

# Retextualizing the literary text of science communication *The periodic table* in the chemistry teaching\*

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## Abstract

Several studies have suggested that approaching texts of science communication and literary texts in Sciences teaching can pose a major contribution, since besides of allowing reflections on values and attitudes, it can also help to construct concepts, thus contributing to achieve scientific literacy. Having such perspective in mind, it was elaborated and applied a didactic sequence (DS) denominated *Chemical Elements in nature and in the society: the socioenvironmental disaster of the Doce River*, which was applied in the first grade of High School in a public school in the city of São Paulo. After analyzing and selecting some literary texts of science communication (LTSC), excerpts of some works have been addressed in different teaching activities. In this article, we analyzed discursive interactions observed in the classroom after approaching some chapters of the *LTSC The Periodic Table* by Primo Levi. Among the results of the application, it can be pointed out the way that both students and the teacher retextualized portions of the work, and moments of initiation and assessment of interaction by the students were observed, a not common discursive interaction pattern in the classroom. Furthermore, while addressing LTSC chapters in the classroom, it was verified the pedagogic aim of the metacognition, since it was noted discursive sequences, where it happened reflections on what is related to the properties of chemical elements. Those results suggest the didactic potentialities of the LTSC in a Chemistry classroom.

## Keywords

Scientific literacy – Periodic law – Didactic sequence.

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\* English version by Márcia Maluf. The translator and the author take full responsibility for the translation of the text, including titles of books/articles and the quotations originally published in Portuguese

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## Introduction

In the classroom, it circulates several discourses linked to contemporary cultures to approach the scientific and technological culture that constitute the present culture. The texts of science communication present legitimacy (GOUVÊA, 2015). According to the notes by Grillo (2006), different textual genres broadcast science communication discourses, such as an article, manuals, classes, and others. Among those genres, this article deals with the literary genre.

For Zanetic (2006), as Science influences literature and vice-versa, approaching literary texts in the Sciences teaching can pose contributions, once it can favor a more integral education to students. Added to this, for Perissé (2003), a literary paper, whenever approached in an interdisciplinary way can contribute to the development of an aesthetic and critical sense, important to enlarge the reading of the world by the students. Other authors as Coelho and Salomão (2014); Almeida and Ricon (1993); Piassi (2015); and Groto and Martins (2015) also present similar position. For instance, Piassi (2015, p. 39) argues that literary works including those that do not explicitly present Sciences contents can represent benefits to the scientific education, once they consist of cultural products that according to the author “opens a perspective before the world that is not overlapped to the scientific rationality” and “enhances the scientific thinking”, as it is presented as another way to reflect about the reality (PIASSI, 2015, p. 39).

Furthermore, we consider that approaching texts of such nature can contribute to the scientific literacy, thus enabling the individual to not only decoding scientific information, but also to reflect, discuss and make responsible decisions (SANTOS, 2007), once that by presenting scientific elements immersed in sociocultural contexts favor readings related to the scientific knowledge with social practices.

However, it is required to consider that to approach literary texts of science communication (LTSC) in the teaching, is not trivial to be accomplished, mainly when it is observed that many of those texts were not structured to have the classroom as circulating sphere. For Cunha and Giordan (2009), this is an aspect that must always be observed when planning to develop teaching activities that include science communication materials, as upon modifying the circulating sphere, the meanings are also altered.

In this sense, when texts of such nature are inserted into the school context, we believe that the teacher is in charge to perform moves of discursive adequacy of the discursive material presented to such new circulating sphere. We consider that this process can be observed in the retextualizing operations accomplished both by teachers and students in the classroom.

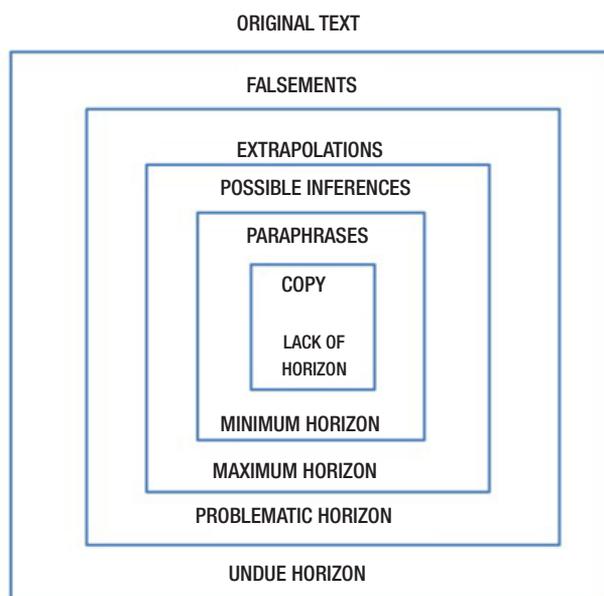
According to Marcuschi (2007, p. 48), retextualizing is related to the process of text conversion that include conversion of the speak to the writing and vice-versa, of the speak to the speak and of the writing to the writing where it is employed high complex operations that interfere in the senses and codes used. To the author, in this process it occurs the production of a new discourse in a new genre, once it is not a matter of a mere repetition of the source-discourse. As retextualizing is consisted of complex operations often performed in the daily life, as for instance, when someone reports to other what he just read in a newspaper or when a student performs written notes of the oral presentation

of the teacher, such process should not be underestimated in teaching, as it presents a major importance to the construction of the meanings, once for it to occur the retextualizing, it is presupposed that there is a recontextualizing, recreation and reconstruction of the source-discourse (MARCUSCHI, 2007), and this is only possible by means of some level of appropriation of the source-discourse by the interlocutor.

To analyze the level of understanding of the discourse, Marcuschi (2008) considers the understanding as a process that includes at least four aspects: strategic, flexible, interactive, and inferential. As to the strategic aspect, it is worth mentioning that the understanding is not an activity presenting automatic results when following formal and logic rules, although there are options to improve communication. As to the flexible aspect, Marcuschi (2008) advocates that there is not a single orientation to the understanding. To the author, orientations depend both of the discursive contexts and the interactants. Related to the interactive aspect, the central idea is that the understanding is negotiated, not unilateral and co-constructed, and this occurs even when reading written texts. Finally, related to the inferential aspect, understanding is not deemed a decoding activity; the production of sense occurs when the knowledge of several sources related to the cultural repertoire of the reader is the result of several ways of thinking (MARCUSCHI, 2008).

In this sense, it can be noted that it is possible to have several readings from a same text. Nevertheless, it is worth pointing out that upon considering the text as it could be interpreted from several ways of Reading, it is pondered that it can be performed readings that are not coherent to the propositions presented in the text. In order to analyze those processes, Marcuschi (2008) proposes the notion of horizons of textual understanding. Figure 1 below presents a flow chart synthetizing such notion.

**Figure 1** – Horizons textual understanding



Source: Marcuschi (2008, p. 258).

In the Figure 1 it is observed five perspectives or Reading horizons: lack of horizon, minimum horizon, maximum horizon, problematic horizon, and undue horizon. The first is related to the repetitions in the text; the second is related to paráfrases which it would be the repetition by using other words; the third is related to the inferential activities, in which it is related information of the own text and others from the cultural repertoire of the reader and it is accomplished the reading between lines of the text; the fourth is about the extrapolations, which in the school level is related to the sphere of the personal opinion that according to Marcuschi (2008, p. 259) goes beyond the information present in the own text, and “is located at the edge of the interpretability”. Finally, the fifth horizon is about readings inconsistent to the meaning of the text (MARCUSCHI, 2008).

Within the Sciences Teaching, a study accomplished by Almeida and Giordan (2014) analyzed retextualizings produced in the formal teaching. The authors analyzed that process produced by children after Reading an article from the magazine *Ciência Hoje das Crianças* (CHC) [Science of the Children Today] and verified that in the retextualizing process, the activities of *saying the text* performed by the children, it was characterized as a metalanguage exercise, and this poses a significant contribute to the scientific literacy of the children.

It is worth mentioning that it is of great value to consider the interactions in the classroom, as they, especially the discursive ones are imbricated in the process of constructing meanings, in such a way that analyzing those information is important to understand how the meanings are constructed within the classroom (MORTIMER; SCOTT, 2002). In this sense, Cunha and Giordan (2012) argue that those interactions that are also cultural are essential in the process of construction of meanings, since it is through them that the individuals reinterpret and create meanings to the information and concepts.

By considering such perspective, this paper presents analyses and reflections on the retextualizing operations from excerpts of the work *The Periodic Table* by Primo Levi, performed both by teachers and students in the Chemistry classes in High School environment. This way, in the next section we will approach details of the methodology we adopted for structuring teaching activities along with that work, and to analyze the outcomes attained.

## Methodology

In order to approach excerpts of the work *The Periodic Table* by Primo Levi in the classroom within the scope of a mastership research, we elaborated a didactic sequence (DS) lasting twelve classes denominated *Chemical Elements in nature and in society: the socioenvironmental disaster of the Doce River*. It is worth pointing out that the option to insert activities on the LTSC in a DS is due to the fact that we considered it was required to create a context to approach the work to get a connection to other purposes of the teaching, as foreseen in the Chemistry curriculum. The DS was elaborated following guidelines of the Topological Teaching Model (TTM) (GIORDAN, 2008) foreseeing variations in the communication approaching and in the teaching supports. Therefore, besides the literary text of science communication (LTSC) *The Periodic Table*, it was also approached excerpts

of other two LTSC, besides of having used videos from newspapers reportages, cards of chemical elements, charts to represent periodic properties, experiments and other supports.

For the activities involving the LTSC, it was adopted an increasing level of complexity of the activity, and also the language adopted in the work. Therefore, the activity with the LTSC *The Periodic Table* was applied at the end of the DS, as it consists of the LTSC with major complexity in the language, and by presenting notably more literary style than the others and having a more complex narrative context. Furthermore, the activity performed was that demanding a greater autonomy from the students, presentation of seminars based on previously elaborated reviews on the excerpts of the work. Among the twelve chapters that compose the LTSC *The Periodic Table*, five chapters were selected to be approached in the DS: *Iron, Nickel, Gold, Mercury* and *Lead*. These chapters were selected because they are related to the central theme of the DS, mining. From those chapters, the first three are autobiographic, and the others are fictional.

The DS elaborated was applied along the first semester of 2016 in a public school of the municipal educational network in the city of São Paulo. Every DS class had audio and video recorded, and to record the classes, we followed the methodology proposed by Giordan (2008). For this, two cameras were used to capture the audiovisual imaging, and wireless microphones for capturing the audio. One of the cameras was fixed in the background of the classroom and the other on the side, which was moved as necessary to capture certain interactions in the classroom. One of the wireless microphones was fixed on the lapel of the teacher, and the others were distributed on the tables where the students were seated in group.

After the video recording of the classes, they watched them several times in order to identify the predominant themes and teaching purposes of each part of the class to be mapped later with segmentation of classes in teaching episodes and their respective sequences of discourse. For this, we were guided by indications of Martins (2006), who considers that the events indicated on a map are the result of the interaction of the researcher with the empirical material when it is considered the interest and the theoretical reference adopted in the research.

By using those mapping, some teaching episodes involving the LTSC approaching *The Periodic Table* in classroom were selected. In order to analyze the episode aiming to check which retextualizing operation did occur, the discursive interactions were transcribed, following the methodology adopted by Almeida and Giordan (2014). It is worth pointing out that in order to transcribe the discourse, we tried to keep the orality features such as hesitations, pauses, and conversational markers such as “see?” and repetitions in the discourse (KODIC, 2008; MARCUSCHI, 2007), as we have considered that the suppression of some of those elements could result in a retextualizing with a change in the meanings (MARCUSCHI, 2007). Therefore, we adopted (/) to indicate a small pause, (//) to indicate that a line was interrupted by the next line, and double brackets (( )) to show some contextual comments. We analyzed the transcriptions by means of comparing the discursive interactions observed in the classroom with the source-discourse of the LTSC. For this, we compared the excerpt from the LTSC approached in the DS, with the discursive interactions performed both by the teacher and the students in different moments of the reading.

In order to compare the excerpt from the LTSC with the discursive interactions on the text approached in the classroom, we analyzed the retextualizing process by means of the retextualizing operations proposed by Marcuschi (2007): *elimination, addition, substitution, and topic reordering*; and the proposals by Silva (2013): *condensation, construction of one's own opinion and resuming*, which were used by Queiroz, Cabral and Silva (2017) to analyze retextualizing processes employed in the oral exposition of Chemistry graduating students.

Furthermore, due to the specificities of the classroom context, discursive interactions have been analyzed by means of communicative approaching categories (*interactive of authority, dialogic interactive, non-interactive of authority, and dialogic non-interactive*) and of the I-R-A interaction patterns (initiation of the teacher, response from the student, and assessment of the teacher) forecasted in the analytical tools by Mortimer e Scott (2002).

## **Results and discussion**

We analyzed the discourse from a teacher and from the students, in order to check how it occurred the retextualizing operations of the LTSC discourse *The Periodic Table* by reading it, having in mind the retextualizing concept defined by Marcuschi (2007). We deemed important to analyze the retextualizing, once that whenever scientific materials are included into the school context, the teacher is in charge to perform adequacy discursive moves of the science communication discourse in the new circulating sphere (CUNHA; GIORDAN, 2015). It is worth pointing out that in the cutout of this paper, we only analyzed retextualizing operations of the text written for the spoken one.

As we described previously, five chapters of the LTSC were selected for the students to present seminars; the chapters entitled: *Gold; Nickel; Iron; Lead and Mercury*. Among the seminars presented, we only selected in this paper teaching episodes related to the chapter *Iron*, since it was in the episodes related to that chapter that we found a major amount of retextualizing operations.

That seminar was presented by a group of students who used photo slides to support their oral exposition. Along the presentation, the students remained all the time in front of the classroom taking turns, and while one of the students was making her oral exposition, other student also participating in the group was passing the slides. Some moments, without interrupting the presentation, the teacher asked for some students who were having parallel conversations during the presentation to remain in silence. Nevertheless, it is worth pointing out that the students were not limited to read the text or the slide. During the presentation of the students, we observed several retextualizing operations that it will be analyzed through the charts below presented comparing the source-discourse with the retextualizing performed by the students.

**Chart 1** – Retextualizing the excerpt of the chapter Iron

Source-Discourse	Retextualizing
<p>Beyond the walls of the Chemistry Institute, it was night, the night in Europe: Chamberlain returned mistaken from Munich, Hitler entered Prague without firing a shot; Franco took Barcelona and dominated Madrid. Fascist Italy, a minor pirate, occupied Albania [...]</p> <p>But within those thick walls, the night did not penetrate; the own fascist censorship, master-piece of the regimen kept us apart from the world in a white anesthetic limbo. [...]</p> <p>There were easy and frank elements unable to be hidden, like iron and copper; others, insidious and elusive, as the bismuth and cadmium. There was an old and reflected systematic method of research, a kind of comb and compressor roll from which nothing could escape (theoretically), but I would prefer to invent each time my way with fast and extemporaneous war incursions moves instead of the extenuating war positioning routine: to sublimate the Mercury in small drops, to transform the sodium in chloride, and recognize it in crystallized fragments under a microscope. [...]</p> <p>A few months before, it had been proclaimed racial laws, and there, I was also becoming a solitaire [...]</p> <p>Between us, Sandro was a solitaire. A medium height, thin, but muscular young man that not even in colder days used to wear a jacket. He came to the classes wearing fake velvet beaded pants, rough wool socks, and sometimes a small black coat that reminded me Renato Fucini. He had big calloused hands, a bony and rough profile, sun tanned face, low forehead under the hairline, a hair that he used very short and cut to the bone: he walked in a peasant's long and slow step [...]</p> <p>His father died when he was a child; his family was simple and poor, and when he was a active young man, they decided to send him to study, in order to bring home some money: he had accepted that with a Piedmont's seriousness, but with no enthusiasm. [...] He selected Chemistry because it seemed to him better than the other course: that was a profession that treated things possible to see and touch, a less tiring way of gaining the bread than being a carpenter or a peasant [...]</p> <p>He was born in a brotherhood, and as for me, he started in frantic times. Sandro seemed made of iron, and he was linked to the iron through some of his ancient kinship: he told me that the fathers of both parents had been boilers men (<i>magnín</i>) and smiths (<i>fré</i>) in the canaves valleys, manufacturing nails in the coal forging, they strapped the wheels of cars with incandescent rims, they beat iron plates to the point of deafness: and he himself, when he used to discover a red shaft of iron in a rock, it looked to him as to find again a friend. When the winter arrived, he used to tie his skis on his rusty bike, leaving his home soon in the morning, cycling up to the snow having no money, with an artichoke in a pocket and the other full of vegetables: he turned back at night or even in the next day, sleeping on the hay of the shelters, and the more the storm let him hungry, the happier and with better health he was [...]</p> <p>Sandro was Sandro Delmastro, the first combatant from the Piedmont Military Command of the Action Party who died.</p>	<p>Student 1. Well, so, it is... our text mentions the hay. (impossible to hear, several students talking at the same time) it is the quotation of several historical events that occurred that time in Primo Levi's memories, such as the fascist Italy and a brief mention to Hitler. We also observed a lot the scenario where the event happens. It is... just in the beginning, we see that the story happens in a Chemistry Institute... a Chemistry Institute, that Primo Levi's story goes on, and also all the relationships both with students and personal, which are presented within such / such scenario.</p> <p>Student 2. It is, along the text, we perceive a kind of visit of a man named Sandro, who was a kind of Levi's partner, who was a lonely man, strong, with a unique and strong personality / and he believed that for everything it always had hope.</p> <p>Student 3. Well, why Sandro's profession? He chose Chemistry because it was a job that could change things, the things could be modified, and also due to his economic situation. That, as Sandro came from a poor family, he..., Chemistry would provide more resources, it was easier being chemist than a mere peasant working on a field and in plantations.</p> <p>Student 4. Primo Levi described Sandro as an independent person. He knew how to handle things, and he used to be concerned with the (inaudible) to himself. Then, the excerpt mentions: "Sandro appreciates being made of iron, he was linked to the iron by an ancient kinship: the fathers of his parents were boiler makers and smiths".</p> <p>Student 1. Well, Sandro's entering in the story is extremely important, since both the issue of quoting the iron / and his entrance had a whole context for the story to go on. It is.../ So, besides of Sandro entering, explaining and helping Levi to move forward, the new relationships with their ideas to the power, it is to follow / the right profession. It is the connection to historic events, always intercalating between Primo Levi and Sandro relationship. It is, they lived in an extremely strict time. Due to this, events like the fascist dictatorship, the dictatorship is... and the Second World War are... they were of utmost importance to their relationship to go on. And also, the iron quotation and Sandro's issue is to differentiate himself from the remaining people, from the rest / from the connection between Primo Levi and Sandro. Unfortunately, he was killed in action due to those historic events and had one, we cannot say tragic end, but / it was the end of that relationship, but it was pointed out by Primo Levi as extremely important for his life. And we can also perceive that along the text, it is mentioned several elements and chemical reactions which are not exactly connected to the iron, but serving in this story to be able to appear that both Sandro and Primo Levi were linked to the chemical elements and its reactions.</p>

Source: the authors.

In Chart 1 it can be noted that each student made a non-sequential retextualizing of the chapter. It is worth pointing out that the paragraphs are not sequential, and due to this, we put brackets in the chart with reticence to indicate suppression of portions not quoted by the students. In this case, the students performed the retextualizing operation of *topic reordering* proposed by Marcuschi (2007). In the retextualizing performed by the students, it can be noted that they tried to keep fidelity to the text, as they do not modify the sense presented, and this is expected, according to the notes performed by Marcuschi (2007) on the retextualizing. For instance, when student 3 described Sandro's motivations of becoming a chemist, she emphasized the economic aspect that also occurs in the LTSC. However, it is worth pointing out that not every information presented in the source-discourse of the LTSC are presented by the students; it also occurs *elimination* and *condensation* retextualizing operations. For instance, when they approached features of the character Sandro, student 3 described him as a "lonely man, strong, with a unique and strong personality", and it is not mentioned other features presented in the source-discourse, such as physical height and type of clothes he used to wear. In that speaking shift it is also observed the *addition* retextualizing operation, as the student 2 reported that the character Sandro was hopeful. Nevertheless, there is no mention in the text of such feature in the character.

It also worth pointing out weightings made by student 1 when she explains the role of the character Sandro in the story, as well as the relationship of the character's features with the events narrated in the story, as for instance, when she mentioned that the time experienced by them was extremely strict. In this case, it occurs the retextualizing operations of *condensation* and *elimination*, since in the source-discourse it is presented descriptions of some fascist behaviors, such as the enactment of racial laws. Furthermore, even with several mentions in the source-discourse to chemical concepts, in the retextualized operations, the most outstanding aspect quoted by the students is the friendship between Sandro and Primo Levi, and not so much the chemical concepts. Only in the end, student 1 mentioned that both Sandro and Primo Levi would be linked to chemical elements. In those cases, it is also verified the *condensation* and *elimination* retextualizing operations.

Another aspect which is also worth mentioning is the organization of the texts in the slides, since they have been assembled retextualizing the LTSC chapter. According to Marcuschi (2007), the retextualizing occurs not only in the textual to the oral genre, but it also occurs in a textual genre to other textual genre, from an oral genre to other oral genre, and from an oral genre to a textual genre.

And also based on the analysis of the information presented, it is worth pointing out that the students began their oral exposition with an opening where it is introduced some considerations on what was presented. This suggests that the students have demonstrated mastering the structure of an oral academic exposition, once the *opening* is part of its structure, according to the notes by Silva (2011). According to the author, the structure of an oral academic exposition is: *opening; development of the subject; conclusion, and closing* (SILVA, 2011). In such perspective, the speeches of students 2, 3, and 4 are related to the step *development of the subject* in the oral academic exposition, as the students explained the information presented in the text.

In such sense, it is worth pointing out that the last speech of student 1 occurs as a continuity of the oral exposition step of *continuation of the subject*. At the end, the student achieves the *conclusion* step, when she declares that:

And we also realize that we can see that along the text, it is mentioned several chemical elements and reactions, which are not exactly connected to the iron, but serving in this story to include that both Sandro and Primo Levi were linked to chemical elements and their reactions. (Student 1).

Based on the students' weightings, the teacher performs some considerations, also retextualizing the chapter of the book. In this case, we observed that the teacher initiates the *closing* step in the oral exposition. Chart 2 below shows a comparison of the discourse between the teacher and student 1, and the source-discourse of the LTSC.

**Chart 2** – Retextualizing excerpts from chapters *Iron* and *Nickel* from the LTSC *The Periodic Table* performed by the teacher and student 1

Source-discourse	Retextualizing
<p>Not here: here the thing got serious; the confrontation with the Matter. Mother, with the enemy-mother was harder and closer. At two o'clock in the afternoon, Professor D., with an ascetic and absent-minded face distributed to each of us one exact gram of a certain very fine powder: for the next day, it was necessary to complete the qualitative analysis, which means, to report which metals and non-metals it was contained there. To make a written report in a dissertation way stating 'yes' or 'not', why it was not admitted any doubts or hesitations: each time there should be a choice, a deliberation; a mature and responsible action for which fascism had not prepared us, and exhaling a good, dry and clean smell. [...] (Chapter Iron).</p> <p>Between us, Sandro was a medium height, thin but muscular lonely young man, who not even in colder days used to wear a coat. He used to come to the classes using fake velvet beaded pants, rough wool socks, and sometimes, a small black coat that reminded me Renato Fucini. [...] (Sandro seemed to be made of iron, and he was linked to the iron by an ancient kinship: he told me that the fathers of his parents have been boilers (magnín) and smiths (fré) from the canaves valleys, manufacturers of nails in the coal forge; they strapped the wheels of cars with incandescent rims, beating the iron plate to the point of deafness: and he himself, whenever discovered a red shaft of the iron in the rock, it seemed to him to find again a friend. [...] (Chapter Iron).</p> <p>He used to keep in a drawer a finely ornate diploma in which it was written in elegant characters that to Primo Levi, of the Jewish race it was being conferred the Chemistry graduation with the highest score and praise: then, this was an ambiguous document, one half glory and the other a mock, one half absolution, the other a conviction. It was kept inside that drawer since July of 1941, and in November it was finished; the world was precipitating itself in the catastrophe, and around me there was nothing happening. (Chapter Nickel).</p>	<p>Teacher. And there is a part there when you perceived that there is a strong connection of this story with the story they told about the nickel, because when they talked that he got into college, and there was a professor who was super strict and that he should make the separation, to make quantitative analyses, he did not accept less than excellence, right? All this construed the strong chemical knowledge in Primo Levi, that later after his graduation, when he talked about his diploma kept in a drawer since 1941, he started using the chemical knowledge from college to extract from there the nickel and other things.</p> <p>Student 1. And there is also the issue of Sandro being so ((impossible to understand)) in nature//</p> <p>Teacher. Yes, as in the beginning, Sandro was a very shy person, he seemed to know nothing, but as the time passed by, he started showing to be a very strong person. / Then the iron/ Then we go, all that story of Sandro's tenacity, his hardness before life in a very difficult context; and he made an association of Sandro's life, Sandro's past for everything he had to overcome, he even tells that he was wearing pants that looked like velvet, and so,, that Sandro enjoyed sports very much, right? He enjoyed skiing and performing other activities. //</p> <p>Student 1. He describes a bit of Sandro's life in order to be able to //</p> <p>Teacher. Yes. He thinks with admiration, right? That he, he had with Sandro, right? And this is why the chapter is denominated / iron, right? Not the chemical element iron, where the major part of you perceived that the chapter, despite of bringing, the chapters despite of bringing chemical elements, it does not speak about the chemical element per se//</p> <p>Student 1: These are truly associations, right //</p> <p>Teacher. Yes, exactly; he uses chemical elements to describe situations, persons, facts in the context of his life, which is a reflection of the properties of the elements within the context that persons are living in this event, the Second/ World War.</p>

Source: the authors.

By analyzing Chart 2, it can be observed that in the retextualizing performed by the teacher, Chemistry aspects are emphasized, which were not mentioned by the students, the quantitative analyses performed. In this case, *addition*, *topical reordering*, *elimination*, *condensation*, *substitution*, and *resuming* retextualizing operations of are noted. The *resuming* operation is noted in every speaking shifts, as in the process of closure, the teacher and the student return to several previously mentioned themes. The operation of *substitution* is observed when the source-discourse uses the term qualitative analyses, but in the teacher speech, he substituted the term by quantitative analyses. The *condensation* and *elimination* operations are evidenced when the teacher quoted the processes of chemical analyses employed, which in the retextualized discourse by the teacher are less detailed than in the source-discourse. As to the topic reordering, it occurs in every speaking shift, once the interlocutors are not limited to follow the linearity of the narrative presented in the source-discourse, so much so that in the retextualizing, it is related information present in other text, in this case the chapter *Nickel* of the LTSC, in a retextualizing process of *addition*.

Also, it is worth pointing out in Chart 2 that the fact that the interventions of the student are made by means of an interruption of the teacher's speech, and although her speeches are also interrupted by the teacher, these interventions contribute for the retextualizing. For instance, when the teacher asserts that the LTSC chapters do not approach the chemical element per se, the student interrupts his speech asserting that they really are associations. In this case, it can be noted the *construction of own opinion* retextualizing operation, suggesting a critical appreciation of the text. In this scenario, we consider that the fact of a student interpreting in a coherent way the metaphors present in the text relating them to the chemical knowledge when explaining the comparisons present in the LTSC related to the properties of the chemical elements with the characteristics and conditions of the life of the characters, this suggests signs of scientific literacy, once according to the perspective of scientific literacy adopted by Santos (2007), under which we also are guided, it can be said that the literacy occurs whenever the students incorporate scientific knowledge, and mobilizing them in their social practices, and in this case, the social practice to which we refer is the oral presentation performed in the school environment.

After the interruption, the teacher complies with the comment made by the student and closes the discursive sequence arguing that the chapters of the LTSC bring reflections on the properties of the chemical elements. In this case, we consider that the reflections indicated by the teacher on the properties of the chemical elements can be classified as one of the pedagogic purposes of using metacognition supports for science communication, raised by Lima and Giordan (2013).

Added to this, it is noted that the teacher makes use of the *interactive of authority* communicative approaching to retextualizing the text, and this suggests a specific way to adapt the discourse of the science communication in the school sphere, and this is in accordance to the ponderations made by Almeida and Giordan (2014), who advocate that the retextualizing of science communication texts trend to reproduce an authority discourse, once the reference of the discourse of science communication is the scientific discourse.

However, the teacher did not retextualize only excerpts of the chapter Iron from the LTSC, but he also retextualizes excerpts of the chapter *Nickel*, aiming to indicate for the students the relationships between texts. In such discursive interaction, it is observed an approaching with an inversion of the I-R-A triad, as observed by Candela (1999), because it is noted to some extent, a contravention to the authority of the teacher, as the student interrupts the teacher, implicitly assessing his comments.

After the retextualizing, the teacher asks the students about their difficulties in reading the text, as it can be observed in the discursive sequence presented in Chart 1 below.

**Chart 1** – Discursive sequence 5 of episode 9, classes 11-12 – Assessment of the chapter *Iron*

Speaking shift	Initial Time	Transcription	Comments
1	01:00:15	Teacher. Did you find the text complicated in the beginning, it took you too long to understand what, who was the iron, why the iron?	Students are paying attention to the students stand in front of the classroom.
2	01:00:21	Student 1. No. In fact, / his text is complex, but even though, after a second reading you are able to perceive points with connection, why / the iron? Then, the association of characters in the story is quite interesting.	
3	01:00:39	Teacher. Beautiful. Thanks.	At the end, students start to clap their hands to the students and the teacher follows the clapping.

Source: the authors.

As it can be observed in the discursive sequence on Chart 1, the student does not deny the complexity of the text, but assess it as interesting by what she denominates “associations of characters”, performing the *construction of own opinion* retextualizing operation. Through the quality of the retextualizing performed by the students along the oral exposition, it can be noted a high level of understanding of the text as the notion of horizons of textual understanding proposes (Figure 1) elaborated by Marcuschi (2008), related to the ways of reading a text. It is noted that they make inferences and related the information present in the text, and this comes close of the reading perspective of maximum horizon of textual understanding proposed by Marcuschi (2008). Added to that, it is not noted in their speeches extrapolations contradicting the sense of the source-discourse. However, those results also suggest some difficulties in understanding, because in the retextualizing performed by the students as to the chemical concepts, it is more frequently observed *condensation* and *elimination* retextualizing operations.

## Final considerations

In our analysis, we evidenced episodes involving reflections about properties of the chemical element Iron, suggesting a didactic potential of the LTSC. For this, both the students and the teacher performed retextualizing processes where it has been observed the retextualizing operations proposed by Marcuschi (2007) *elimination*, *addition*, *substitution*,

and *topical reordering*; and the proposals by Silva (2013), *condensation*, *construction of own opinion* and *resuming*. Among the retextualizing operations, those that more frequently occurred were *elimination* and *condensation*, suggesting difficulties to interpret some concepts narrated in the text. However, even upon the difficulties observed, we consider that the diversity of the retextualizing operations found as well as the occurrence of the *construction of own opinion* operation are evocative of the LTSC contributions to the scientific literacy process of the students.

In the retextualizing observed in the discursive interactions between students and the teacher, it was used the communicative approaching of the *interactive of authority*, and in some interactions, it was observed the I-R-A triad; in one of the interactions, it occurred something close to the inversion of the triad, in a similar situation to that described by Candela (1999). We consider that those results are coherent with the records made by Cunha and Giordan (2015), indicating that to approach science communication supports in the classroom, it is necessary to perform adaptations, once the science communication discourse is different from the school discourse. In this case, we believe that the nature of the interactions observed is indicative of the adaptation of the science communication discourse. Furthermore, those results are also coherent with the indications made by Almeida and Giordan (2014), who advocate that retextualizing texts of science communication usually reproduces an authority discourse, once the reference of the science communication discourse is the scientific discourse.

In a general way, the retextualizing operations presented on the chapter *Iron* suggest work potentialities of this LTSC in Chemistry classes, as the text propitiates reflections on the properties of chemical elements upon relating properties of the iron with Sandro's personality, what it was perceived by the students. Those elements can be deemed one of the pedagogic purposes of using science communication metacognition supports raised by Lima and Giordan (2013).

Having in mind those results, we consider that the text can serve as source to problematize the properties of chemical elements and their respective applications, and they can also contribute to increase the cultural repertoire of the students, defying them to read and interpret more complex textual genres that are not present in their daily life, thus contributing to the scientific literacy process of the students.

As a possible unfolding of this study, we consider that in future papers, analyses can be accomplished of the written productions of the students related to the LTSC, also approaching the notion of retextualizing. It is likely that those analyses can supply even more clues on the potentialities and limitations of the LTSC as cultural tool approached in teaching contexts.

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