Preconceptions of science shared by students from a public rural school in Brazil*[1]

Rosielson Soares de Sousa[2]
ORCID: 0000-0002-1370-407X
Wagner Rodrigues Silva[3]
ORCID: 0000-0002-3994-1225
Cristiane Carvalho de Paula Brito[4]
ORCID: 0000-0002-7210-6635

Abstract

This article aims at discussing discursive representations of science shared by students from a 7th-grade class at a rural school in the Northern Region of Brazil. The research draws on discourse perspectives of language and Applied Linguistics-oriented science education studies based on theoretical assumptions of science teaching and literacy studies. Data consist of semi-structured interviews with nine students, all of which were transcribed and organised into discursive sequences pointing to enunciative patterns. Their utterances evoke two major discourses: a "dominant science discourse", which represents science practices associated with the natural sciences and excludes the social sciences and language studies; and a "copying discourse", which relates to typical school tasks, such as research tasks that assume students' learning through information copying. The present analyses contribute to challenging naturalised discourses about science in basic education and eventually to fostering science education for and amongst the social actors at school. A critical approach to teaching (one based on various research practices) can help students find meaning in the instructional contents addressed in the various curricular activities.

Keywords

Discourse – Elementary School – Science Education.

***** English version by Igor Antonio Lourenço da Silva. The authors 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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2- Universidade Federal do Norte do Tocantins (UFNT); Rede Municipal de Ensino de Palmas. Palmas, TO, Brazil. Contact: rosielson.soares@hotmail.com

3- Universidade Federal do Tocantins (UFT). Palmas, TO, Brazil. Contact: wagnersilva@uft.edu.br

4- Universidade Federal de Uberlândia (UFU). Uberlândia, MG, Brazil. Contact: depaulabrito@gmail.com

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In Science, we study about water, soil, er... the human body.
The human body parts. Science fair projects, we do a lot.
And those science classes we use to understand
more about the science the person is explaining.[5]
(Student LS, 7th grade, Q1P7R29)

Introduction

The epigraph, uttered by an elementary student from a rural school, is a call for investigating conceptions of science in his educational context. In this article, we set out to understand how some elementary students perceive science in its vast and multiple dimensions. The representation of science in the epigraph points to bodies of knowledge or objects of investigation from the natural sciences, especially in reference to school activities that include science classes and science fairs.

This suggests that we have inherited a notion of science. But what notion is this? To answer this question, we identified discursive representations of science in utterances produced by elementary students in the 7th grade at a rural school. The word "preconceptions" used in the title of this article is related to this study's being part of the ConGraEduC project[6], which has concluded its first stage (i.e., producing teaching materials) and is now carrying on interventional research. We expect that upon our interventions, students give new meanings to their initial preconceptions of science.

In this study, we establish some interfaces between Applied Linguistics (AL) and Discourse Analysis (AD). In embracing their shared epistemological paths, we take a critical, culturally sensitive approach to rural students' representations of science. More specifically, we investigate these students' stance taking as utterers by identifying some discursive representations in and through language materiality.

The epigraph seems to indicate that students' representation is that of science as a priori only accessible by a specific group, namely the scientists who manipulate chemical formulas and human bodies. However, the pedagogical approach to science education in our project aims at providing the ordinary citizen with democratic access to plural scientific knowledge, which includes linguistics and several other areas of knowledge (SILVA, 2019, 2020a).

This article consists of 4 sections, in addition to this Introduction, Final Remarks, and References. In section 1, we share some of the theoretical assumptions of our approach to science education, which is also based on literacy studies. In section 2, we provide the theoretical scope used to design and analyse our corpus. In section 3, we describe

5- Original in Portuguese: Ciências, a gente estuda é sobre a água, o solo, é... os corpo humano. As partes do corpo humano. As feiras de ciências a gente faz muito. E essas aulas de ciências que a gente usa para entender mais sobre a ciência que a pessoa está explicando.

6- Developed by the research group Práticas de Linguagens (Practices of Languages) – PLES (certified by the National Council for Scientific and Technological Development – CNPq and Universidade Federal do Tocantins – UFT), the project *Grammatical Awareness through Science Education* (funding CNPq 441194/2019-2) aims to promote and investigate research practices in Portuguese language classes. The project involves researchers and high school, undergraduate and graduate students from three public educational institutions in Brazil: Universidade Federal do Tocantins (UFT), Universidade Federal do Norte do Tocantins (UFNT) and Instituto Federal do Tocantins (IFTO). The project was approved by the UFT Research Ethics Committee (Approval No. 3,457,383). For further information, please access: wagnerodriguesilva.com.br/labgram.

the methodological procedures used for collecting and processing data. In section 4, we exemplify and discuss some of the students' representations of science.

Science education at school

Approaching science education at school can help students find meaning in the instructional contents addressed in the various curricular activities. This can be attained by a teacher who creates educational situations – or "educational practices", quoting Freire (2008) – that help students navigate through the school grades as citizens, i.e., as conscious subjects[7]. This process enables the learner to establish their own tracks or paths of knowledge autonomously. According to Freire (1983, p. 16), "knowledge [...] requires the curious presence of a subject before the world. It requires their transforming action upon reality. It requires constant seeking. It entails invention and reinvention"[8].

It is noticeable how fragilely the school imparts some principles that are necessary for students' science education, such as curiosity, investigation, relevance, persistence, creativity, collaboration, and communication, all of which contribute to developing skills that are necessary for any critical citizen, as described in Silva (2020a). But what is science education? In Brazil Silva (2016, 2019, 2020a, 2021) has been dedicated to understanding or (re)constructing the common thread of uses of the terms "alfabetização científica" and "letramento científico" (both of which could refer to the umbrella term "science literacy" in English), as well as their oscillations in Brazilian specialized literature. The concepts underlying these terms are part of his proposal of science education. By adopting an "indisciplinary" perspective, the author's AL studies are based on both science teaching (HURD, 1958, 1998; LIU, 2009) and education science (FREIRE, 1979, 1983) in addition to the theoretical assumptions of literacy studies produced within Applied Linguistics (KLEIMAN, 1995, 1998, 2001; SIGNORINI, 2000, 2007).

Considering the origin of the terms, Silva (2016, 2019, 2020a, 2021) understands "alfabetização" as related to the learners' awareness of how the alphabetic and orthographic system of a language works, which enables their learning of reading and writing skills; whereas the term "letramento" corresponds to the social uses of writing for specific purposes, i.e., it highlights the interactive and sociocultural dimensions of language. Then, what would be the specifics of "alfabetização científica" and "letramento científico", considering that the combination of both is what we understand as science education in Brazil?

7- According to Freire (2008, p. 35), "there is no educational practice [or educational situation] without subjects, those who educate and those who are educated; there is no educational practice outside this space-time that is the pedagogical space-time; there is no educational practice outside the gnosiological experience, no educational experience that is apolitical; there is no educational practice that is not involved in dreams; there is no educational practice that does not involve values, projects, utopias. There is, therefore, no educational practice without ethics."
Original in Portuguese: "não há prática educativa [ou situação educativa] sem sujeitos, sem sujeito educador e sem sujeito educando; não há prática educativa fora desse espaço-tempo que é o espaço-tempo pedagógico; não há prática educativa fora da experiência gnosiológica, que é experiência educativa que não seja política; não há prática educativa que não esteja envolvida em sonhos; não há prática educativa que não envolva valores, projetos, utopias. Não há então prática educativa sem ética."

8- Original in Portuguese: "o conhecimento [...] exige uma presença curiosa do sujeito em face do mundo. Requer sua ação transformadora sobre a realidade. Demanda uma busca constante. Implica em invenção e em reinvenção."

Silva *et al*. (2018, p. 89) state that in the field of education, "letramento científico" is "the process whereby students will be able to access and produce writing-mediated scientific knowledge in such a way that they will be able to look at and intervene in the real world consciously and critically"[9]. In contrast, "alfabetização científica" is "meta-knowledge about the dynamics of scientific investigation activities, including availing oneself of languages used by different communities of field specialists"[10] (SILVA, 2019b, p. 151).

The pedagogical approach proposed by Freire (1979) is consistent with the concept of science education used in this article. The author refuted conventional literacy methods based on memorization, domestication, and silencing by positing a liberating education project committed to transforming and empowering popular classes. He proposed an approach to literacy as an act of creation, one whereby "the human being, who is neither passive nor an object, develops the activity and vivacity of invention and reinvention, both of which are characteristic of states of seeking"[11] (FREIRE, 1979, p. 22).

For female literacy teachers ("alfabetizadoras") to plan educational situations, Freire (1979) put forward the notions of creation, invention, and state of seeking. In fact, there are some indications of a scientific performance in the planning of literacy procedures. For instance, selecting words for pedagogical materials (cards, posters) in generative vocabulary instruction consider both linguistic and social aspects: "they must arise from this demand [from the popular sectors] rather than from a selection that we carry out in our study, however perfect it may be from a technical point of view"[12] (FREIRE, 1979, p. 23). Paulo Freire conceived of what Santos (2007) later coined as abyssal thinking[13], which transforms delegitimized knowledge into research topics. He went further to transform and foreground active subjects capable of establishing their own history.

In a counter-hegemonic movement, Paulo Freire proposed the empowerment of lives and people, an approach that is consistent with the participatory research carried

9- Original in Portuguese: "como o processo por meio do qual os estudantes estarão aptos a acessar e produzir conhecimentos científicos mediados pela escrita, de modo que possibilite o olhar e a intervenção consciente e crítica no mundo real."

10- Original in Portuguese: "o metaconhecimento sobre a dinâmica das atividades de investigação científica, compreendendo, inclusive, a apropriação de linguagens utilizadas por distintas comunidades de especialistas."

11- Original in Portuguese: "o homem, que não é passivo nem objeto, desenvolvesse a atividade e a vivacidade da invenção e da reinvenção, características dos estados de procura."

12- Original in Portuguese: "devem nascer desta procura [dos setores populares] e não de uma seleção que efetuamos no nosso gabinete de trabalho, por mais perfeita que ela seja do ponto de vista técnico".

13- Abyssal thinking presupposes an unequal or asymmetric organization of social spaces, and therefore, of interactions or people. From this perspective, "one side of the line" ("um lado da linha", in Portuguese) is where a reality is said to be important and considered valid within scientific parameters, while the "other side of the line" ("outro lado da linha", in Portuguese) is where we find nonexistence, negation, the invisible, the non-dialectical. This shows how "tensions between science on the one hand and philosophy and theology on the other have turned out to be highly visible, but all of them, as I argue, take place on the one side of the line. Their visibility is based on the invisibility of forms of knowledge that do not fit into any of these modalities. I am referring to popular, layman, plebeian, peasant, or indigenous knowledge on the other side of the line, i.e., knowledge that has been denied the status of relevant or measurable because they are beyond the universe of the true and the false" (SANTOS, 2007, p. 72-73).

Original in Portuguese: "[...] tensões entre a ciência, de um lado, e a filosofia e a teologia, de outro, vieram a se tornar altamente visíveis, mas todas elas, como defendo, têm lugar deste lado da linha. Sua visibilidade assenta na invisibilidade de formas de conhecimento que não se encaixam em nenhuma dessas modalidades. Refiro-me aos conhecimentos populares, leigos, plebeus, camponeses ou indígenas do outro lado da linha, que desaparecem como conhecimentos relevantes ou comensuráveis por se encontrarem para além do universo do verdadeiro e do falso."

out in this study. According to Brandão (2006, p. 32), this type of research works "as a solidary alternative for creating social knowledge, one which engages in relevant social transformation processes with popular and emancipatory inclinations"[14]. As a matter of fact, Paulo Freire was at the forefront when it comes to considering asymmetrical social relations in a literacy process aimed at raising the learners' awareness.

Following Paulo Freire, our stance within AL is one which understands teaching and learning as situated processes developed by unfinished language individuals radically constituted by/in otherness. Such a stance intends to "account for the plurality of voices in action in the social world and consider that this involves issues related to power, ideology, history, and subjectivity"[15] that revolve around language (MOITA LOPES, 1994, p. 331).

As such, the efforts of any plural science of excellence are at the service of freedom and explicitly committed to reflecting upon reality both scientifically and critically. Meanwhile, any critical, problematizing education is a dialogic construction, with any educational situation understood as a product of the interaction with the students' social contexts.

Theoretical scope

In this article, we engage in a fruitful border movement that interfaces the theoretical-methodological assumptions of Applied Linguistics (AL) with those of Discourse Analysis (DA) as developed by Pêcheux. We investigated discursive representations of science in utterances produced in semi-structured interviews by nine students from a rural school. Such an investigation points to aspects of pedagogical practice at school while also having a strong social relevance, something which is characteristic of AL research and can inform future teacher training.

AL is socially and politically committed as it addresses asymmetrical relationships in different human interactions as a way to gain a better understanding of social reality. AL research is committed to socially invisible people, such as those silenced in oral, written, or multimodal interactions, as shown in literacy studies (KLEIMAN, 1998; SILVA, 2020b). It also focuses on political and ethical issues involving both the social sciences and the human sciences (MOITA LOPES, 2006; SILVA, 2021).

Using the phrase coined by Signorini (2006), "mixings of all kinds" allow an applied linguists with a non-disciplinary perspective to construct complex objects of research that consider changes in time, space, and linguistic and extralinguistic resources. According to Pennycook (2006, p. 76), we can speak of a transgressive AL, as it aims to "cross borders and break rules in a reflective stance towards what and why it crosses; [...] it rests on action towards change"[16]. Specifically, it assumes that the theoretical fields are fluid

14- Original in Portuguese: "como uma alternativa solidária de criação de conhecimento social, ela se inscreve e participa de processos relevantes de uma ação social transformadora de vocação popular e emancipatória."

15- Original in Portuguese: "dar conta da pluralidade de vozes em ação no mundo social e considerar que isso envolve questões relativas a poder, ideologia, história e subjetividade."

16- Original in Portuguese: "atravessar fronteiras e quebrar regras em uma posição reflexiva sobre o quê e por que atravessa; [...] articula-se para a ação na direção de mudança."

and seeks interrelationships in concepts, thoughts, and cultures, thus paving the way to change in research procedures.

It is worth noting that the interface between AL and DA can be transgressive when it challenges crystallized meanings that produce effects of truth in/on teaching-learning processes. In this study, we start from some assumptions of DA to understand the students' utterances about science. DA as developed by Pêcheux allows the analyst to have a critical, comprehensive reading: "it is more than linear, superficial. It is comprehensive, careful, disciplined, attentive"[17] (FONSÊCA, 2014, p. 380). In fact, unveiling meaning requires more than reading; it requires a theoretical framework that provides the reader with conditions to understand meaning (FONSÊCA, 2014). Brito and Guilherme (2013) argue that

> DA seeks to describe, analyse, and interpret how meanings, in an articulation of language with history, are established and produce effects in society. Therefore, analysing utterances produced by language teaching-learning subjects and those responsible for teacher training in connection to both language materiality and history materiality entails approaching discursivity as an effect of language liable to the failure in history itself (PÊCHEUX, 1975/1997). It also entails challenging the unfolding of their discourses in their pedagogical and educational practice and praxis. (BRITO; GUILHERME, 2013, p. 27).

We use, therefore, concepts such as imaginary formation, stance taking, interdiscourse, and intradiscourse, all of which reflect the utterance conditions. Such conditions are dealt with through historical indexicality, as utterances cannot be analysed ahistorically. As such, stance taking point to the images that one construes of oneself and others in our society, with those images being materialized in language. It follows that the subjects' discourse is the result of a network of identification with meanings that circulate socio-historically. "Discourse is construed in its meanings because the subject says something from/within a given discursive formation rather than another to produce a given meaning rather than another"[18] (ORLANDI, 2001, p. 43).

According to Pêcheux (1975/2014, p. 163), "the individual's constitution as subjects of their own discourse derives from their identification with the discursive formation that dominates them (i.e., the one in which he is constituted as a subject)"[19]. All this determines the conditions under which the discourse is produced. It is, therefore, a matter of refuting language transparency and positing utterance opacity. One word refers to another word, which is why all verbal interaction is only constituted in the language matter. The word is directed to an interlocutor and crossed by projections made of oneself and of others, in addition to the places one assigns to oneself and to others in the functioning of the discursive process (PÊCHEUX, 1969/1997).

17- Original in Portuguese: "é mais do que linear, horizontal. Ela é vertical, cuidadosa, disciplinada, atenta."

18- Original in Portuguese: "O discurso se constitui em seus sentidos porque aquilo que o sujeito diz se inscreve em uma formação discursiva e não outra para ter um sentido e não outro."

19- Original in Portuguese: "a interpelação do indivíduo em sujeito de seu discurso se efetua pela identificação (do sujeito) com a formação discursiva que o domina (isto é, na qual ele é constituído como sujeito)."

This game of projections – the imaginary formations – affect the turn taking, (de) limiting what can and should be said. This is how we understand the representations of science produced by the research subjects. The representations of science are socio-historically determined and take into account the image that these subjects have, for example, of themselves as elementary students, of their teachers, of the school, of the researchers (whose questions they answered), of the curricular components they study, of the act of researching, etc. However, pervaded by constitutive oblivion, the subjects produce utterances as part of something already said, of discourses that precede them and continue producing effects of truth.

Interdiscourse is linked to the unconscious, i.e., to discursive memory, which goes beyond verbal expression. It is, therefore, what

> [...] "supports utterances in a stratification of expressions that have been already made, but which are forgotten while they build a history of meanings". This gives the false impression that we control what we say or write, producing "the illusion that we are at the origin of whatever we say."[20] (ORLANDI, 2001, p. 54).

The intradiscourse, in turn, is the linear dimension of the utterance, the thread of the verbal expression effectively produced in the language syntax. "At the intradiscourse level of analysis, we study how the linguistic materiality and the discursive process of what is said relates to what has been said before and to what is pointed at"[21] (SERANI-INFANTI, 1998, p. 140).

Thus, we seek representations of science in imaginary formations produced in the overlap of intradiscourse and interdiscourse. In other words, we are interested in understanding what is (un)veiled in linguistic materiality as a way to evince the functioning of a discursive memory that constitutes the subjects and that comes to light when they produce utterances about science at school.

Data

Data were produced from video-recorded semi-structured interviews with nine 7th-grade students from a rural elementary school in the public education network of the City of Palmas, State of Tocantins, in the North of Brazil. The interviews were based on 14 questions and carried out in the scope of project ConGraEduC. After their transcription, we selected discursive sequences (DS) according to the enunciative patterns that emerged from the students' utterances in our interpretation.

20- Original in Portuguese, respectively: [...] "sustenta o dizer em uma estratificação de formulações já feitas, mas esquecidas e que vão construindo uma história de sentidos". Isso passa a falsa impressão de que controlamos o que falamos ou escrevemos, construindo "a ilusão de que somos a origem do que dizemos".

21- Original in Portuguese: "No nível intradiscursivo de análise, estuda-se a relação da materialidade linguística-processo discursivo do dito, com o que se disse antes e ao que se aponta".

In this article, we organized the DS into three sets containing the interviews of three participants (RL, DR, and ML), whose utterances are indicative of the representations we found in the corpus. We are interested in these research participants for the discursive position they occupy as elementary students whose words produce meanings beyond their discursive intentionality. They produce meanings "in relation to", i.e., they do not mean in themselves, but rather from resonances of historicized meanings. That is why different verbal expressions – observed in the intradiscourse – provides a glimpse of paraphrastic movements that emerge from the continuous clash of unity and dispersion in the subjects' utterances.

In this article, we consider four questions from the interviews that evoke stances towards science, namely: (1) "Why were you interested in participating in this research?", (2) "What do you understand as science?", (3) "What do you understand as research?", and (4) "Have you ever participated in any research activities at school? Please explain. You can mention more than one activity." Answers to other questions were investigated and reported elsewhere by Antonella, Silva, and Brito (2022).

To mediate the dialogue with the students, we had the interviews carried out by a teacher-researcher (TR) who was a member of our project team. The students answered TR's questions spontaneously. We can characterize this situation as an asymmetrical interaction, as those responsible for the research at school were also in the role of teachers of the participating students.[22].

The interviews were transcribed preserving the linguistic register used by the participants, as this is relevant in our project's study of Portuguese grammar[23]. To avoid students' exposure or embarrassment, we use their initials. We added alphabetical and numerical codes for better data organization: Q for questionnaire and its number, P for participant and his/her number, and R for answer and its number, in addition to the DS identity of the participating students – for example, (Q1P1R30) RL.

As mentioned before, we seek to outline some discursive representations of how the students relate to science. Their representations are expected to bring to light already-given, sedimented, socially and historically-constituted meanings, of which they avail themselves in the illusion that they are at the origin of their own utterance, thereby "forgetting" that in discursive practices "subjects have to let themselves speak, utter, even

22- The first author of this article was the teacher of the class approached in this study. A member of the ConGraEduC project team was responsible for the interviews; she is a servant of the federal network of basic education.

23- Transcriptions were made using the following conventions (PRETI, 1999), with commas added according to the writing norms:

((information))	descriptive commentary by the transcriber,
(...)	indication that speech was interrupted at a certain point,
...	any pause,
:::	prolonged vowel or consonant,
[...]	excerpt omitted,
--	commentary that breaks the thematic sequence,
UPPERCASE	emphatic intonation.

The English versions sought to be as literal as possible.

in monologues, because the body is also discourse" [24] and reverberates in us the voices "of those who have somehow participated in our development"[25] (NEVES, 2002, p. 94).

We understand that the analysis of these representations can contribute to challenging meanings of science that are crystallized in basic education. Eventually, it may foster the development of science education at school in view of the different language practices available in this educational context.

Representations of science

The participants' representations of science were based on a recurrent "dominant discourse" characterized by rigid, objective methodological scientific constructs, with the quantitative approach typical of the natural sciences and the exact sciences prevailing over the others. In the words of Silva (2020b, p. 121-122), this discourse "has direct implications for science funding policies in the country [Brazil] and indirect implications for the citizens' science education"[26]. The students' discursivity privileges the teaching of natural sciences at school, i.e., students seem to believe that doing science is restricted to this field of knowledge.

When it comes to the students' understanding of research, their dominant discourse points to the idea of googling and copying information. This shows in their attitude that knowledge must be written down and memorized, as the research was requested by their teachers. We refer to this stance taking as a "copying discourse". Part of this content transference, seen as research by the student, comes from a school tradition that is "passive, merely receptive, duplicative, domesticating [...], because it secures the status of an instructional content"[27] (DEMO, 2011, p. 42).

In opposition to the copying practice at school, Demo (2011) proposes the development of "reconstructive questioning". He argues that we should train a questioning student – one who challenges the reality or existing knowledge and reconstructs it through their own text (oral/written/multimodal). As a result, the students' reading and writing proficiency is questioned, as well as the elementary teachers' pedagogical practice. Considering this perspective, we found contributions to science education in the school/classroom.

In Set 01, we reproduce a fragment of the interview carried out with RL, with versions in English followed by the original in Portuguese in italics. We provide some evidence of the "dominant science discourse" and the "copying discourse".

24- Original in Portuguese: "o sujeito tem que se deixar falar, enunciar, mesmo quando monologa, porque o corpo também é discurso"
25- Original in Portuguese: "[...] daqueles que tiveram e têm participação de algum modo em nossa formação."
26- Original in Portuguese: "tem implicações diretas para as políticas de financiamento das ciências no país [Brasil] e, indiretamente, para a educação científica dos cidadãos."
27- Original in Portuguese: "passiva, meramente receptiva, copiadora, domesticadora [...], porque consolida a condição de objeto de ensino."

Table 1

Set 01	
Dominant Science Discourse / Copying Discourse	
DS1	**TR:** what does science mean to you? o que você entende por ciência? **(Q1P1R30) RL:** ((thinking)) (09'35" – 09'56")
DS2	**TR:** it's your opinion -- you can give your own answer, have you heard the word science before? é a sua opinião -- você pode dar sua resposta, você já ouviu a palavra ciência antes? **(Q1P1R31) RL:** I have!! já!!
DS3	**TR:** and what does the word science mean to you? e o que que você entende da palavra ciência? **(Q1P1R32) RL:** that it studies the lives of animals and plants and other things. é que estuda as vidas dos animais e das plantas e de outras coisas.
DS4	**TR:** and the word research? (...) what have you heard about the word research? e a palavra pesquisa? (...) o que que você já ouviu falar da palavra pesquisa? **(Q1P1R33) RL:** ((thinking)) (10'26" – 10'33")
DS5	**TR:** what is research to you? o que é pesquisa para você? **(Q1P1R34) RL:** research is searching for things we don't know on the Internet. pesquisa é procurar na internet as coisas que a gente não sabe.
DS6	**TR:** How cool ((laughs)) have you ever participated in any research activity at school (...) not necessarily in this one, as you said you hadn't studied here before (...) in other schools, have you ever... have you ever done research? Que legal ((risos)) você já participou de alguma atividade de pesquisa na escola (...) não necessariamente nessa, que você disse que não estudava aqui antes (...) em outras escolas, você já... você já fez pesquisa? (Q1P1R36) RL: I have!! já!!
DS7	**TR:** and what kind of research have you done? e que tipo de pesquisa você já fez? **(Q1P1R37) RL:** looking up words we don't know -- in, in the dictionary or on the Internet. pesquisar palavras que a gente não conhece -- no, no dicionário ou na internet.
DS8	**TR:** is just this research that you've done? só essa pesquisa que você já fez? **(Q1P1R38) RL:** yeah!! sim!!

Source: the authors.

In DS1, the question asked to the student proved to be quite relevant, as the 21-second pause before his answer demonstrates his difficulty in perceiving doing science at school as a diverse type of science education. RL remains thinking, and silence sets in. According to Orlandi (1995, p. 23-24), silence provides "subjects with the possibility to deal with their own constitutive contradiction, one that places each individual as 'one' in relationship with the 'multiple', one that embraces reduplication and displacement as a way for us to see that every discourse refers to another discourse that ascribes a

significant reality to it"[28]. We understand that the student's silence points to his difficulty in communicating a practice that seems to be unfamiliar to him at school, and this leads to a tension in his utterance. Silence is, therefore, indicative of a memory that seemingly point to a lack of or dissociation with the topic.

RL's answer to the question "What is science?" points to the so-called hard sciences, such as Biology, Chemistry, and Physics, which enjoy scientific prestige in society. Silva *et al.* (2018), who all work in undergraduate programs in teacher training, provide a similar account of science: humanities tend to be made invisible, while health and natural sciences stand out. In DS3, the student probably refers to the school subject "science", which corroborates this representation.

The words "animals" and "plants" are suggestive of this relationship with said school subject. It seems that the name science is intertwined with school memories, where they are related to a single field of knowledge; this eventually silences other practices, other forms of knowledge production and, therefore, other school subjects such as Portuguese. We account for RL's utterances in both linguistic and memory terms, as history affects the subjects' stance in discourse and their discursive representations. Such a stance has led us to identify a "dominant science discourse".

Furthermore, in seven out of the nine interviews, students stated that science corresponded to the school subject, while only two mentioned the Portuguese language, but they did not know how to explain this school subject as a scientific practice and its contributions to society. In the students' accounts, the human sciences and the social sciences were made invisible. All in all, answering the question "What is science?" is not a simple endeavour, as it requires that the utterer take a stance that bears the meaning effects established in historicity; as such, it should be impossible to think about the scientist's work as dissociated from the social and historical context.

By stating that "research is searching for things we don't know on the Internet" and "looking up for words we don't know --- in, in the dictionary or on the Internet", RL brings to light the school practice of doing research, one whereby his perspective is outside the very act of research and he is guided to perform note-taking activities, one that articulates the circumstances, the research places (on the internet; in the dictionary) and, so to speak, the "copying discourse". It is worth mentioning that the phrase "copying discourse" does not necessarily refer to the student's delivery of a text or content that is identical to the one found on a website, for example. Rather, it is an inscription that corroborates the idea of knowledge transposition – with knowledge being supposedly static and at the ready – from a place (on Google, in the book) to another (the students' notebook). Thus, the "copying discourse" points to the lack of authorship and to the erasure of the subjective and implied nature of the research process, bringing to light the weight of school tradition.

28- Original in Portuguese: "a possibilidade para o sujeito trabalhar sua contradição constitutiva, a que o situa na relação do 'um' com o 'múltiplo', a que aceita a reduplicação e o deslocamento que nos deixam ver que todo discurso sempre se remete a outro discurso que lhe dá realidade significativa."

RL's utterances also point to the possibility of a subject engaging in knowledge construction, as the search is for what "we don't know", "we aren't familiar with". Fernandes (2016, p. 56) states that "the practice of copying reveals the need for a more effective monitoring of activities by the research supervisor to ensure knowledge construction through digital literacy"[29]. In other words, the representation that research is equivalent to copying or merely searching for easily available, finished information can be challenged through literacy practices that promote significant spaces for knowledge production at school, with subjects being able to take the leading role in their relationship with knowledge.

In Set 02, participant DR reinforces the "dominant science discourse", but touches on linguistics and arts as a research area.

Table 2

Set 02	
	Dominant Discourse
DS9	**TR:** what does science mean to you, the word science, what do you understand as science? o que que você entende por ciência, a palavra ciência, o que você entende por ciência? **(Q1P8R29) DR:** ((pause)) ((nods in denial)) Lots of things! How can people say... like, these days... that the Earth was square, but no, the Earth is round. In my suggestion, the Earth is round. Muitas coisas! Como que o povo fala... esses dias assim... que a Terra era quadrada, mas não, a Terra é redonda. Na minha sugestão, a Terra é redonda.
DS10	**TR:** but what is research to you? mas, o que é pesquisa pra você? **(Q1P8R31) DR:** research is when we research something that we aren't familiar with. That's when we [inaudible] till we understand. When we understand, we already know more or less of the text. The text about the research. pesquisa é quando a gente pesquisa assim uma coisa que a gente não entende. É quando a gente [inaudível] até entender. Quando a gente entende, a gente já sabe mais ou menos o texto. O texto sobre a pesquisa.
DS11	**TR:** it was not recorded. What does research mean to you? não saiu gravado. O que você entende por pesquisa? **(Q1P8R32) DR:** When we research, and we learn more about a text. When we don't know the text, we go there and google it, and then we learn more about the text. Quando a gente pesquisa, e a gente aprende mais sobre um texto. Quando a gente não sabe o texto, a gente vai lá e pesquisa no Google e aí a gente aprende mais sobre o texto.
DS12	**TR:** Have you ever done any research activity at school? If you've already participated in any, could you please say what was it? você já fez alguma atividade de pesquisa na escola? Se você já participou, diga qual foi? **(Q1P8R33) DR:** I have! I have participated in a Portuguese activity and in a theatre activity. já! Já participei de português e na de teatro.
DS13	**TR:** What was this research like? como foi essa pesquisa? (**Q1P8R31) DR:** good... We learned more, and the guys* learned more! boa... A gente aprendeu mais, e os meninos aprenderam mais! TR: very good! Thank you, alright, DR. muito bem! Obrigada, tá bom, DR.

* Other students.

Source: the authors.

29- Original in Portuguese: "a prática de cópia revela a necessidade do acompanhamento mais efetivo das atividades pelo professor orientador da pesquisa, de forma que possa garantir a construção do conhecimento por intermédio do letramento digital."

In DS9, DR's utterances about science refer to contemporary pseudo-scientific theories. False beliefs about scientific knowledge, such as the anti-vaccine movements[30] and the flat earth model, have emerged in the political debate in an attempt to manipulate data and forge the representations of the scientific age. According to Bezerra (2020, p. 21), "believing in the flat earth model is just a symptom of a larger and quite popular phenomenon in Brazil: the scientific denialism wave [...] which have spread across different areas of knowledge"[31,32]. DR is in favour of the science discourse, probably because of his school memory that reverberates the science history model (CHASSOT, 2004).

Astronomy (science that studies celestial bodies in outer space) is a field in discursive memory. The student brings up the stance-taking conflict between unscientific ("the Earth was square") thinking and scientific ("the Earth is round") thinking.[33]. It is important to mention that planets had been probably addressed in the 6th-grade science syllabus. This student's stance points to the clash between the unscientific thinking and the scientific thinking, signalling some conflicting connections in the tangled network of science and opinion (or common sense).

Even though his words seem to present this clash as a solved issue, some tension emerges in the utterance "In my suggestion", in DS9, which could be paraphrased as "In my opinion". By characterizing his utterance as a suggestion/opinion, the subject weakens his own previous statement that categorically refutes that the Earth is square: "but no, the Earth is round". Thus, the student's stance seems to make an uncritical use of the scientific discourse conveyed in/by the school, one which does not rest on scientific arguments or evidence for his discursive representations.

The challenge of ConGraEduC is, therefore, to help students formulate successful arguments and counterarguments, proposals and counterproposals for scientific research work. We understand that school research can contribute to minimizing this problem in the scientific/technological era and add greater functionality to instructional contents.

The utterance "research is when we research something that we don't understand" (DS10) resonates with DS5 and DS7 as it points to the meaning of science as investigation and search for knowledge. This stance strays away from a limited pedagogical discourse, one in which knowledge is circular and unfamiliar with uncertainty or the unknown. If we accept that "knowledge needs incompleteness, unfinishedness, the wandering of

30- Anti-vaccine movements have spread through fake news on social media and WhatsApp. Source: https://saude.abril.com.br/medicina/por-que-as-pessoas-estao-tomando-menos-vacina/. Accessed on: 09 Feb. 2022.

31- Original in Portuguese: "a crença na terra plana é só um sintoma de um fenômeno maior e bastante popular no Brasil: a onda de negacionismo científico [...] que se espraia por diferentes áreas do conhecimento."

32- Bezerra (2020) reports on science denial in the Brazilian political context at the end of the 2010s. According to the author, the wave of denialism "can be a deadly tsunami, as attested by the tragic numbers of the Covid-19 pandemic among us" (p. 21).
Original in Portuguese: "pode ser um tsunami mortal, como atestam os números trágicos da pandemia do COVID-19 entre nós."

33- The website "A Terra é redonda" ["The Earth is round"] illustrates an effort by Brazilian researchers against unscientific thinking. "One of the website's principles is that it is against general flat-earthers' thiniking, not exactly the idea that the Earth is flat, but rather anti-science," says Professor Ricardo Musse, from the Department of Sociology at the School of Philosophy, Languages, Literature and Human Sciences (FFLCH), Universidade de São Paulo (USP), deputy editor of the website. Source: https://jornal.usp.br/cultura/professores-criam-site-em-defesa-da-ciencia/. Accessed on: 09 Feb. 2022.
Original in Portuguese: "Um dos princípios do site é que ele é contra o terraplanismo geral, não exatamente o pensamento de que a Terra é plana, mas a anticiência."

individuals and meanings, inaccuracy"[34] (ORLANDI, 2016, p. 71), we can only assume that science education in elementary schools begins precisely with encouraging a quest for undefined answers in the school contents. Such an undertaking, in our view, is only possible when one assumes the historicity of knowledge, individuals, and language.

The word "text" appears, in DS10 and DS11, directly associated with the activity of doing research, in opposition to the previous utterance. In other words, by associating research with something that is done – "When we do not know the text, we go there and google it and then we learn more about the text" – the student brings in the "copying discourse" and points to the memory of a recurrent school practice, one which can be referred to "Ctrl C + Ctrl V" in the digital age. Thus, these discursive sequences corroborate the fragility in the student's discourse about what it is like to do research at school. This reverberates in the DS in Set 03.

Table 3

	Set 03
	Copying Discourse
DS14	**TR:** and research, what is this? e pesquisar é o que? **(Q1P5R37) ML:** research is when you have to read, do these things and then you provide an answer turning it into research. pesquisar é você ter que ler, fazer essas coisas e daí você formula uma resposta fazendo que isso seja uma pesquisa.
DS15	**TR:** have you ever participated in any research activity? você já participou de alguma atividade de pesquisa? **(Q1P5R38) ML:** I have, but it was in other classes... in Portuguese it is more difficult. já, mas foi em outras aulas... em português é mais difícil.
DS16	**TR:** what were these research activities like? como eram essas atividades de pesquisa? **(Q1P5R39) ML:** the teacher told us to research this, this, and that. Then we researched and handed in the activity to her the other day. a professora falava para a gente pesquisar isso, isso e aquilo. Aí a gente pesquisava e dava a atividade para ela no outro dia.

Source: the authors.

School, academic, or scientific research requires procedures, strategies, and methods that require a more reflective attitude. Knowledge production begins with one's own ability to elaborate one's own thought: to think, to recreate, to be creative would be the concerns of those who set off to investigate, to research. In DS15, research activities in Portuguese classes are characterized as "more difficult" to occur at school.

What is in fact legitimated as research is marked in the utterance: "turning it into research" (DS14). The student's constructed image points to copies or paraphrases of original texts. The non-authorship of research also shows in DS16, with research being equivalent to a simple activity, or rather, a copy (or paraphrase) that must be handed in to the teacher the next day. Only a simplified kind of research (perhaps an information query or search) could be performed in approximately 24 hours.

34- Original in Portuguese: "o conhecimento precisa da incompletude, do inacabamento, da errância dos sujeitos e dos sentidos, de sua inexatidão."

The subjects' utterances show that their discursive memory about what science is is entangled with the pedagogical discourse. In other words, the DSs show a network of meanings that erupts in the intradiscourse and corroborates an image of science and research at school that seems to resonate with a banking education perspective, one whereby the knowledge deposited "there" (DS11) is withdrawn by the student and returned to the teacher, with little space for reflection and for stance taking. However, as language is marked by opacity, it is also possible to perceive the possibility of slipping and finding other meanings in utterances such as "we don't know", "we aren't familiar with". We see in this the possibility to explore scientific literacy practices that challenge the subjects' relationship with knowledge at school.

Final remarks

In reading the students' utterances, we identified the "dominant science discourse" and the "copying discourse". Those are preconceptions of science, and we hope that such discourses will be re-signified while we carry out our project in elementary schools.

The discursive stances reported in this article point to scientific practices that are characteristic of the natural sciences, excluding social sciences and linguistics. Historicity makes this perspective reach both the student and any ordinary citizen, privileging the hegemonic science informed by laboratory practices and experimental approaches.

A participating student reminded us of the adverse context faced by Brazilian science under partisan and political interests. This tells us that the humanities, including the social sciences and linguistics, all of which have a lot to say about and contribute to social dynamics, can configure themselves (in fact, they are configuring themselves) as threats to a society that has been deprived of science education. Lack of knowledge about science can be advantageous for politicians who, sometimes, ignore or disallow scientific guidelines that are not aligned to their private interests, instead of performing as the elected representatives of the people.

Finally, we emphasize that school research activities need to be better planned to avoid distorted representations of science. To that end, we need educators familiar with the scientific practices that underly the curricular components for which they are responsible; we still need reformulated curricula that do enable the planning and implementation of educational situations informed by the science education approach.

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Rosielson Soares de Sousa holds a master's degree in Language and Literature from Universidade Federal do Tocantins (UFT). He is a teacher working for the Palmas City Department of Education, State of Tocantins. He works as an Applied Linguistics researcher, particularly addressing science education at school.

Wagner Rodrigues Silva holds a PhD and master's in Applied Linguistics from Universidade Estadual de Campinas (UNICAMP). He is a full professor at Universidade Federal de Tocantins (UFT), Campus Palmas. He has been awarded a research productivity grant from the Brazilian research funding agency CNPq (National Council for Scientific and Technological Development).

Cristiane Carvalho by Paula Brito holds a PhD and master's in Applied Linguistics from Universidade Estadual de Campinas (UNICAMP). She is a professor at Universidade Federal de Uberlândia (UFU) and coordinator of the research group LEP – Laboratório de Estudos Polifónicos (Laboratory of Polyphonic Studies) (CNPq/UFU).