teaching courses and it was applied, in 2014 and 2016, with students from four classes of the first secondary school series of a Public School in the city of Niterói, Rio de Janeiro State – BR. The School is located between one middle class neighborhood and four poor communities, where the students live. In those communities people live daily with drug smuggling and conflicts between rival groups of smugglers and between them and the police. Such reality, decreases the self esteem of students, causing them hopelessness and lower their expectations for their futures. This strategy meant to provide specific knowledge on Physics and Chemistry and to increase self esteem and contribute to civic education.

2 The strategy

The development of the strategy occurred in weekly meetings with the undergraduates for studying and thinking about citizenship and human rights, especially based in Adela Cortina [4] and Boaventura Sousa Santos [5], watch videos, select and test experiments, socializing knowledge and to establish a manner on how to work with the students.

The strategy was used to begin the 3rd bimester of school year and took place in two lessons of Scientific Initiation, 100 minutes each. The students worked in groups up to six components, each group was accompanied by a undergraduated, whose tasks were to instigate curiosity and

the discussion between students. The first lesson, called “Cinematório”, consisted of the exhibition of the video “Cosmos – The electric boy” [6], which deals on Faraday’s life and work on electricity and magnetism, culminating on the Faraday’s Law of Induction and the electromagnetic nature of light. During the exhibition there were scheduled pauses for the students perform four experiments similar to those shown in the video, to discuss about the social-scientific culture at Faraday’s life time and about his socioeconomic status. The second lesson was based on the Faraday’s book “The Chemical History of a Candle” [7]. The students received materials and executed without using any written scripts or verbal instructions the experiments of ionic conduction and the electrolysis of water. At the end, students wrote their reports, with observations, discussions and conclusions. Undergraduates recorded their observations and analyzes in their field notebooks.

3 Discussion and Conclusion

Throughout the activity "Cinematório" we observed the growing interest of students about Faraday’s life and work, especially his socio-economic condition. They engaged on the experiment’s execution, they discussed the Law of Induction and concluded on the real existence of the magnetic field. During the electrolysis and ion conducting experiments the students concluded that the atoms bind in two different ways, ionic and covalent, and in different proportions to form substances. Finally, the discussions on the use of electrolysis nowadays have led them without doubt about the brilliance of Faraday. The activities contributed to the development of general skills such as the capacity of collaboration, decision, socialization, autonomy and leadership, abstraction, reasoning, writing and synthesis of ideas and develop citizenship. In all classes, there was the same enchantment with Faraday and how, despite humble origins, he became one of the greatest scientists of his time. In the end of the second lesson, one of the students said: "and he was poor, right?". After that, there was a significantly change of attitude on students behaviour. They participated of Physics and Chemistry lessons with more enthusiasm and they started to make plans for the future. Most of the sixteen students of 2014 class finished the secondary school with another vision of the world and of themselves. Eight of them are nowadays studying at university.

For undergraduates all the path was a special opportunity to think, plan and execute the science teaching-learning from social contexts attempting for a education that contributes for life in society.

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