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Between culture and the market: what do physics teachers take into account when choosing their textbooks?

Alisson Antonio Martins & Nilson Marcos Dias Garcia
Universidade Tecnológica Federal do Paraná
Brazil

Abstract

Here we present some results of an ongoing study into the processes by which secondary school teachers choose physics textbooks, in this case, teachers from Brazil and Portugal. The objective is to understand what teachers take into account when selecting a physics textbook. To contextualise the study, the development and presence of physics textbooks in Brazil in the period between the mid-nineteenth century and the present day is discussed. These reflections highlight how cultural, economic, political and social factors are carried through to educational expressions. We show that the production of physics textbooks went through three periods, according to the pedagogical conception prevailing at each time. This research is based on the assumption that these books should be understood as elements of the school culture, being identified as cultural products as well as commodities. These dimensions have been little explored in research on textbooks, so this work presents a unique discussion that reflects on the relationship between culture and the market in order to understand physics textbooks from a structural perspective.

Keywords: physics textbooks, school culture, cultural product, commodity, choices processes.

Introduction

Textbooks have been established, throughout the times and across different countries, as important objects for the processes that take place in everyday school life. This shows that textbooks play a central role in the curricular organisation of school subjects as well as in the presentation of the methodologies which contribute to the teaching-learning process.

According to Garcia (2009), even though textbooks have been used in school education since its beginning, they have only been the object of research, at least in Brazil, since the 1950s. In analysing a collection of these studies, Choppin (2004) shows that there was a surge in research between the 1970s and 1980s, as a result of a growing interest in the elements of school culture.

Referring once again to Choppin (2004), the increase in research on textbooks over the last 30 years has been accompanied by a dissemination of the approaches and aspects considered, which has resulted in more diverse and improved research on the subject.

As reported by Reiris (2005), these qualitative differentiations converge into three main lines of study. The first line corresponds to critical, historical and ideological studies about the contents of textbooks. The second refers to formal, linguistic and psycho-pedagogic studies on the legibility and comprehensiveness of textbooks, as well as elements of their presentation and general adjustments. Finally, the third line identified by Reiris is related to studies on cultural policies, editorials and economic policy of the textbooks, materialised in the levels of production, circulation and consumption.

Beyond these three lines of study, Choppin (2004) and Garcia (2009) posit the existence of a fourth line of study that corresponds to research on the usage of textbooks in schools. This line of study has not been broadly looked into, and entails a different approach than the others. Identifying these lines of study provides the conditions to apprehend, in general terms, what is taken into account when these textbooks are researched.

In summary, these identifications allow us to categorise research on textbooks into two broad groups, reflecting the form of relationship established with the books. On the one hand some studies look into the relation between textbooks and the internal processes of school education, understanding the textbook as an object meant for formal education in a school context, in other words, as an element of school culture. On the other hand, other studies consider textbooks within a broader cultural, economic, political and social context outside of the

educational processes, regarding textbooks as a cultural product and, at the same time, a commodity.

Studying the relationship between textbooks and the process of school learning, it is possible to verify that the concept of school culture (Forquin 1993) is essential to understand the specificities of this complex object (Bittencourt 2004, Choppin 2004). This understanding refers to the fact that the knowledge expressed in these textbooks, as well as being connected to specific knowledge of physics, relates to school knowledge (Lopes 1999), which is different to reference science because its social function is specific to the school learning process.

On the other hand, for the study of the relationship between textbooks and broad social structure, the analysis of the production and consumption of textbooks must be complemented by macroeconomic elements; understanding textbooks as a result of their place as a commodity (Apple 1995) having an exchange value that is, in some situations, higher than a book's natural use value, and which is decided outside the school area by governments and publishers.

These assumptions and preliminary ideas motivated a search of the literature, in studies analysing physics textbooks as products of school culture as well as their production as commodities over different historical periods.

School textbooks: the relation between school, culture and the market

Several studies have contributed to a greater understanding of the specifics of textbooks as an object of research, utilising a variety of approaches and with different objectives. Among these studies we can name, for example, the works of Oliveira, Guimarães and Bomény (1984); Freitag, Motta and Costa (1989) and Apple (1995), related to the social and economic politics of textbooks; the works of Nosella (1981) and Faria (1986) on the ideological elements implicit in textbooks; and the works of Barra and Lorenz (1986), Wuo (2000), Megid Neto and Fracalanza (2006), Garcia (2007), Garcia (2009), Silva, Garcia and Garcia (2010) and Lorenz (2010) on science and physics textbooks.

Specifically in relation to Brazil, the increased number of postgraduates in education and in areas related to research on teaching different school subjects has contributed to an expansion in the number of studies on school textbooks. Similarly, Leite, Garcia and Rocha (2011) and Souza and Garcia (2013) show that plans for the buying and distribution of textbooks, such as the Ministry of

Education's 'National Program of Textbooks for High Schools' (PNLEM) and the 'National Program of Textbooks' (PNLD)¹, have contributed to an increase in interest in this subject over the last few years.

These works conclude that the main tendencies of studies is to refer to conceptual corrections of educational contents and the methodology of education and other internal elements of textbooks. According to Ferreira and Selles (2004), this tendency comes about because these studies are generally based on reference science.

There is, however, a lack of research on the reasons why textbooks are the way they are today, the purposes underlying their development and design, and very few reflections on the historical and social conditions that shaped their formats.

In this article, we propose that textbooks should be studied by taking into consideration three complementary dimensions: as elements of school culture, as cultural products and as commodities. It is believed that viewing textbooks in this way will enable us to shed light on the elements that physics teachers consider when choosing a textbook.

In order to examine the characteristics of textbooks as elements of school cultures, we look at Choppin (2004), Lopes (1999) and Forquin's (1993) elaborations. In analysing the place of textbooks as cultural products within the broader social structure, we refer to Adorno and Horkheimer (1991), Williams (2000) and Bourdieu (2009). Finally, the studies that contribute to understanding the marketing dimension of textbooks are analysed (Apple 1995, Marx 2010, and Munakata 2012).

Textbooks: an element of school culture

According to Choppin (2004), there are four functions attributed to textbooks within the context of school education: referential, instrumental, ideological and cultural, and documental. Each one of these functions refers to ways that subjects relate to these elements of school culture due to the feelings and meanings that they attribute to them.

¹ *Programa Nacional do Livro Didático para o Ensino Médio* and *Programa Nacional do Livro Didático* respectively.

To the author, the referential function depicts the idea that textbooks are a privileged base of contents, knowledge, techniques or abilities related to what is considered important to transmit in a given social group.

The instrumental function can be understood by the fact that “textbooks put into practice methods of learning, propose exercises or activities” (Choppin 2004: 553), contributing to the process of memorising knowledge, and gaining capacity and abilities among other things.

The third, ideological and cultural function, indicated by Choppin to be the oldest of them all, is related to the fact that textbooks are established as an important element in the configuration and confirmation of “the language, culture and values of the ruling classes” (2004:553). In this sense, textbooks hold an important symbolic value in the acculturation, explicit or implicit, of new generations.

Lastly, the documental function is confined to environments where initiative and autonomy of students is favoured, demanding active participation, in addition to adequate qualifications of teachers focused specifically on this. In this function, which for Choppin is the most recent, textbooks enable to provide “a collection of documents, textual or iconic, whose observation or confrontation can develop the critical spirit of the student”² (Choppin 2004:553).

These functions identified by Choppin (2004) establish the relationship between textbooks and the educational context. Concretely, this relationship happens because of the existence of school subjects that, according to Chervel (1990), are not a simple vulgarisation of reference science knowledge, but are defined by a particular logic, which is attached to the existence of the school institution.

In accordance with this point of view, Lopes (1999) shows that ‘school knowledge’ is produced from a combination of broader social knowledge, and scientific and everyday knowledge. This type of school knowledge is different from other types because of the appropriation of the original combination of both. The ideas of school subject and school knowledge are complementary, being bound to the concept of school culture. For Forquin, school culture refers to the “conjunction of cognitive and symbolic content that, when selected, organised, 'normatised', 'routinised', under the effect of the imperative of

² Our translation from the Portuguese: “*um conjunto de documentos, textuais ou icônicos, cuja observação ou confrontação podem vir a desenvolver o espírito crítico do aluno*”.

didactisation, usually constitutes the object of deliberate transmission in the context of schools”³ (1993:167).

In other words, within the inherently distinctive material properties in textbooks, there are some referring to curricular selection and organisation of a specific school subject (Ferreira & Selles 2004:1). In this sense, textbooks contribute to the process of selection and organisation of school knowledge, with the intention of meeting the educational needs being, as such, an element of school culture.

Textbooks: cultural products and commodities

Besides textbooks being elements of school culture, making the assumption that the educational context is part of a broader social context, it is possible to establish other relations within these contexts and, in this sense, we can assume a codetermination between them. Thus, considering the interdependence between these aspects, it is possible to understand that textbooks have a relation with the social structure on two specific dimensions.

On the one hand, textbooks are cultural products (Bittencourt 2004) being produced and consumed in a determined way by determined social groups. On the other hand, textbooks are commodities (Apple 1995, Munakata 2012). Therefore their production and consumption happen in a society where trading in the market is the essence of their material existence.

Although these dimensions don't exclude each other it is considered that this distinction plays an important analytical role, as it helps in setting boundaries to questions that arise when analysing. In other words, when textbooks are considered as cultural products it is possible to take away the economic elements. On the other hand, when considered as commodities the cultural aspects can be taken away without compromising the economic analysis.

Preoccupations about the specifics of cultural production started with studies undertaken in the Frankfurt School, where reflections provided the base upon which to build the Critical Theory of Society. Specifically, Adorno and Horkheimer (1991) were pioneers in this discussion, with the studies in their book, *Dialectic of Enlightenment*, whose objectives were to analyse society in

³ Our translation from the Portuguese: “conjunto dos conteúdos cognitivos e simbólicos que, selecionados, organizados, ‘normatizados’, ‘rotinizados’, sob o efeito dos imperativos da didatização, constituem habitualmente o objeto de uma transmissão deliberada no contexto das escolas”.

the transition from the 'domain of reason', in its enlightenment sense, to the 'domain of technical reason' in the context of capitalist industry.

In general, the positions defended in the context of critical social theory point to the existence of a cultural industry which designs cultural products with particular aims in mind. From this perspective, one could say that textbooks try to stamp specific values and ideas on their audience, which is contrary to what is supposed to happen in the school context, due to the differences between what Lopes (1999) defines as being scientific, everyday life and scholarly knowledge.

In contrast, it is important to recognise that textbooks play a bigger role in broader social functions, given their relationship to cultural production. In this sense their specific social destination to school education must be seen as an assumption, however it is necessary to realise that they can be understood in different ways depending on the characteristics of their appropriation in distinct social contexts.

According to Bourdieu (2009), the way many different cultural products are appropriated is related to the position, situation and disposition expressed by agents in the social structure. The cultural products acquire distinct significance and meaning depending on the position of the agents. In other words, it is possible for textbooks to be understood in relation to the identification with other printed publications and in this sense these objects can be considered as books, giving them a symbolic value, represented by their ownership.

In order to analyse the modes of consumption it is imperative to understand the modes of the production process, as the two processes are intrinsically connected. When analysing the relation between culture and society, Williams (2000) identified four phases of cultural production as defined by the subject involved in the production and circulation process (and not referring specifically to the modes of consumption), each phase configured from its relation with the dominant market in each historical period.

The first phase of cultural production is identified as handcraft, where, although the author depends on the immediate market, he manages to keep his work "under his control in all stages and in this sense he can consider himself independent" (Williams 2000:44) from middlemen and commercialisation of his work.

In the second phase, called post-handcraft, "the manufacturer is still a craftsman, but now in a more complex and organised market where he is

practically dependent on middlemen” (2000:45), however, the manufacturer still offers his finished product. Here, the relationship between the manufacturer and middlemen becomes more natural, in other words, the manufacturer may start to “offer his work to produce works in an established way” (45).

The third phase is characterised by the presence of market professionals, distinguishing itself from the previous phase by the strengthening of productive middlemen, i.e. modern editors and, in parallel, a bigger professionalisation of writers. Williams shows that the most significant factors of this phase are copyright and royalties which regulate the relation to property in a period marked by massive reproduction of works through the usage of publishers in which greater control should be given to writers. As an expression of the regulation of properties (copyrights), a new payment system emerges, “relative to each copy sold” (royalty), substituting the direct, bulk purchase from the author.

Lastly, the fourth phase represents the enlarged complexity of market relations. The presence of the market professional persists but with the company occupying the central position. This results in a relationship which prioritises the role played by the business professional. If in the third phase it was possible to recognise the co-existence of the work produced originally by the authors and ordered by the editors, in the business phase the latter becomes hegemonic because there is an “extremely organised and entirely capitalised market” (51) which, in the last instance, determines the course of the production.

These phases indicate the ways cultural products and productive middlemen relate, making it possible to realise that these relations tend to become more and more complex, resulting in the authors, who are recognised as craftspeople, starting to produce in accordance with the necessities of commercial relations with companies.

In this sense, it is possible to verify that, currently, the production of textbooks is subordinated to commercial relations in which the publishers meet their expectations. Meanwhile the meaning and significance that teachers and students attribute to textbooks will depend on resources made available to them, in spite of the ways these books are produced.

These aspects contribute to the understanding of the complexities that come from the studies of textbooks in the context of a commodities-based society. Thus, Apple (1995) and Munakata (2012) indicate that textbooks can be seen as commodities, according to Marx's labour theory of value (2010). This makes it possible to identify their dual nature: on the one hand, textbooks have a use

value and on the other hand a trade value which, in some moments, can be greater than their specific use value.

The analysis of the use value of textbooks allows us to comprehend that the agents that in some way related to the educational context create expectations in relation to these objects. In this sense, these agents organise distinct resources in that they secure ownership of these textbooks, while understanding, however, that these books carry social meanings that are bigger than their relation to the school environment.

In accordance with Bourdieu (2009), these resources are not confined to a purely economic question, though this is central in the acquisition of books. Financial resources, specifically, are designated as “financial or economic capital” by Bourdieu (2009), a specific type of capital amidst other possible capitals. Beyond economic capital, Bourdieu (2009) discusses, for example, the cultural, social and symbolic capitals relative to the ownership of distinguished aspects that are disclosed by distinct cultural products, among them, textbooks.

Coming from these conceptions, it is possible to say that the meaning and significance given to textbooks depend directly on the distribution of the specific capitals in the social structure and, at the same time, on the position, situation and disposition of the agents in this same structure.

In this particular instance, taking as reference only two groups of social agents⁴ (Bourdieu 2004:20) involved in the production and usage of textbooks, we have on one side the authors who classify what teachers, the other agents, will work with in the classroom. Dichotomising these functions, on the one hand we have the one who researches and produces knowledge and on the other hand the ones who will teach, as Garcia shows, putting “‘teacher researchers’ and ‘teacher non-researchers’ on different sides – the latter being ‘only prepared to teach’” (2012:253).

In other words, an unequal distribution of capital will tend to give the agents who have determined positions in the social structure with incorporated predispositions, an unequal ownership of the distinct elements within this same structure.

⁴ According to Bourdieu (2004:20), social agents are viewed as subjects who have an important role in the structure of society, as opposed to a structuralism without subjects like in Lévi-Strauss and Althusser.

Physics textbooks in Brazil: influences of pedagogical conceptions

We started with the assumption that the development and presence of physics textbooks in Brazil must be understood in terms of their established relations with educational structures, as well within a broader social-historical context.

In this sense, it is necessary to find an articulation between elements relative to the specifics of physics textbooks and the general aspects that relate to the educational processes in a given context.

Accordingly, the studies of Almeida Junior (1979, 1980), Gaspar (1997) and Villani (1981) all contribute to understanding some aspects related to the development of physics teaching in Brazil, and the studies of Barra and Lorenz (1986), Wuo (2000), Megid Neto and Fracalanza (2006), Garcia (2007) and Lorenz (2010) raise questions on the history of textbooks in this subject.

Additionally, the division in periods of the history of Brazilian education suggested by Saviani (2011) enables us to comprehend how physics textbooks were produced and presented in the country at various moments in the past.

Physics school textbooks in the conception of pedagogical tradition

According to Saviani (2011), the traditional pedagogic conception, which was disclosed in a period between the arrival of the first Jesuits, in 1549, and the 1930s, can be divided into two parts, one religious and one secular. The religious period was hegemonic until the 1830s and from this moment a secular approach started to predominate in the educational context.

One of the reasons for the transition from the religious period to the secular is connected to events that took place in the process of Brazil's independence from Portugal. The Brazilian empire needed to be rebuilt upon a new base. Ideals of positivism contributed to this process, whereby an exaggerated predominance of humanistic studies was developed in the educational processes (Saviani 2011).

The foundation of the Colégio Pedro II in 1837, the first Brazilian high school, taken as a model for education in the country at that period, can be considered as the expression of the necessity to establish an educational system on the most modern educational terms available. Almeida Junior (1979) demonstrates that Colégio Pedro II adopted the French educational system, establishing a counterpoint to the predominance of humanistic studies through balancing humanism with distinct subjects related to natural science.

Referring to Barra and Lorenz (1986), Garcia (2007) and Lorenz (2010), physics textbooks from that period, circa 1840s to 1930s, were, essentially, translations of works by French authors. Roughly, these textbooks were propaedeutic and encyclopaedic and given indiscriminately to teachers and students.

Although there was no concern about the specific destination of textbooks, the central element of teaching-learning was performed by the teacher and the students had to passively accept it. This central role played by the teacher is a characteristic of the traditional pedagogic conception. According to Saviani (2011), it is based on an essentialist vision of mankind, where one is conceived as formed by a universal and unalterable essence. Education's role is to shape the particular and real existence of each pupil to the ideal and universal essence that defines him as a human being (Saviani 2011:58).

This idea is connected to the religious period as well as the secular one. However, while the former considered human essence to be connected to a "divine essence", the latter posits that reason is responsible for the building of this essence.

Thus, it is understood that the physics textbooks from the secular period, which were predominantly translations or adaptations of French books, tried to establish a situation where the teacher played a central role with the purpose of contributing to the configuration of the student, shaping him into what was considered to be an ideal human being. This pedagogical conception would be upheld for more than a century.

Physics textbooks in the pedagogical conception of the New School

In the 1930s, the process of industrialisation began in Brazil, a process that would contribute to the ensuing transformation of the social structure of the country. This period was different from the previous one in many ways, and there were significant changes in the political regime and economic structure of the country. Brazil was in the first years of the Republic and at the same time, starting its implantation of capitalist means of production, in an attempt to overcome its economic and social tardiness in relation to more advanced countries.

These changes in the social structure found expression in the educational structure and have motivated the presence of distinct proposals in the sense of organising a national education. According to Romanelli (1986), these proposals happened in different states, pushing the government to consider this question seriously.

The educational reform implemented by Francisco Campos, Minister of Education in 1931, can be seen as a sign of these pressures. Meanwhile, the reform that had more impact was implemented by Gustavo Capanema, Minister of Education, in 1942. This reform had as a central characteristic the modification of educational processes to incorporate the formative necessities of the labour market, which had brought about the social complexification of the country, associated with the growth of national industrialisation.

According to Saviani (2011), in this period there was a balance between the traditional pedagogical concept and the New School, which had developed from the necessity to adjust education to the demands of an increasingly more complex society, where scientific knowledge played a central role.

The influence, though, of the New School pedagogical concept on the production of physics textbooks would only become more evident after many disputes had occurred in different educational institutions. In other words, the authority of the traditional pedagogical concept was very strong, and was a barrier to renovating processes.

From the second half of the 20th century, physics textbooks produced in Brazil were influenced by external teaching methods, no longer from France, but from North American and English science teaching projects that were linked to New School concepts. Those projects had originated, as stated by Barra and Lorenz (1986) and Garcia (2007), as a result of the reorganisation of the teaching sciences in countries such as the United States and England, in light of the scientific progress of the then Russian Soviet Federative Socialist Republic (RSFSR) and as one of the many consequences of the dispute which occurred after World War II, during the Cold War.

Physics textbooks produced from that moment started to transfer the central role in the process of teaching-learning from the teacher onto the student. This movement can be verified by the distinct activities given in the textbooks, which tried to make the students more active in the learning process. For instance, algebraic exercises, experimental activities and other features allowed students to act as the main character, and the teacher's role was to guide and coordinate the student's work.

Physics school textbooks in the productivist pedagogical conception

The pedagogy of the New School dominated the educational scene for a very short period, between the 1940s and mid-1960s, when a technicist pedagogical concept started to be articulated. In the case of physics textbooks, specifically,

some elements of the New School model were retained, but under the guise of technicism.

The productivist pedagogical conception is more mingled than the others, having, according to Saviani (2011), three main segments: technicist pedagogy, counter-hegemonic pedagogy and new productivist pedagogy (and its variations). The main characteristic of this conception, which guarantees integrity between its different segments, is the fact that the relationships between educational roles and productive processes are considered to be more dynamic. The most significant expression of this relation was the promulgation of Law no. 5.692 in 1971, which compulsorily turned high schooling into professionalising courses (Garcia 2000).

In essence, the distinctions between these segments depends on how this question is considered, because, according to the technicist conception the relation between work and education is upheld on the Human Capital theory; the counter-hegemonic segment settles critics of this theory and has a position that culminated in the formulation of, amongst other things, historical critical theory and finally the new productivist conception brings back elements of the traditional and the New School pedagogy with the purpose of considering education as providing the necessary formation for the demands of the current phase of work organisation.

It is necessary, therefore, to distinguish physics textbooks produced in the period between the late 1960s and currently, taking into consideration these aspects of the productivist conception and identifying their particular characteristics.

It is possible to assert that physics textbooks produced under the pretext of the technicist conception emphasise a tendency to prioritise the student's role in the teaching-learning process. A book known as "Física auto-instrutiva" (Self-instructive physics), based on programmed instruction, is a significant example. This method consisted in giving general information, presented in parcels and divided throughout modules, and a set of exercises aimed at the memorisation of the contents by students.

The presence of programmed instruction in textbooks, in physics and other disciplines, lasted for a short time, almost a decade, only ending through a governmental decision which restrained the production of disposable books that, according to Gaspar (1997), were necessary for students.

In the 1970s, a process was begun to develop a community to research the teaching of physics. Researchers started to question the methods used in the technicist conception, and maintained a critical position, resulting from contact with the Brazilian school reality. They felt that the methods in use were contributing to the increase in educational inequality, offering a technical education to the lower classes, but a more broad education for those who would continue their studies in higher education. Some of the textbooks developed consequently tried to adopt a counter-hegemonic conception, articulating distinct aspects of popular pedagogy and historical critical pedagogy. These initiatives, however, could not significantly override the technicist influence that, with the government's support, still predominated in textbook production during that period.

This influence began to wear with the political reopening after the military dictatorship. Nevertheless, the distinctive configuration of the counter-hegemonic approach would only get some expression from the 1990s, more precisely after the promulgation, in 1996, of the Law of Guidelines and Bases of National Education, no. 9394, which would place education in other bases.

This new legislation, albeit slowly, began to provide the premises for a new production of physics textbooks. From this moment on, and especially from 2009, when the PNLEM distributed for the first time physics textbooks to all students in Brazilian public high schools, these books started to incorporate some of the results of research on physics teaching. Among these results, it is possible to see, for example, that textbooks present discussion on science, modern and contemporary physics, communication and information technology, history and philosophy of physics, as well as suggestions on content organisation, which breaks away from traditional approaches.

Methodology for the present study

With the intention of deepening the analysis on articulations between dimensions relative to textbooks, our proposal was to investigate what a group of physics teachers, from different school systems and cultures, think about these relations and more specifically about which elements they consider in the process of choosing a textbook for this school subject. There is a big variety of physics textbooks and we would like to know what factors lead a teacher to select a specific book over others.

The objectives of this research were to compare two culturally and educationally distinct groups of physics teachers, one group from Portugal and the other from Brazil in order to identify convergent and divergent criteria for the groups'

selection of physics textbooks, and to analyse how training processes and professional performance can influence these choices. Looking at two culturally distinct groups of teachers enabled us to broaden the spectrum of possibilities that can influence these choices and the understanding of the processes underlying them.

Part of this research was conducted during a doctoral internship at the Universidade de Lisboa, in Portugal. The reason for choosing a doctoral internship in this country was due to the cultural proximities with Brazil, expressed, for example, in the fact that the use of a common official language has allowed the Brazilian and Portuguese researchers to appropriate the results of research conducted in both countries. In addition, there is an important historical element because, for a long period, Brazilian education was guided by Portuguese education. After the independence of Brazil these two educational systems followed different paths and, in this sense, this research project allowed us to understand some aspects of the Portuguese education nowadays, more specifically with regard to the choice of physics textbooks.

The fieldwork comprised two main stages. Firstly, participants were given a questionnaire, filled out as an online form. Questions were aimed at, on the one hand, determining the teachers' qualifications, professional performance, and experience in the development of research and participation in scientific events, and, on the other hand, providing information about factors considered by the teachers in the process of choosing their physics textbooks. Secondly, some teachers were interviewed with the objective of exploring aspects related to the selection of books, giving them the opportunity to deeply explain this process.

In particular, we were interested in determining whether the textbook as an element of school culture, as cultural product and as a commodity, as presented above, played a part in the considerations of teachers when choosing their physics textbooks. With this aim in mind, we endeavoured to find out how teachers comprehend the constituent dimensions of textbooks as elements of school culture, cultural products or commodities. In other words, how do they conceive of the possible connections between these distinctive dimensions? Are these connections evidenced by the teachers in the process of choosing physics textbooks?

The questionnaire was sent to thirty Brazilian teachers and thirty Portuguese teachers. Seventeen Brazilian teachers and fourteen Portuguese teachers completed the questionnaire. Semi-structured interviews were conducted with eight Brazilian teachers and seven Portuguese teachers.

Of the whole group of thirty-one teachers, twenty-three worked exclusively in public schools, seven simultaneously in public and private schools, four mainly in public schools and three mainly in private schools. Only one teacher indicated teaching exclusively in private schools.

Public or private school	Brazilian	Portuguese
Public school only	11	12
Private school only	0	1
Public and private school, with more time in public	3	1
Public and private school, with more time in private	3	0

Table 1. Number of teachers according to type of school administration where the teacher works.

Of the participants, twenty-five were predominantly secondary teachers, four were primary school teachers and two taught at the vocational level of secondary school.

School level	Brazilian	Portuguese
Primary school (Ensino fundamental)	0	4
High School (Ensino médio)	15	10
High school level professional technical education (Educação técnico-profissional)	2	0

Table 2. School level taught by teachers

However, all of the teachers had experience teaching at the secondary level. On average, this group of teachers had spent eleven years as professionals in the field. Most had been teaching professionals for more than eleven years, only seven having less than ten years' experience in the field.

Results and analyses

In analysing the answers from the questionnaire as a whole, it was possible to observe some convergences relating to the aspects considered by the two groups of professionals. For both the Brazilian teachers and the Portuguese teachers, the primary consideration when choosing a textbook related specifically to its use within the school. This demonstrates that the consideration of physics textbooks as a cultural element predominates; the textbook is a cultural product.

This convergence can be explained by the consideration of elements that, notably, relate to the meaning that textbooks have to the teaching-learning process of physics. The vast majority of teachers in this study considered factors such as methodological treatment, the relation to students' everyday life, organisation and current contents, to be more relevant in their choice of textbooks.

These considerations are reinforced by the idea presented by teachers that the selection of physics textbooks is also determined by the valid official curriculum of each country. In this respect it is important to highlight that there are some differences in relation to curriculum orientation in Brazil and Portugal, which consequently have an impact on the production of physics textbooks. Namely, while in Portugal the official curriculum is nationally unified, in Brazil curriculum guidance and parameters are set on a national level, but there is also state-level curriculum orientation.

This distinction contributes to the Portuguese teachers surveyed perceiving that the content of physics textbooks is in harmony with the official curriculum, while for Brazilian teachers, this is not the case. The production of textbooks in Brazil proceeds in accordance with national guidelines, and at the expense of state guidelines. This feature is important because the administration of secondary schools is the responsibility of the individual states. In accordance with Brazilian educational legislation, the National Textbook Program put forward national guidelines. It is not surprising, then, that Brazilian teachers surveyed revealed that they had difficulties selecting books because of this dual system of guidelines.

Another factor which was commonly cited in the answers given as being fundamentally important to the choice of physics textbooks concerned the role of the selective processes to get into higher education. The relevance of textbooks to what is required by distinct processes of selection demonstrates the importance of the official curriculum orientation in each country. This further

strengthens the idea that textbooks are considered by the teachers we studied as cultural elements.

There is a small difference in how the selection for higher education occurs in these two countries. In Portugal the system of access to higher education is outlined during study at the secondary level, the student enrolling in courses specifically related to the area of future study. At the end of secondary education the students complete exams in the subjects they studied, and they receive a certain percentage as a grade or score, and entrance scores for different courses of study vary from university to university.

In Brazil, there are distinct global selection processes that assess students in all curricular components of secondary education, and most of these processes, if not all, are organised by institutions of higher education. However, since the transformation of the National High School Exam (Exame Nacional do Ensino Médio) into a selection process for higher education, there have been inequalities and even incompatibilities between the requirements of the different selection processes and curricular organisation at the school level.

Thus, predictably, while the Portuguese teachers surveyed indicated that selecting a textbook was strongly related to the examinations provided for the purpose of access to higher education, the Brazilian teachers indicated that the differences between the various selective processes for higher education were elements that made the selection of books more difficult, since it was virtually impossible to find a book that fulfilled all of the various criteria.

Although features relative to specificities of formal schooling played a central role in the considerations presented by the teachers, there was also evidence that they consider school textbooks as both cultural products and commodities.

Some of the teachers in the study did not indicate any recognition that physics textbooks are able to have any other value apart from their role in the process of teaching-learning. It is possible, however, to realise that the presence of differentiated elements in textbooks contribute to them being considered cultural products. The possibility to extrapolate, for example, a “conventional” use based on the analysis of the pre-elaborated example or in the conclusion of exercises, from the attribution of a new special meaning to the reading, the attention to elements that connect with everyday life, among other aspects, indicates that the teachers in the research aim to add in the scope of a broader cultural process.

Apart from this question, the worries teachers surveyed have concerning the commodities dimension of textbooks were identified. Although this factor was not discussed overtly in these terms, the use of particular words and expressions indicated the presence of this concern in the process of selection of textbooks. Examples included terms and phrases such as: price, taxes, spending, investments, waste, and household budget.

This aspect is important because currently, a government program of distributing textbooks, *per se*, is in place, which presumably would lead us to exclude the hypothesis that Brazilians consider textbooks as commodities. However, this is not the case, since they recognise that for the existence of the program, the participation of the whole society is required, by paying taxes, for instance.

In this sense, despite the assumption that situational aspects are decisive in relation to the definition of a commodities dimension as an influencing criterion, it is possible to see that, even in a country where this factor shouldn't be highlighted, as in the case of Brazil, it was possible to grasp its presence, even if subtle. On the other hand, in Portugal where the current economic crisis would likely exert a bigger pressure on the teachers' choices of textbooks, the perception of a marketing dimension was seen as circumstantial and temporary, in other words conditioned by the crisis the country is going through.

Final Conclusions

The consideration that textbooks can be understood as elements of school culture, cultural products and commodities, sheds light on their complex nature. Thus, despite the perception that textbooks are produced with the purpose of answering the needs created at school, we must recognise that the meanings attributed to them are greater and related to the location of the agents.

In general, the analysis has shown that, although inserted in different educational contexts, the positions of teachers converge on the importance of the official curriculum and selection processes of access to higher education in the establishment of selection criteria for physics textbooks.

The dimension of textbooks as part of the school culture grew in the set of selection criteria considered by teachers. It is believed that this is due to the fact that they are talking about a reality that is particularly meaningful to them, that is, about those aspects that relate to their professional practice in schools.

The influence of the commodities dimension in the selection process was most strongly revealed as a situational characteristic, not as a structural characteristic, although the conception of textbooks as commodities becomes apparent at the level of relations exchange in our society, from its structural linkage. However, some of the teachers surveyed did indicate that their choice of textbooks is not exempt from the consideration that they are commodities.

However, these notions don't impede submitting questions concerning consumption types predetermined by cultural producers, towards the cultural industry. Nonetheless, it is considered that, as a counterpoint, this question can be best understood in terms of capital mobilised by different agents who give the textbooks distinct meanings and significance depending on the positions, situations and dispositions expressed in the social structure.

These concepts need to be deepened and developed through further study, assuming that textbooks are intended for education and seek to integrate other dimensions of social experience, such as the relations between culture and the market.

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Biographical note

Alisson Antonio Martins is a professor in the Academic Department of Physics, at the Federal University of Technology - Paraná (UTFPR), in Curitiba, Paraná, Brazil. He is interested in physics teaching, textbooks and teacher education.

He can be reached on email at: alimartins@gmail.com

Nilson Marcos Dias Garcia is a professor of the Academic Department of Physics and Postgraduate Program of Technology at Federal University of Technology – Paraná (UTFPR). He also is a professor of the Postgraduate Program in Education at Federal University of Paraná (UFPR), Brazil. He is interested in physics teaching, textbooks and teacher education.

He can be reached on email at: nilson@utfpr.edu.br