CONTEXTUALIZATION AND INTERDISCIPLINARITY IN CHEMISTRY TEACHING IN BRAZIL: AFTER TWO DECADES, EVERYBODY KNOWS BUT NOBODY UNDERSTANDS

Hoziam H.X. Rocha,a Deyse de S. Dantasb and Robson Fernandes de Fariasa

a.Universidade Federal do Rio Grande do Norte. Cx. Postal 1664, 59078-970, Natal-RN, Brasil.
*E-mail: robdefarias@yahoo.com.br
b.Universidade Federal do Amapá, 68903-419, Macapá-AP, Brasil.

ABSTRACT

In Brazil, a new law dedicated to the establishment of the policy and bases of national education (law 9.394/1996) was published in 1996. Then with the publication, in 1999, of the National Curricular Parameters for High School Teaching in Brazil, modifications in the chemistry teaching that should be promoted by a contextualized and interdisciplinary teaching were proposed. Based on textbook analysis and interviews with high school teachers, the present study argues that the proposed modifications were not achieved, taking into account that both, chemistry teachers practices and chemistry high school textbooks, have not changed in two decades. *[African Journal of Chemical Education—AJCE 7(1), January 2017]*

INTRODUCTION

In Brazil, since 1996, with the publication of a new law dedicated to the establishment of the policy and bases of national education (law 9.394/1996) and specially with the publication, in 1999, of the National Curricular Parameters for High School Teaching, two words have been leading a series of actions in high school (and also in the undergraduate courses, dedicated to the formation of the new generations of elementary and high school teachers) teaching in Brazil: *contextualization and interdisciplinarity*.

In a broad sense, contextualization means that the teaching of a given knowledge must be inserted in a context, that is, must be putted in a large understanding of that knowledge, in order to not make of the student a narrow-minded person. Also in a broad sense, interdisciplinarity means to correlate the specific knowledge of all sciences to show that, for example, chemistry, physics and biology are not "isolated" sciences, but that their specific subjects and achievements are closely related.

It is understood that contextualization is a process of embedding knowledge in history, culture, philosophical questions, and personal experiences, and it is the prototypical mode for generating knowledge in the humanities [1].

So, not only the background provided for future teachers in the undergraduate courses, but also the textbooks and the practice of high school teachers have been (presumably) redirected, taking into account the two previously mentioned words.

In the present work it is reported a research involving both, analysis of high school chemistry textbooks and interviews with high school teachers in order to evaluate if, after two decades, some real change can be verified in the teaching of chemistry in the high schools.

METHODOLOGY

Twelve high school chemistry textbooks (from the main authors, employed for the most schools, both public and private) were analyzed. These books are used in Brazil, in all States. Twenty high school teachers, that had concluded their graduations in the 1991-2007 years were interviewed. So, as can be verified, were chose teachers that have been formed before and after the edition of the law 9.394/1996.

The teachers were chosen taking into account their experience as teachers, ranging from those with a few years as teachers (5-6 years of experience) to those with many years of professional activity (12-21 years as teachers). As will be verified in the results and discussion section, this was a suitable choice, since there is remarkable differences in the teachers' practices in the classroom, depending on their experiences.

The interview consisted of mainly a questionnaire with some key questions to be answered in a "yes" or "no" style, in order to avoid extremely "open" responses with no real meaning. The research was conducted in Rio Grande do Norte State, Brazil.

RESULTS AND DISCUSSIONS

Analyzing the chemistry high school textbooks after two decades of the law (after the edition of the law 9.394/1996), it is possible to verify that no "real" modifications were introduced. In Brazil, chemistry textbooks dedicated to high school teaching published in the 2010's are not different from those published in the 1990's, 1980's or 1970's. The only changes that can be observed are in the graphical aspects. For example, a 1970's textbook only talk about alcohols, whereas a 2010's textbook brings with the text a colorful photo of an ethanol bottle.

The topics and sequence of the subjects, as well as the teaching approaches, however, remains the same. So, no real innovations were observed in high school textbooks, after analysis of twelve of the most employed ones [2].

Furthermore, in the high school classes, the practice of the chemistry teacher, in the public or private schools, also remains the same. From the interview and questionnaires it was verified that 70% of the teachers declared that contextualize and put the chemistry knowledge in an interdisciplinary fashion could improve the chemistry learning by high school students. However, only 25% of them have studied the National Curricular Parameters for High School Teaching, and most of them have difficulties in defining contextualization and interdisciplinarity. In other words: chemistry teachers in the high school do not understands clearly what really means contextualization and interdisciplinarity [1, 2].

The same teachers (75 %) said that their perception in that other teachers (physicists, biologists, for example) do not try to teach taking into account contextualization and interdisciplinarity goals. They also stated (85 %) that the lack of interaction with the teachers of other areas, the lack of appropriate pedagogical resources and the reduced time (number of hours, per week, dedicated to chemistry in the high school) compromise the achievement of such goals. Furthermore, only 60% of the teachers declared that they try to teach in a contextualized and interdisciplinary fashion.

In the teachers' opinion (70%), the high school chemistry textbooks present the subjects in a contextualized and interdisciplinary fashion. Such results are in contrast with the perception of the authors of the present work, as mentioned in the first paragraph.

The data shown until now take into account the total population of interviewed teachers. However, comparing teachers educated in the years 1991-1998 (T1), with those educated in the years 2000-2007 (T2), some remarkable differences are observed:

a. Can teaching chemistry in a contextualized and interdisciplinary fashion improve the learning process? T1 = 37.5%; T2 = 91.7%;
b. Have you already had ready/study the National Curricular Parameters ? T1 = 0.0%; T2 = 41.7%;
c. In your classes, have you ever been concerned to teach chemistry in a contextualized and interdisciplinary fashion? T1 = 12.5 %; T2 = 58.3%;
d. When you were an undergraduate student (had been trained as a teacher) in the pedagogical disciplines, were contextualization and interdisciplinarity main themes? T 1= 0.0%; T2 = 25.0%. So, even to the teachers trained after the edition of the law 9.394/1996, contextualization and interdisciplinarity were not properly focused in the university courses;
e. Do you have some interest in postgraduate courses dedicated to the contextualization and interdisciplinarity themes? T1 = 25.0 %; T2 = 91.7%

CONCLUSIONS

As general conclusions, it can be stated that, after two decades, no “real” modifications can be observed in the high school chemistry textbooks.

Concerning the teachers education and practices, despite the fact that “younger” teachers are most involved (at a theoretical and informational level, at least) with the contextualization and interdisciplinarity themes, it can be verified that even they do not have proper perception/understanding of such themes.

It can also be verified that the "revolution" in chemistry teaching expected after the publication of the National Curricular Parameters for High School Teaching was, in the first moment, a promise, then a mirage, and nowadays it is a deception. Not only because of this but also it is important to remember that in 2012, Brazil was in the 59th place (in a total of 65 countries) in the PISA (Programme for International Student Assessment) evaluation of science learning, promoted by OCDE (Organisation de coopération et de développement économiques) (considering fifteen years old students). The results of the 2015 test was be published in December 2016 but no significant modifications are expected. In the PISA science exam [3], 55.3% of the Brazilian students achieved only the level 1 of knowledge, that is, they are able to apply their scientific knowledge to a few day by day situations and to provide correct scientific explanations to a few facts based on their evidences. So, the PISA exam results shows, more clearly than any other data, that the main goals proposed by the so called contextualization and interdisciplinarity, were not achieved.

At this moment, it is not possible to know if the future of chemistry teaching-learning in Brazil will be a promise, a mirage or a disappointment.

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