

Recontextualization and the level of demand of conceptual school knowledge

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Abstract

The empirical study described in this article has focused on the transformations that occur in the pedagogical discourse in relation to the level of conceptual knowledge and it has aimed at extending the understanding of the process of constitution of school knowledge. The study was conducted in a public state school in the municipality of Valinhos, in São Paulo state, and its research sources were the National Curriculum Parameters of Natural Sciences, a textbook and the classes of an 8th grade teacher. I adopted the procedures of document analysis and classroom observation, and the main theoretical-methodological reference was the theory of Basil Bernstein. The mixed research methodology adopted in this research proved to be interesting because it allowed a quantitative approach to demarcate space for reflection on the qualitative aspects involved in the analysis of the process of recontextualization. The results seized the process of recontextualization and revealed that, throughout this process, there was an impoverishment of the level of conceptual demand. This took place – within the limits of this investigation – through losses in relation to intradisciplinarity, to the complexity of scientific competences and the complexity of the scientific content used in the teaching / learning process. After identifying the points at which the trend of losses in the level of conceptual demand of school knowledge was the most evident, I emphasize elements that can bring some contribution to the processes of production and implementation of educational policies, as well as of production of teaching materials and of teacher training.

Keywords

School knowledge – Recontextualization – Conceptual demand.

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A recontextualização e o nível de exigência conceitual do conhecimento escolar

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Resumo

O estudo empírico descrito neste artigo focalizou as transformações que ocorrem no discurso pedagógico em relação ao nível conceitual do conhecimento e visou ampliar a compreensão do processo de constituição do conhecimento escolar. Foi conduzido em uma escola da rede pública estadual, no município de Valinhos, Estado de São Paulo, e as fontes de pesquisa foram os Parâmetros Curriculares Nacionais de Ciências Naturais, um livro didático e as aulas de uma professora da 8ª série do ensino fundamental. Adotaram-se os procedimentos de análise documental e observação de aulas, e a principal referência teórico-metodológica foi a teoria de Basil Bernstein. A metodologia mista de investigação adotada nesta pesquisa mostrou-se interessante por permitir que uma abordagem quantitativa demarcasse um espaço de reflexão sobre os aspectos qualitativos envolvidos na análise do processo de recontextualização. Os resultados flagraram o processo de recontextualização e revelaram que, ao longo desse processo, ocorreu um empobrecimento do nível de exigência conceitual. Isso se deu – dentro dos limites desta investigação – por meio de perdas no que se refere à intradisciplinaridade, à complexidade das competências científicas e à complexidade dos conteúdos científicos mobilizados no processo de ensino/aprendizagem. Identificados os pontos nos quais ficou mais evidente a tendência às perdas no nível de exigência conceitual do conhecimento escolar, ressaltam-se elementos que podem trazer alguma contribuição para os processos de produção e implantação de políticas educacionais, bem como de produção de materiais didáticos e de formação dos professores.

Palavras-chave

Conhecimento escolar – Recontextualização – Exigência conceitual.

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This article presents and discusses the result of a study on school knowledge, understood as the result of the transformation of knowledge from the its production field when it is inserted in school conditions, notably those relating to the time, space and way one deals with knowledge.

Since the initial readings in the context of such research, it became evident that reflecting on the relevance of school knowledge to the training of students generates many questions. But in the face of any of these questions, it remains certain that receiving from older generations the indications of what has already been constituted in terms of knowledge is an inalienable right of children and young people. And also that it is the school's duty to transmit a selection of such knowledge which should allow the use, understanding and questioning of the information and of the tools available in society. Failing to fulfil this social function empties the school of its major meaning, as indicated by Maria das Mercês Sampaio (1998), referring to public schools:

public schools make sense as long as they can do their specific job of knowledge and of expanding horizons, of understanding the world. (p. 22)

Recent studies have indicated that young people point to the belief in the power of school education as an instrument of positive transformation of their living conditions (Giovinazzo Jr., 1999, 2003; Meconi, 2004; Oliveira, 2001; Souza, 2003). But, in addition to the possible convictions of these young people about schooling, what is offered to students undergoing this process? How has knowledge been treated in official documents, in the materials used by teachers and students and in classrooms? With what level of complexity has such knowledge been addressed in these instances?

This research was inserted in the ambit of the questions above and it focused them

from the point of view of the teaching of science, admitting that this knowledge should ensure student mastery of the tools, thinking competences and concepts that enable students to know the world around them – in its natural features and the multiple human interventions on it – to understand, question and mark their position in the discourse of power embedded in the social practices in which they are inserted, moving toward a fairer society. From this perspective, I sought traces of what is made available to students for learning science with regard to the conceptual level at which scientific knowledge is treated.

The main theoretical-methodological reference of this research was Basil Bernstein's theory and it focused on the process of recontextualization of scientific knowledge for school transmission.

The author's conception of the role of theory in the reading of the empirical justified the choice of taking him as a theoretical and methodological reference to this research. His understanding of the mechanisms of cultural production, reproduction and transformation and of the relation between theory / empirical studies today is perpetuated in studies of several research groups, notably in the work of the Group of Sociological Studies of the Classroom (*Grupo de Estudos Sociológicos de Sala de Aula - ESSA*), linked to the Center for Research in Education, Faculty of Science, University of Lisbon. (*Centro de Investigação em Educação da Faculdade de Ciências da Universidade de Lisboa*).

The studies related to the teaching and learning of science developed by this group analyze curriculum texts (programs and textbooks), pedagogical practices and relations between discourses, subjects and spaces, among other topics with a theoretical and methodological focus linked to the theory of Bernstein.

Due to the centrality of these studies on the methodological choices of the research presented here, I bring up an example of research conducted by the Group ESSA with the aim of finding characteristics more conducive

to the acquisition of scientific knowledge and investigative competences of students from different social backgrounds. Ana Maria Morais, Isabel Neves and Delmina Pires (2004) analyzed the teacher's pedagogical practice and the scientific acquisition of children, focusing on the interaction between the social background of these children, pedagogical practice and scientific learning, taking the level achieved by children in complex cognitive competences¹ as a measure of acquisition.

The analysis of the practice of teachers was conducted in terms of relations between subjects (teacher / students), discourses (intradisciplinarity, interdisciplinarity and academic / non-academic knowledge) and spaces (teacher's space / students' space).

Those researchers inform that the results indicate that a practice highly conducive to the learning of children from different social backgrounds should merge features, such as: weak boundaries between spaces of the teacher and students; open communicative relations between teacher-students and students-students; explicit evaluation criteria; flexible pace of learning²; strong intradisciplinary relations; high level of conceptual demand and high level of investigative proficiency.

Based on this and other studies by the Group ESSA, they also stress in quite a suggestive way for the context in which my research was conducted that:

It is not necessary to lower the level of conceptual demand for all children to succeed in school. Increasing the level of conceptual demand is actually an essential step to make everyone have access to a higher level of scientific literacy, valued by both the scientific community and society at large. (p. 14)

1- Among complex cognitive competences, one can highlight analysis and synthesis for example.

2- The word pace refers to the use of time in the process of teaching and learning. A flexible pace of learning means more flexible time management in class, in order to follow different times of learning.

Having indicated the theoretical framework that guided the methodological choices and the analysis of the information obtained, and having brought some indications of reflections of researchers that circulate in the same context of investigation, I shall now locate the central concern of the research presented in this article: recontextualization, i.e., the transformations that occur in the official pedagogical discourse in the process of production of textbooks and in the teaching practice, especially with regard to the conceptual level of school knowledge of science.

The central question that guided this study was: what transformation occurs with the official pedagogical discourse (OPD) from the point of view of the conceptual level of knowledge and competences and of the relations between discourses in its movement from the field of recontextualization and to the field of transmission?

Data analysis focused on three instances of recontextualization: (1) the National Curricular Parameters of Natural Sciences (NCP / NC) for the fourth cycle of basic education³, representing here the expression of the OPD; (2) the textbook distributed to the school by the National Textbook Program (*Programa Nacional do Livro Didático* - PNLD/2005), a result of the recontextualization of OPD performed by publishers and authors of these materials in the pedagogical recontextualizing field; and (3) the professional practice of a science teacher with a group of eighth grade of junior highschool, which evidences the context of transmission, in the field of reproduction of the pedagogical discourse. The research procedures adopted were document analysis and observation of classes.

The research was conducted in a state public school in the city of Valinhos, São Paulo, and the three sources were analyzed using a methodology based on the procedures and tools created and applied by different authors linked to the Group ESSA. The answers

3- Translator's note: Basic education in Brazil comprises 9 years of schooling. By fourth cycle of basic education, the author means the last two grades.

to the questions raised by this study intended to enable a better understanding of the process of constitution of school knowledge of science, as well as to bring some contribution to the discussion of the sociological determinants that may act to enhance or weaken the relation of students and teachers with such knowledge. With this research goal and the main concern announced above, and based on the theoretical framework adopted, two hypotheses derived, which guided the research: (1) that it would be possible to seize and explain the process of recontextualization of the school knowledge of science and (2) that this process would demonstrate a tendency to lower the level of conceptual demand.

In this study, I opted to adopt a mixed methodology of research, taking into account that quantitative and qualitative research are not incompatible and can be used complementarily according to the nature of the research questions, in order to allow in-depth analysis.

Thus, the methodological orientation had a quantitative character when it used, for the construction of models and data analysis, numerical indicators and calculations, according to the chosen theoretical framework. On the other hand, it followed a qualitative line when it dealt with indicators and descriptors, as well as the data obtained from direct observation of the contexts under study, seeking their meaning and the relations between them.

The process of gathering information took a quantitative character in the organization and operation of the issues raised in the document review and in the observation of practice. It also took a qualitative character throughout the entire process, since the selection of the aspects to be investigated.

Data analysis also took this dual nature: quantitative treatment and interpretative analysis of the contents of the documents and classes observed.

Central theoretical issues

In order to discuss some of the concepts of Bernstein's theory for understanding the path taken in this research – with regard both to research procedures and to data analysis – it is first necessary to present the concept of pedagogical device developed by the author. Such device consists of a set of rules that internally govern pedagogical communication and exert influence on a range of meanings that can be transmitted by schools.

To perform the selection of the meanings that will be brought to the school curriculum – and how they will be treated – the rules of the pedagogical device have relative stability and express the dominant positions in the arena of struggle for hegemony in a particular social group. Thus, the pedagogical device is not ideologically neutral and the relative stability of its rules is due to the connection it has with the distribution of power and the ways of maintaining social order.

The pedagogical device provides the intrinsic grammar of pedagogical communication. It is the means by which power, knowledge and awareness relate, that is, it is a fundamental moral activity and it operates through three sets of interrelated rules: *distributive rules*, whose function is to regulate the relations between power, social groups, forms of consciousness and practice; *recontextualizing rules*, which regulate the formation of the specific pedagogical discourse; and *evaluation rules*, which establish the criteria for practice (Bernstein, 1998).

Distributive rules distinguish two classes of knowledge: the thinkable, which deals with the knowledge produced by mankind, and the unthinkable, which is what is yet to be developed in terms of knowledge. The first of these classes refers to the knowledge that is already available to explain phenomena. The second relates to the meanings created to explain what does not find a meaning directly in the practices, involving the production of new knowledge.

For the author, what *distributive rules* define is which orders of meanings will be accessible to which social groups. They act in the definition of who will have access to these two classes of knowledge.

The space for the unthinkable represents the space of search for other meanings beyond what is already available as an explanation for the practices and phenomena in the world. Ultimately, it represents the space for questioning the social order itself. Hence, the need to control the access to such space.

Bernstein (1996) points out that

the pedagogical device is both control over the 'unthinkable' and control over those who may think it [through *distributive rules*]. (p. 257)

Evaluation rules deal with the transformation of the pedagogical discourse into pedagogical practice, through the specialization of the time, space and text produced, united in a special relation (Bernstein, 1998). It is a principle of order of the pedagogical discourse that takes place by the definition of a specific time and space, which will generate a determined text. Pedagogical practices constitute, interrelate and regulate the possibilities of two communication principles that define what the author calls *form of the communicative context*.

Recontextualizing rules refer to a central concept for understanding the research presented in this article: the process of recontextualization. In this process, a set of meanings related to science is produced. Such meanings deal with knowledge that, in its place of production, universities and research centers, for example, is self-explanatory, but that, when treated in school, must be mediated for transmission.

Such mediation, performed by the pedagogical device, produces a potential discursive gap, a space for the creation of meanings. Thus, a part of scientific knowledge is subject to the school conditions of transmission. In this adaptation process, scientific knowledge is modified. As a result, the pedagogical

discourse of science should not be confused with scientific discourse (Bernstein, 1996).

In the process of recontextualization, the text (e.g., scientific) from the field of knowledge production undergoes numerous changes until it is ready for use by students and teachers in the classroom.

The concept of pedagogical discourse is also relevant to understand the research presented. It is a principle of insertion of instructional discourse (ID), specific skills, in a moral regulating – or regulative – discourse (RD), which is dominant over the first. According to Bernstein (1996),

instructional discourse concerns the transmission / acquisition of specific competences and regulative discourse concerns the transmission of principles of order, relation and identity. (p. 297)

It should be emphasized that the pedagogical discourse has to do with a *what* and a *how* of the pedagogical practice. Thus, in the context of teaching and learning, *what* refers to the concepts and competences developed in pedagogical practice and *how* concerns the relations between discourses that are established in this practice (relations between knowledge of the discipline under study – intradisciplinarity –, relation between academic and non-academic knowledge and relation between the discourses of different disciplines – interdisciplinarity), relations between subjects (teacher / students and students / students) and the relations between spaces (space of the teacher / students and space of student / student).

Having presented the concepts of pedagogical device – with its sets of rules –, of recontextualization and of pedagogical discourse, I shall now highlight two other absolutely central concepts in Bernstein's theory: classification and framing, which refer respectively to the configuration of relations of power and control expressed in communication relations.

For a first approximation to these concepts, it can be stated that in the case of pedagogical communication, classification is expressed, for example, in the degree of maintenance of boundaries between disciplines. The greater the distance between them, the greater the effort to maintain such separation, the stronger the classification. The more these boundaries fade, the weaker the classification. Framing is expressed, for example, in the form the teacher / student relationships take. The more control is concentrated in the hands of the teacher – for example, regarding the selection of topics to be addressed or the sequence in which they will be worked – the stronger the framing. The more this control is exercised also by students, the weaker the framing.

Methodological aspects

What I intended to evidence was the result of the process of recontextualization of the scientific knowledge selected for school transmission. Thus, one of the pedagogical features that I intended to focus on was (1) the conceptual demand with which scientific knowledge and competences are treated in the NCP / NC, textbook and pedagogical practice. For this analysis, I considered the complexity of contents and competences and the degree of intradisciplinarity with which scientific

knowledge is treated. This approach allowed searching for traces of transformation in these instances of recontextualization especially with regard to the instructional component of pedagogical discourse (to the *what* of pedagogical discourse).

Another way of recontextualization considered in this study was(2) the relations between discourses, specifically between discourses within the discipline, and between academic and nonacademic knowledge, again in three instances (NCP / NC, textbooks and teaching practice). In this case, the investigation focused on the *how* of pedagogical discourse.

At the micro level of classroom, I considered one more aspect related to the *how* of pedagogical discourse: (3) the relation between subjects, specifically between teacher and students, which is expressed in pedagogical communication. This analysis focused only on this instance of recontextualization and aimed to identify the extent to which different genres of pedagogical practice could enhance or limit the level of conceptual demand, intradisciplinarity and the establishment of relations between non-academic and academic knowledge in the treatment of the school knowledge of science.

Figure 1 identifies the three instances of recontextualization and the pedagogical features chosen to seek the answers to the questions on the conceptual level of school knowledge of science:

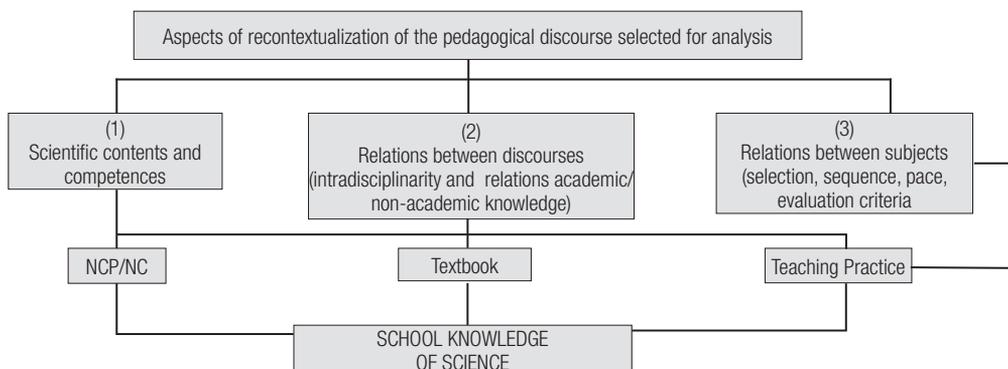


Figure 1 – Sources and pedagogical features to be analyzed

The analysis proposed in this study focused on the second and third levels of the model of pedagogical discourse developed by Bernstein⁴ – the levels of transmission and recontextualization. In order to evidence the conceptual level with which the school knowledge of science is treated in the three instances of recontextualization, some aspects of the *what* and the *how* of pedagogical discourse (PD) were chosen to comply with the purposes pursued. Figure 2 shows the features selected for the analysis of pedagogical discourse (PD) on the basis proposed in this study:

To conduct the research, for each instance of recontextualization 15 units of analysis (UA)⁵ were extracted. In this article, I chose to explain the treatment given to the question concerning the level of conceptual demand. Therefore, even though directly related to this point, the approach to the relations between subjects will not be detailed (indicated by number 3 in Figure 1)

Here are a few UAs, extracted from each instance of recontextualization and of which I performed the analysis. In these and in the other UAs, I sought the pedagogical features

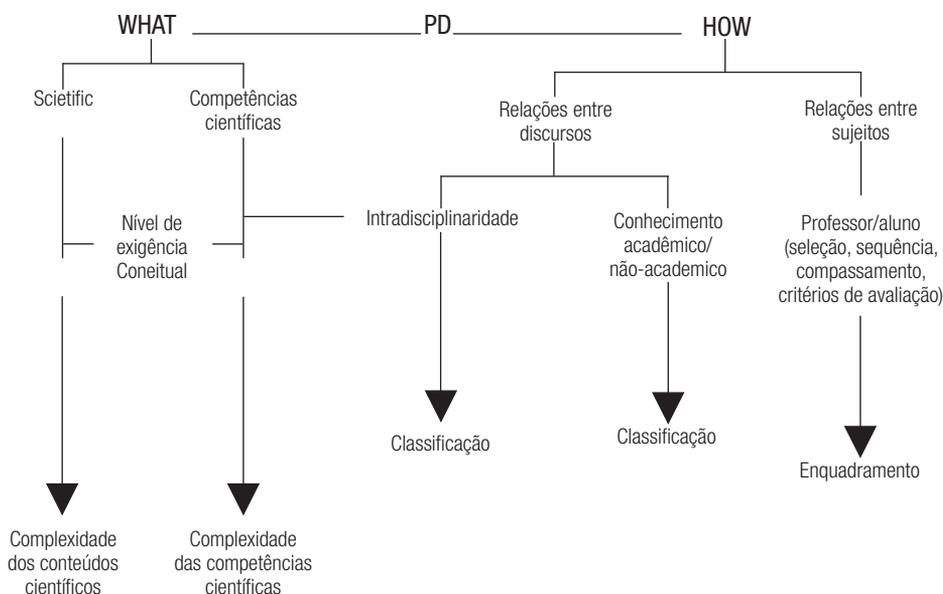


Figure 2 – Approach to the aspects considered for analysis

indicated in figure 2 (degree of establishment of intradisciplinary relations, complexity of scientific contents and complexity of scientific competences) and then I calculated the level of demand with which conceptual knowledge is treated in different instances:

Unit of analysis 7 (NCP)

Establishment of relations between the phenomena of photosynthesis, cellular respiration and combustion to explain the carbon and oxygen cycles in an integrated manner to the unidirectional flow of energy on the planet.

4- Refer to model of pedagogic discourse adapted by Morais and Neves (2003).

5- Units of analysis (UA) are one or more periods that have a certain semantic meaning.

Unit of analysis 14 (classes)

How does the centrifuge in a washing machine work? What is solid? Clothes. They accelerate the separation process.

Unit of analysis 7 (textbook)

When several substances are together, the set is called mixture. For example, when one adds a spoonful of sugar (pure substance) to a glass of water (pure substance), one obtains a mixture.

The calculation of the level of conceptual demand

A high degree of establishment of relations between the discipline contents studied, associated with the mobilization of more complex scientific contents and competences is a treatment of knowledge at a high level of conceptual demand. With regard to intradisciplinarity, this is justified because the establishment of relations between the contents of the same discipline favors the formation of an integrating view of scientific knowledge. Such a view reflects the organizational nature of scientific knowledge, which according to Bernstein is characterized by a vertical discourse, with a hierarchical structure oriented to integrate propositions to operate at increasing levels of abstraction (Morais; Neves, 2007). On the other hand, the approach of contents and more complex scientific competences allows gradually acquiring a broader and deeper view of science.

It should be emphasized that the calculation of the level of conceptual demand, according to the studies by the Group ESSA⁶ does not take into account the establishment of relations between academic and non-academic knowledge. However, in this research,

6- The procedure for calculating the composite index that expresses numerically the level of conceptual demand of the material analyzed is available in several studies of the Group ESSA, such as Calado (2007).

I considered that this pedagogical characteristic also influences the level of conceptual demand with which knowledge is treated in school. The relevance of the establishment of relations between academic and non-academic knowledge to the conceptual level at which knowledge is treated in school lies in the fact, under this approach, knowledge is treated having as a starting point what the student knows about the phenomena studied, and from there one moves on to more complex knowledge and competences. In this case, the knowledge that students have serves as a means to achieve a higher conceptual level, ensuring meaningful learning. But these relations can also mean moving very little or nothing from what the student already knows, if in the balance between academic / non-academic knowledge, the latter gains more importance than the first, or if academic knowledge serves only as a tool to improve the understanding of non-academic knowledge.

Checking how the relation between academic and non-academic knowledge is addressed in official documents, textbooks, and especially in teaching practice can shed some light on what is proposed and what actually takes place in the classroom. Thus, in the research presented here, to analyze the relation between academic and non-academic knowledge, I considered the degree of maintenance of the boundary between them, with academic knowledge assuming the highest status in the educational context.

To calculate the level of conceptual demand, I considered the degrees of complexity of scientific competences and contents and the degree of intradisciplinarity of the UAs drawn from the three instances of recontextualization in order to calculate the partial indexes for each of these aspects.

The degrees of intradisciplinarity, complexity of scientific competences and complexity of scientific contents were converted into numerical values. It is noteworthy that the lowest numerical value was assigned to very

strong classifications because they mean, from the standpoint of intradisciplinarity, the failure to establish relations between the contents of the discipline, which is associated with the approach of simpler concepts regarding the complexity of the scientific contents and the mobilization of scientific competences that require low level of abstraction. The highest numerical value was assigned to the very weak classifications, because in terms of intradisciplinarity they mean the establishment of relations between contents, and with regard to the complexity of scientific contents, they express the approach to complex concepts, and regarding the complexity of scientific competences, they express the mobilization of more elaborate competences. Thus, each UA was assigned a numerical value according to its degree of intradisciplinarity, the complexity of scientific contents and the complexity of scientific competences; then, I calculated the partial indexes of conceptual demand for the three pedagogical features analyzed.

After calculating the partial indexes for the criteria analyzed for each instance of recontextualization analyzed, I was able to reach the level of conceptual demand in full by calculating a composite index. This is calculated from the partial indexes. Thus, from the partial indexes obtained for each of the criteria analyzed – intradisciplinarity, complexity of scientific contents and complexity of scientific competences – I calculated the composite index that represents the level of conceptual demand found in each instance of recontextualization considered.

Relations suggested in the analysis of the results

During the study, it became evident the possibility of seizing three moments of the process of recontextualization of scientific knowledge through the analysis of the form of expression of the pedagogical characteristics defined in the sources – NCP and textbooks

– and the teaching practice followed. In order to identify the trend found in the process of recontextualization analyzed, I highlighted the forms of expression of each of the characteristics considered in this investigation. Thus, in the document which presents the official pedagogical discourse, the NCP / NC, it was possible to identify a concern on the part of the agents responsible for this instance of recontextualization with highlighting and prescribing for teachers: (1) attention to the establishment of relations between the contents of different topics within the sciences; (2) the mobilization of more complex scientific competences; and (3) the mobilization of less concrete scientific contents, including those that deal with the major unifying themes of science and that require a higher level of abstraction. However, with regard to the establishment of relations between academic and non-academic knowledge, in the first instance of recontextualization considered, the recontextualizing agents did not seem to care to set clear criteria for the establishment of such relations in the teaching practice.

In the second instance of recontextualization considered in this research – the textbook – I identified a disregard on the part of the author and the publisher of the three aspects analyzed. Such disregard was noticeable in (1) an unclear indication of the relations between the contents within the area of science, tending to the non-establishment of such relations, (2) a tendency for the mobilization of simpler scientific competences and (3) a tendency for the mobilization of complex scientific contents, but not enough to allow the understanding of the unifying themes of science. The relations between academic and non-academic knowledge here did not receive due attention by the recontextualizing agents either, and tended not to be indicated in the textbook.

In class, the three points considered reflected the same tendency to disregard, through the emphasis on (1) the failure to establish relations between contents within

the topic under study (2) the emphasis on the mobilization of simple scientific competences, yet tending for a smaller loss than that found in the textbook, and (3) the preferred mobilization of more concrete contents, which require less capacity for abstraction. The teacher also failed to take care of the establishment of relations between academic and non-academic knowledge, neglecting them in her/his choices for dealing with the topic under study.

Figure 3 presents an overview of these forms of expression of intradisciplinarity, the complexity of scientific competences, the complexity of scientific contents and the relations between academic and non-academic knowledge, with an indication of the partial indexes obtained and the level of conceptual demand reached, in each instance. It shows more clearly the trend of loss of conceptual demand in the process of recontextualization:

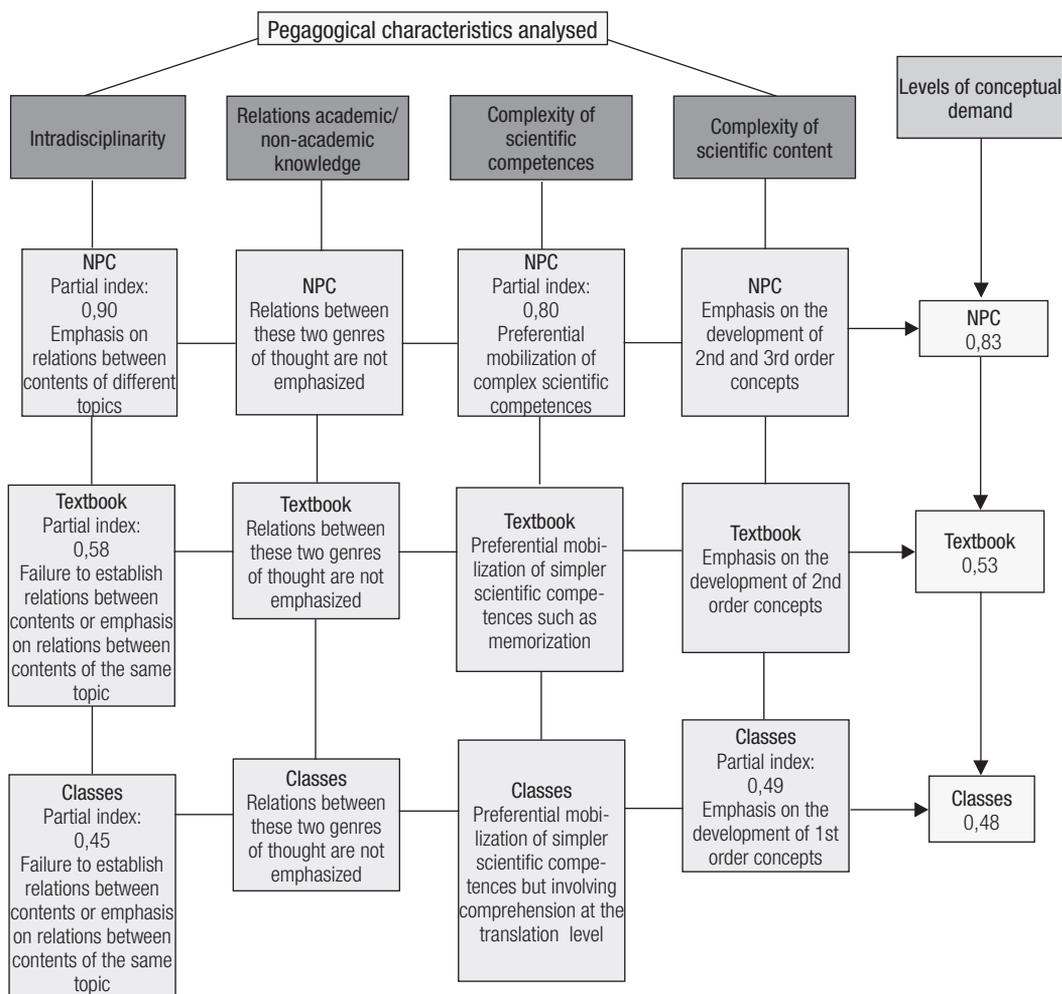


Figure 3 – Trend of the recontextualization process: partial indexes and levels of conceptual demand

It is possible first to note a sharp decrease in the emphasis on the establishment of relations between topics of natural sciences. In the NCP / NC, the partial index is very favorable and decreases gradually until it reaches the classroom, where it is very impoverished. Failure to attach importance to the integration of knowledge within the discipline under study contributes to the fragmentation of knowledge and to the establishment of a superficial level of treatment of scientific issues, which hinders making great syntheses and understanding the unifying themes of science. The direction for the great themes, aiming at developing the capacity of making more complex syntheses suggested in the NCP / NC, does not actually mark the teacher-student-knowledge relation.

On the first passage followed in this research from one instance of recontextualization to another – the passage from the NCP to the textbook – the loss in this feature is very significant. And what can explain this first trend of loss? It may have to do with a concern of the recontextualizing pedagogical agents – the publisher and the author of the textbook studied – with what is understood, in this case, as the impossibility of teachers, given their poor training, to deal with a book that leads the discussions that they will establish with their students to the unifying themes of science. If this is the case, however, in the face of teachers with serious training gaps and a book that avoids the establishment of a more relational perspective in the approach to knowledge, I fear that one is continually forming, in science classes, a view of scientific knowledge as a portion of fragmented information that can be accessed without the mobilization of more complex forms of thought.

On the other hand, regarding the level of complexity of the scientific contents selected for the teaching of science, there is a loss during the process of recontextualization of scientific knowledge. Opting for the mobilization of less complex contents – in the textbook, and even more markedly, in classes – more directly

related to the material basis on which students circulate, binds students to the understanding that they already had of the phenomena under study, possibly providing the acquisition of new vocabulary to refer to previous knowledge, but without advancing to another form of understanding of concepts that could point to the future integration of knowledge about scientific themes. Joining this to the lack of classroom situations that allow the comparison between the day-to-day knowledge of experience and that which requires a higher level of abstraction for its grasping, the configuration of a very unfavorable context to advance toward complex thought is even more evident. Thus, this loss in the level of complexity of scientific contents in the process of recontextualization also points to one of the mechanisms through which there is a reduction of the school potential to fulfill its role of raising the capacity for more comprehensive and deeper understanding of the world in which we live.

The search for the mobilization of more complex scientific competences would make sense if accompanied by the integrating approach of themes and the increasing complexity of the scientific contents treated. But also with regard to this feature, there was a loss from the analysis of NCP toward teaching practice. However, this feature was more relevant to the teacher than to the author of the textbook adopted. It is possible that the trend imposed by the type of demand emphasized in official assessments of basic education – the development of skills and competences – keeps the teacher alert to the need to create situations that allow training to have a good performance in such evaluations, even if this training resembles *training* in the sense of dressage or grooming because it is established on empty content.

Another aspect revealed by the results concerns the establishment of relations between academic and non-academic knowledge. What I could highlight is that even the NCP indications for the treatment

of this aspect have undefined boundaries and that, in the textbooks and teaching practice, such aspect is gradually neglected. Although the importance of considering the knowledge brought by the student is a recurrent issue in the discussions about education in various spheres – from those discussions that take place in the intellectual field to the most steeped in common sense – this research indicates that the way which this knowledge should be used as a starting point for discussions that advance to allow the necessary breaks between the initial explanations and the new contents to be learned is not being duly considered. The lack of definition in the different instances of recontextualization can work as an extra element to lower the complexity of scientific contents and consequently to lower conceptual demand. This is because the mobilization of students' knowledge seems to be working in fact not as a starting point, but as a limit on the approach to scientific contents, since the contents prioritized are those for which one can find examples clearly perceptible in everyday life of children.

Disregard to the need to find ways to ensure the presentation of non-academic knowledge and the essential movement of continuity and rupture with this initial knowledge, checked in the three instances of recontextualization, generate more concern about the relation with the scientific knowledge built inside schools. And this concern increases when one takes into account that these young people live in a city that offers little access to cultural goods and that, most of those children, have parents whose education level is one more factor that hinders the development of discussions that point to the understanding and use of less concrete concepts. But the dismay in the case of this research lies in the failure of the school to fulfill its social function, and not in the impossibilities of the family, since it is the educational institution that has the role of expanding cultural horizons. The fact that families have needs should not be an excuse for

the school's poor performance. On the contrary, such shortcomings represent additional factors in the composition of a context that does not value the relation with the knowledge socially accumulated and that therefore requires the school to do more to fulfill its function.

It is also noteworthy that the analysis of all the pedagogical features investigated has highlighted the ways in which the loss in the level of conceptual demand of school knowledge of science can occur, and it has allowed to say that there are many possibilities of intervention which can be developed to seek maintaining a higher conceptual level in dealing with scientific knowledge. The *training* in the sense of dressage or grooming to develop the scientific competences that are the target of official evaluations cannot guarantee by itself any increase in the ability to access more complex knowledge. It is necessary to consider the different dimensions in dealing with knowledge – relations between discourses, between subjects, between spaces – so that one can aim for universal access to “powerful knowledge”, ie, the one that allows “providing realible explanations or new ways of thinking about the world “ (Young, 2007, p. 1294).

With regard to knowledge on natural sciences, the concept advocated by this research is that knowledge represents a means of gaining access to tools, thinking skills and concepts whose mastery allows us to understand, question and make a point on the discourse of power embedded in social relations. The approach to this fraction of knowledge with a low level of conceptual demand – as evidenced in the context studied – is the restriction of the possibility of understanding the world in which we live and of the opportunities to think of another configuration of the real.

In this research, I followed a process of recontextualization of scientific knowledge that took a character of reduction, of sharp conceptual loss in relation to the knowledge from where the instructional discourse of natural sciences comes. However, the statement

of this research hypothesis does not mean that one can take such configuration as a sentence which cannot be escaped. It is certain that this is *one* way of recontextualization, not the only one, and certainly not the best. I accept the fact that the school deals with a fraction of scientific knowledge transformed in order to construct a school discipline and that,

therefore, the school does not make science. I also state the possibility of having for goal a process of recontextualization – and the school knowledge resulting from it – that takes a sense of expliciting the relations between contents studied and of prioritization of the development of scientific competences and more complex scientific contents.

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