Student voice as a new way for curriculum development in the science education

La voz del estudiante como un nuevo camino para el desarrollo del plan de estudios de la ciencia

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Abstract

This article aims to investigate the research which has been done in the past years on textbooks and school curriculum and map the contributions of students in building the science curriculum. A literature research was conducted using scientific journals available online in the areas of teaching and/or education, in Portuguese and Spanish. The journals selected were classified in 2014 as Qualis/CAPES A and B, which is the primary classification system used to evaluate scientific journals' quality in Brazil. We found 70 articles, among which we selected 50 articles related to Textbooks and School curriculum in the science areas, the oldest from 2000 and the most recent ones from 2013. For the analysis, such articles were divided into thematic blocks. The results revealed few works addressing in any way the active participation and opinions of the school community, particularly students and teachers who should be key participants in the educational reform process. These results expose the need to expand the number of studies concerned with the 'student voice' due to the clear importance of students' participation in the process of curriculum (re)construction. This lack of a student voice could contribute to the lack of interest of students in Science or in pursuing a scientific career.

Key words*: textbook, science curriculum, public policies, student voice.*

Resumen

Este artículo tiene como objetivo la investigación sobre los libros de texto y el currículo escolar. El análisis de la literatura se realizó utilizando revistas científicas disponibles en línea en el ámbito de la enseñanza y/o educación, en portugués y español. Las revistas seleccionadas fueron clasificadas en Qualis/CAPES 2014, 3 en las categorías A y B, que es el sistema de clasificación más utilizado para evaluar la calidad de las revistas científicas en Brasil. Encontramos 70 artículos, entre los cuales se seleccionaron 50 artículos relacionados con libros de texto y currículo escolar en las áreas de ciencias, estos artículos fueron divididos en bloques temáticos. Los resultados revelaron que, pocas obras que tratan de alguna manera la participación activa y la opinión de la comunidad escolar, en particular los estudiantes y maestros - figuras clave en este escenario de las reformas educativas. Estos resultados exponen la necesidad de ampliar el número de trabajos, centrados en las opiniones del estudiante debido a la importancia de la participación en el proceso educativo. Las opiniones de estudiantes, al tenerlos en cuenta, pueden aumentar el interés en la ciencia y las carreras científicas.

Palabras clave: *libro de texto, ciencia currículo, políticas públicas, la voz del estudiante*

INTRODUCTION

In the twenty-first century, Brazilian public education is experiencing some technological changes, including the use of computers, tablets and internet access. However, in most schools, there is still an organizational structure based mainly on three central elements: students, teachers and textbooks.

Although other teaching resources are present in the context of the contemporary school, such as those supported in the new technologies of information and communication (NTIC), the textbook remains, according to Frison et al. (2009), the main teacher supporting tool and source of study and research for students.

Therefore, public policies created by the government, such as the National Textbook Program (PNLD) become important in the textbook qualification process. The PNLD recognizes the textbook as "a support of knowledge and methods for teaching, which serves as a guide for the activities of production and reproduction of knowledge. [...] It is also considered an instrument of transfer of ideological and cultural values" (BRAZIL, 2006, p. 13).

Throughout the textbook qualification process, PNLD has important responsibilities, including the evaluation of educational criteria such as coherence, methodologies, clarity, concepts and information. Baganha and Garcia (2011) highlight the importance of the textbook for the teaching-learning process, considering the various roles it plays in schools.

For the authors, "using textbooks in the organization of school curriculum as well as a source of images, activities and complementary texts confirms the importance of this feature for the development of the teacher's pedagogical activity, and for the support of the scholastic scientific knowledge of students".

The use of textbooks has a very close relationship with traditional programs adopted in schools, i.e., the school curriculum. In this sense, Soares (2002, p.2) points out "the ideal role and the actual role [...] Ideally, the textbook should be only an aid, a support, but in fact it actually ends up being the basic guideline of teaching".

However, in spite of the 'multiplicity of functions' assigned to the textbook, it is the attitude of the teacher towards the Textbook that will determine its actual function. In this sense, Silva and Carvalho (2004) state that since the Textbook is the only school material the student is able to read, the way students are instructed to use it is decisive so that this book constitutes an instrument that really contributes to the teaching-learning process.

Thus, the textbook can function as an important visual resource of communication between teacher and student, in mediating the school learning process. Accordingly, the curriculum can be regarded as the 'central element' of educational practice, for it selects and directs the contents to be taught.

For Saviani (2000), "the curriculum goes beyond the simple selection of contents". For the curriculum to be implemented it is necessary that school policies and administrative conditions come to an agreement, consolidating it during the preparation of the Pedagogic Political Project (PPP).

However, in every discussion about educational reforms, problems will arise when the views, attitudes and opinions of students do not receive proper attention, neither by university professors nor by the coordinators of educational public policies.

In line with this idea, Cook-Sather (2002, p.3) claims "there is something fundamentally wrong in structuring and restructuring an entire education system without listening, nor even at a single point, to those whom the system is intended to serve."

But when we think of a curriculum restructuring, we cannot consider that listening as sole and final. It is important to consult the social actors, but the curriculum also has its role in leading and training a critical and conscious citizen. Several surveys and studies on 'student voice' are becoming more frequent in the education field (FIELDING 2001; POLMAM & PEA 2001; COOK-SATHER, 2002, 2006; MITRA, 2004; JENKINS, 2006; TOLENTINO-NETO, 2008; ROBSON & TAYLOR, 2013; SANTOS-GOUW, 2013; GEDROVICS et al., 2014).

Some of these researches reveal reasons for the lack of interest of students in learning Science at school. According to Jenkins (2006), a common complaint from students is that the Science curriculum is 'overloaded with contents'. In addition, students would like their Science classes to have a clearer application to their daily lives, including more practical activities, more attention to current scientific topics and engaging discussions.

These papers reinforce the idea that many of the educational problems today are curriculum-related. In this sense, Jenkins (2006) draws attention to the influence that studies on the student statements may have in curriculum and pedagogical changes.

According to Polman and Pea (2001), the student's voice can be considered as an element of 'transforming communication' in which the basis for scientific research inside the classroom is not conducted by the teacher and 'based on well-known answers'. But it is rather founded on perceptions that only students can have and "its value lies mostly in its ability to alert schools to deficiencies in their current performance and provide possible ways to address these problems" (FIELDING, 2001, p. 123).

Establishing the student voice as a protagonist in the construction of the science curriculum is a bold and transforming vision, considering the school context we have and the one we long for. However, according to Gedrovics et al. (2014, p.11) "the understanding of how and what students think about science, their interests and priorities are essential for a meaningful education."

Students are always mentioned in education researches, but rarely (or hardly ever) as protagonists of this process. Works dedicated to students' opinions become very relevant to the design of new methodological procedures and new curricular proposals for science teaching. Thus, this article aims to investigate the work being done in recent years on textbooks and school curriculum and to map the contributions of students' views in building the science curriculum. Is the student voice being considered in school science curriculum and textbook development in Brazil?

METHODOLOGY

For the present study, a literature review was carried out in different scientific journals, since much of the research and reflections on the subject are publicized in scientific articles. The articles analyses were based on the content analysis proposed by Bardin (1977).

Firstly, the best classified journals (*Qualis A and B*) in the areas of education and/or teaching were selected according to the 2014 classification of *Qualis/CAPES*. Seven journals were chosen for investigation, as shown in Table 1.

Table 1: List of journals examined and their respective classification according to Qualis/CAPES 2014

Journals	*Qualis/CAPES*
Educação e Pesquisa	A1 Education, B1 Teaching
RBEDU (Revista Brasileira de Educação)	A1 Education
REBPEC (Revista Brasileira de Pesquisa em Educação em Ciências)	A2 Education, Teaching
REEC (Revista eletrônica Enseñanza de las Ciências)	A2 Education, Teaching
Investigações em Ensino de Ciências	A2 Education, Teaching
Revista Ensaio Pesquisa em Educação em Ciências	A2 Education, Teaching
Cadernos de Educação (UFPEL)	A2 Education, B1 Teaching

Within these journals, we selected 70 articles, in Spanish and Portuguese, which had 'textbook' and/or 'curriculum' in their title and/or abstract and/or keywords. Based on their abstracts, only the papers related to science (elementary school) and natural sciences (high school) were selected, reducing the amount of articles to 50. The thematic blocks were elaborated according to the abstracts' content.

RESULTS AND DISCUSSION

We selected for this work 50 articles related to textbook and school curriculum in the areas of sciences and natural sciences, the oldest being from 2000 and the most recent ones from 2013. The ratio of the total number of articles found in each one of the journals and the respective number of articles per theme is presented in Table 2.

It should be noted that, after this more refined search, the articles present in *Revista Brasileira de Educação* were excluded because the articles found in this journal were not related to Science and Natural Sciences.

Table 2: Total number of articles per journal analyzed and theme studied.

Journals/ Thematic Blocks	Textbook Analysis	School Curriculum	Criteria for Selection of Textbook	The Role of Textbook	Analysis of Textbook and School Curriculum	TOTAL
Educação e Pesquisa	1	1	___	___	___	2
REBPEC	6	2	___	___	3	11
REEC	4	2	___	___	2	8
Revista Investigações em Ensino de Ciências	7	2	___	___	3	12
Revista Ensaio Pesquisa em Educação em Ciências	10	2	2	1	1	16
Cadernos de Educação (UFPEL)	___	1	___	___	___	1
TOTAL	28	10	2	1	9	50

___ Signals the absence of articles in the journals and thematic blocks.

Among the journals surveyed, the ones with the largest number of published articles were respectively: *Revista Ensaio* with 16 articles, *Revista Investigações em Ensino de Ciências* with 12 articles and *Revista Brasileira de Pesquisa em Educação em Ciências* with 11 papers. In addition, these three journals share the same *A2* classification in the areas of education and teaching according to *Qualis/Capes*.

Regarding the thematic blocks created, the block named ***Textbook Analysis*** is the one having the largest number of articles (28), 10 belonging to *Revista Ensaio*. The second thematic block in number of articles is the category named ***School Curriculum***, with 10 works, being the only thematic block present in all journals examined. The third most comprehensive block is ***Analysis of Textbook and School Curriculum*** with 9 articles.

The blocks ***Criteria for Selection of Textbook*** (2) and ***The Role of Textbook*** (1) were the themes with the least interest of publication in the journals investigated. From this perspective, we analyzed the distribution of areas of interest in science and natural sciences in each category, as seen in Table 3.

Table 3: Distribution of articles according to the area of interest in each thematic block

Thematic blocks	Sciences	Natural Sciences		
Textbook Analysis (28)	11	Biology 9	Physics 2	Chemistry 7
Criteria for Selection of Textbook (2)	1	Biology 0	Physics 0	Chemistry 1
The Role of Textbook (1)	1	Biology 0	Physics 0	Chemistry 0
Analysis of Textbook and School Curriculum (9)	3	Biology 1	Physics 3	Chemistry 3
School Curriculum (10)	6	Biology 2	Physics 3	Chemistry 0
TOTAL 50	22	31*		

* The total sum of articles per area of interest exceeds the total number of articles per thematic blocks because certain articles covered more than one book and/or educational level.

The most comprehensive thematic block in number of articles - ***Textbook analysis*** – had in the area of Natural Sciences its greatest representation (18), among which the majority (9) is on Biology and 7 on Chemistry. Regarding the block ***School Curriculum***, the area of Science was the one with the largest number of articles (6). It is possible to observe a low production of studies within the thematic blocks ***Criteria for Selection of Textbook*** and ***The Role of Textbook***, with no article related to natural sciences present in the latter.

In both elementary and high school-related articles, we identified a tendency of the articles published in the Science area to address the theme ***Textbook analysis*** (28). According to Freitag, Costa and Motta (1997, p. 65) "virtually all studies conducted in Brazil on textbook have its contents as the analytical dimension, with varied emphases".

This 'preference', observed so far, can be associated with a constant concern of researchers in knowing how specific contents have been developed in textbooks. For the aforementioned authors (1997, p.124) "the textbook is not seen as a supporting tool for classes, but as the ultimate authority, the absolute criterion of truth, the excellence standard to be adopted in classroom".

The second block in number of works is ***School Curriculum*** with 10 articles, among which the majority of the works analyzed prioritize the presence of contents, teacher formation and the defense of disciplinary curricula. Regarding science curriculum, few are works dealing with curriculum reconstruction, new contextualization and curriculum proposals.

The third block ***Analysis of Textbook and School Curriculum*** includes 9 articles. In this thematic block, the selected works present analyses of the contributions of chemistry textbooks to high school goals, the impacts of textbooks based on workbooks of preparatory courses for university entrance, comparisons on the evolution of science textbooks in Brazil and Spain, as well as discussions about the inclusion and selection of contents in the school curriculum.

In addition, these studies prioritize discussions on the relations between the reconstruction of curriculum policies and the production of textbooks, the analysis of specific contents in textbooks and the evolution of such contents and/or subjects in a certain period of the curriculum history.

One example was the analysis of the topic citizenship in science textbooks and the influence it had in educational policies, curricula and science education teaching, especially in the formation of individuals more committed to participate in decisions about science and its impact on society.

The fourth block ***Criteria for Selection of Textbook*** had two studies analyzed, which were concerned with finding what criteria teachers point to as guiding principles for their choice of textbooks, as well as the reasons given to this selection. The implications of their choices and the difficulties during this process are also approached. It is also possible to detect a concern with finding which criteria are most commonly used by teachers instead of considering the textbook as an additional supporting material for teachers.

In the last block ***The Role of Textbook***, only one article was found, which discusses innovative methodological approaches for teaching practice as well as the role of the textbook and its relation with the teacher. In this article, it is possible to identify an aspiration for changing but, at the same time, the difficulties of developing something different from the conventional.

Indeed, we believe that there is no 'perfect' and/or 'ideal' textbook which could address all the problems found in classroom. However, proposing innovative methodological changes to the authors of textbooks is not enough, since the main users of this material are not able and willing to practice a new teaching and methodological perspective for the textbook.

Thus, there is a chance that all the efforts to develop and publicize 'innovative' science textbooks do not obtain positive results and do not continue on the market due to the refusal of teachers themselves to use the books.

Through the analysis of these works, we can observe a lack of curriculum policies contextualized in different ways and the need to design a new outline for the science curriculum. It is well known that the science curriculum organization is unattractive to students who frequently end up avoiding a scientific career due to the impression that science is all about 'mechanical memorization' and 'difficult terms'.

A curricular reform in science education is necessary, not only in terms of reorganization, but also in terms of a recontextualization of the contents to be taught. In accordance with the National Curriculum Guidelines for Basic Education (DCNs), science teaching needs to be addressed in an interdisciplinary and contextualized way, always taking into account the social aspects involved in the lives of students and teachers (BRAZIL, 2013).

The concept of 'recontextualization' of scientific knowledge has as main reference Basil Berntein's theory. Galian's work (2011, p.766) is based on this theory and defines the recontextualization of school knowledge as "the transformations occurring in the official pedagogical discourse during the textbook production process and teaching practice, particularly referring to the conceptual level of science school knowledge."

But for this to happen we must also mention the authorities responsible for that task, for example, the State and its educational policies, the teachers in the pedagogical sphere, and the university which contributes with researches, teacher training and publications.

Nevertheless, we cannot forget that this curriculum reform should also involve the active participation of another social actor - the student. They should leave the role of supporting actors and become protagonists in the process of school curriculum construction. Unfortunately, the student voice has not been contemplated by researchers (university), educators (teaching sphere) or the public educational policies (state).

Involving students in decisions about their own education can help learners to better manage important questions which are sometimes complex, but at the same time instigate critical thinking when making decisions and exercising citizenship. SJOBERG (2000, p.5) corroborates this idea stating that "for the teaching contents be meaningful to students, they need to have some sort of relevance related to the personal and social context of students."

Thus, we see the need to fill this gap between the science curriculum and students as well as to contextualize it to school reality. Making the school curriculum closer to school reality makes contents more meaningful and scientific knowledge more easily applicable. Therefore, in order to achieve a real reconstruction in science education, it is necessary to establish new goals and purposes to make the Science curriculum more attractive and interesting not only for students but also for teachers.

However, a 'curriculum reform' is only possible if schools overcome certain barriers, among which we highlight a better understanding of the role of educational policies not as an 'insulator', but as a 'conductor' favoring dialogue and collectivity among all actors involved in the process: school, teachers, professors, the state and why not the university? We believe this is the only path towards an education of quality and equity.

The renovation/revolution in science education, defended by some authors as Cachapuz (2005), is inspired by the desire that teachers broaden their horizons, using new methodologies and epistemology to make their classes more attractive and meaningful to students. Teachers should translate scientific knowledge to students in a way that makes sense to their school lives and to the regions where school communities are inserted, contextualizing and interdisciplinarizing learning.

CONCLUSIONS

The research carried out in the present study revealed not only a lack of articles concerned about a recontextualization/reorganization of the science curriculum, but also the absence of participation of the school community, especially the student voice related to the construction and modification of the school curriculum.

Regarding the textbook, we cannot overlook its importance in the teaching-learning process since it is a visual aid of communication between the teacher and the student – which is a good definition for that teacher who uses it as auxiliary tool. However, the role of textbook in class reflects the teacher training process. Although many authors speak of an 'ideal' and 'actual' textbook, in fact there is no recipe to follow of how to use it in class. Indeed, there are several pedagogical practices which can help the teacher as much as the textbook, enhancing the idea that the textbook should not be the only teaching supporting material, but a complementary one.

We believe that there is still an ingredient missing in this recipe so that students' view in relation to the curriculum components, especially science and biology, change. In fact, creating a new dynamic in schools, with a new selection of contents, combining mandatory curricular issues and matters of students' interest, is a strategy not to disregard the usually proposed contents and adapt other forms of developing them.

Therefore, we believe there are some essential aspects which should be taken into account for the curriculum construction: the interests of students, the teachers' practical experience and the schools reality. We seek to find a 'balance' in which all school actors participate during the process of

curriculum (re)construction. It is difficult to achieve this 'balance' since the identity of science cannot be ignored by teaching only what students want, what teachers like, or even considering only the context in which they are inserted. In fact, it is important to stress there are certain contents that should and need to be developed in class, regardless of the tastes and preferences of students and teachers.

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What do students think about animal welfare? A survey in different contexts
¿Cómo es la actitud de los estudiantes hacia el bienestar animal? Una encuesta realizada en diferentes contextos

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Abstract

This article presents a study comparing attitudes towards animal welfare across a sample of 897 students, ages 11 to 26, from secondary school to university, in three different countries: Spain, Colombia and Austria.

An individual's attitude towards animal welfare includes aspects such as animal abuse for pleasure or due to ignorance, issues related to leisure with animals, the relation to farm animals and the phenomenon of animal abandonment. The instrument we used in this study is a Likert-type attitude scale questionnaire with five answers previously validated, known as the Animal Welfare Attitude (AWA) Scale.

Our results show that students tend to reject items related to animal abuse for pleasure or due to ignorance. Issues related to leisure with animals had the lowest mean values on the AWA Scale; furthermore, with regard to the country of origin, Spain was found to have the lowest scores. It was also found that females generally display a more positive attitude to animal welfare than males, and students of urban origin over those of rural origin.

***Keywords**: animal welfare, attitudes, education, students, questionnaire*

Resumen

Este artículo presenta un estudio sobre actitudes hacia el bienestar animal realizado con una muestra de 897 estudiantes de Secundaria y Universidad, de edades comprendidas entre 11 y 26 años, en tres países diferentes: España, Colombia y Austria. La actitud hacia el bienestar animal incluye aspectos como el maltrato animal por placer o por desconocimiento, temas relacionados con el ocio con animales, la situación de los animales de granja y el abandono de mascotas. El instrumento que se ha utilizado es un cuestionario validado de actitudes tipo Likert, conocida como actitudes hacia el bienestar animal (en inglés, AWA Scale). Nuestros resultados muestran que los estudiantes tienen tendencia a rechazar ítems que tienen que ver con el maltrato animal por placer o desconocimiento. Los aspectos relacionados con el ocio con animales obtuvieron los menores valores medios de la AWA Scale; y centrándonos en el país de origen, España recibió los peores resultados. Se observó también que las alumnas expresan una actitud más positiva hacia el bienestar animal que los alumnos, así como los de origen urbano con respecto a los de origen rural.

***Palabras clave**: bienestar animal, cuestionario, educación, estudiantes*

INTRODUCTION

As noted by Horgan and Gavinelli (2006), European society currently ascribes an increasingly important role to the issue of animal welfare, and also in the curricula of some countries (Marsden, 2010). The question arises as to whether or not animal abuse could be prevented by a change of attitude in cases where it is necessary. We thus need to be able to measure