Online Comic Strips Production in the interdisciplinary approach to teaching Biology and Languages /
Produção de Histórias em Quadrinhos on-line na abordagem interdisciplinar de ensino de Biologia e Linguagens

*Sabrina Anacleto Teixeira**
Ph.D. in Letras (Language Studies) at Pontifícia Universidade Católica do Rio de Janeiro, Brazil (2017). Teaches Portuguese and writing at Centro Federal de Educação Tecnológica de Minas Gerais, Campus Leopoldina, Brazil.
    http://orcid.org/0000-0002-3689-4558

*Juliana Neves Barbosa***
Ph.D. in Agronomy/Plant Physiology at Universidade Federal de Lavras, UFLA, Brasil with collaborative period at Universidade de Lisboa. Biology teacher at Centro Federal de Educação Tecnológica de Minas Gerais/Campus Leopoldina, Brazil.
    http://orcid.org/0000-0002-5220-107X

ABSTRACT
Due to the advent of the new coronavirus pandemic, the need for isolation has led many education professionals to create alternative methods to adapt to the new reality of teaching practical classes outside the laboratory and the school environment. In this context, interdisciplinarity becomes an ally in the teaching-learning process, enabling the interaction of content from different areas, favoring student learning. In the classes of Writing and Biology of a federal public institution, an interdisciplinary activity of production of comic strips was promoted with the use of digital technologies. The aim of this paper is to verify to what extent the students used in their texts the characteristics of the comic strips textual genre, articulating with a narrative that demonstrated mastery of the concepts about the functions and characteristics of the organelles. This work is a case study in which analytics were carried out with a qualitative approach of the comic strips produced by the students. The analysis of these productions revealed that the students

*
    sabrina.anacleto@cefetmg.br

**
    juliananb@cefetmg.br

were able to produce a text that was appropriate to the textual genre that reflected their knowledge in the field of Biology. Regarding the use of digital technologies, it was noted that 70% of the productions were made with the aid of some digital tool.
KEYWORDS: ICT; Text production; Comic strips; Cells; Organelles.

RESUMO

Com o advento da pandemia do novo coronavírus, a necessidade do isolamento fez com que muitos profissionais da educação criassem métodos alternativos para se adaptarem à nova realidade de ministrar aulas práticas fora do ambiente do laboratório e da escola. Nesse contexto, a interdisciplinaridade torna-se uma aliada no processo ensino-aprendizagem, possibilitando a interação de conteúdos de áreas distintas e favorecendo a aprendizagem. Nas aulas de Redação e Biologia de uma instituição pública federal, promoveu-se uma atividade interdisciplinar de produção de Histórias em Quadrinhos (HQs) com o uso de tecnologias digitais. O objetivo deste trabalho é verificar em que medida os alunos empregaram em seus textos as características do gênero textual HQ, articulando com uma narrativa que demonstrasse domínio dos conceitos acerca das funções e das características das organelas. Do ponto de vista metodológico, este é um estudo de caso em que foram realizadas análises com uma abordagem qualitativa das HQs produzidas pelos alunos. A análise dessas produções revelou que os alunos conseguiram produzir um texto adequado ao gênero textual que refletia os conhecimentos da área de Biologia. Em relação ao uso das tecnologias, foi observado que 70% das produções foram construídas com o auxílio de alguma ferramenta digital.
PALAVRAS-CHAVE: TDIC; Produção de textos; Histórias em quadrinhos; Células; Organelas.

1 Introduction

In the contemporary and globalized world, it is easy to understand the importance of information and communications technology (ICT) and its available tools to create and share information. Those tools provide ample socialization among individuals, create new spaces for the construction and exchange of knowledge, bring people together and promote a breakthrough in communication. Whereas the use of ICT faces challenges, it has been studied as a mean of optimizing the teaching-learning process (LEMKE, 2010; MORAN, 2000), since they encompass the production and media reproduction of information that were previously only found in books, encyclopedias and textbooks, but in a fast and dynamic way, more attractively and closer to the students' reality.

With the advent of the pandemic and the need for quarantine, regular classes had to be suspended and a type of Emergency Remote Education (ERE) became part of the students and teachers' lives. In ERE, ICT stopped being supporting to become, as far as possible, protagonists. Teachers had to find creative solutions to mitigate the impacts on students' learning in face of the new reality. In this context, we can think about the challenges (which were and still are many) and the benefits of using technology *in* and *for* teaching, especially regarding the teaching of disciplines considered to be practical, such as Biology and Writing.

The cellular universe is a diverse and complex world, which is full of microscopic details. The study of the cell, that is, cytology is a field of biology that involves the use and handling of laboratory instruments such as microscopes and slides, among others. All this apparatus and techniques are designed to facilitate

the visualization of structures as tiny as cells. However, the need for quarantine has led many education professionals to create alternative and creative methods to adapt to the new reality of teaching practical classes outside the laboratory and the school environment. In this context, interdisciplinarity becomes an ally in the teaching-learning process, enabling the interaction of disciplines from different areas and favoring learning.

In this scenario, the Biology and the Writing teachers asked the students to create comic strips about the subject of cytology. The proposed activity sought to awaken creativity and to promote the use of multiple languages in the production of the text as well as the construction of more abstract concepts in the field of Science. This work of textual practice verified to what extent the students used the characteristics of Comics textual genre in their texts discussed in the Writing classes, articulating with a narrative that demonstrated mastery of the concepts regarding the functions and characteristics of the organelles presented in the Biology classes.

In Cytology, we approach complex words and concepts that make it difficult for students to learn and build knowledge. Designations, such as Plasma Membrane, Cytoplasm, Rough Endoplasmic Reticulum, Golgiense Complex, Centrioles and many others related to the functions performed by these structures, are usually difficult for students to understand. Seen in these terms, texts that articulate written codes both visual and verbal can favor the understanding of these more complex concepts. According to Mayer (2009), students learn better when information is given through images and words than when it is presented only by words. Therefore, the production of a multimodal text, such as comics, could assist in the build of concepts.

In the work on which this paper focuses, as it will be discussed, students were able, among other things, to create a scene with images and dialogues, through which the function of the Plasma Membranes that control and select cell entry and exit substances, was compared to the function of a doorman who controls the entry and exit of people from a certain building.

Comics textual genre can be characterized, in general, as a genre that is constructed by different codes, from the visual to the written verbal. As typical elements, comics present images, panels and speech bubbles and/or captions. The construction of meaning, in this way, is built through the mastery and articulation of these different codes. The mastery of reading texts with different codes is one of the skills that should be developed in Basic Education. Rama and Vergueiro (2005) discuss the need to include this genre in classes in order to develop a kind of *literacy* for the comic language.

Currently, comics circulate in the printed medium, such as newspapers, magazines or comic books, and, mainly, in different digital media, such as websites, digital platforms, online newspapers. Thus, developing the reading and production of comics can be a way of inserting the use of ICT at school, as well

as opening new possibilities for pedagogical work with these digital tools. Corroborating this proposal, the research made by Sales, Aguiar and Chaves (2014), on the production of online comics with elementary school students from a public school, indicated that the production of this genre "associated with the use of the computer is a resourceful possibility of learning" (SALES, AGUIAR and CHAVES, 2014, p.15, our translation).[1]

At school, working with multiple languages and different media should not be restricted to the area of languages, since those texts are part of several communicative practices in which the subjects are involved in their daily lives. Studies, such as those by Cabello, Rocque, Sousa (2010) and Castilho (2008), show that many scientific dissemination materials have been produced, especially for students, using multimodal genres, such as comics. In this context, an interdisciplinary project, especially involving teachers from different fields of knowledge, can be an ally, since makes it possible to develop comprehension skills and producing texts in multimodal language and, in addition, the use of texts with multiple languages can, in a way, facilitate the understanding of concepts and terms from the scientific community that can present a high degree of complexity. The research carried by Santos, Silva and Acioli (2012) corroborates this idea, as it showed that the use of comics facilitated the understanding of scientific concepts in the area of Chemistry and Biology, as well as made possible the socialization of information and scientific dissemination.

Therefore, in this paper, we seek to demonstrate that it is possible to carry out a more consistent work with comics, which goes beyond a mere moment of playful motivation or a sporadic project unrelated to the usual planning of the disciplines. We can explore the teaching of comics as it is done with any other genre, paying attention to its functioning, analyzing the various aspects of the production of meaning, not only restricted to the Portuguese Language or Writing classes, but also with relevant application in other disciplines, such as Biology.

Hence, we seek to discuss the results and challenges of a pedagogical activity in the production of online comic strips in an interdisciplinary approach in the disciplines of Writing and Biology. We will also present the correction criteria used in the reading of the 20 comic strips produced by the students.

For this purpose, this paper was divided in the following way: in the next section, the importance of interdisciplinarity in the teaching of languages and biology will be discussed. In section 3, there will be a brief theoretical presentation on comics that addresses the characteristics of this textual genre, as well as its use in High School (HS). Section 4 will present the contextualization of the comic strips production process, as well as considerations about the methodology employed at its work. In section 5, the correction

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[1] Original: Associado com o uso do computador é uma possibilidade rica de aprendizado (SALES, AGUIAR e CHAVES, 2014, p.15).

criteria of the comic strips and the results of the analysis of two comic strips produced by the students will be portrayed and discussed. In the last section, final considerations and reflections on the challenges faced in carrying out the work will be considered.

2 Interdisciplinarity: students' awakening to languages and Biology

Regarding the face to face classroom context, in the teaching of Biology, didactic-pedagogical resources such as projector, computer or even interactive digital whiteboard facilitate learning during the expository class. However, the process of building knowledge is not just addressing concepts, presenting methods, problems and/or events. Learning is something that awakens us and the way the teacher approaches the subject in class makes the student change. The teacher becomes a transformative agent and not a mere helper in sharing unknown information to the student. In this approach, the teacher invites the student to change the way he sees, to live the daily life, to experience a practice of the subject involved in the interaction with the scientific community. Additionally, it transforms the studied reality and helps the student to make connections with the world around him.

This teaching proposal is in consonance with the guidelines of the Brazil's National Common Curricular Base - BNCC (BRASIL, 2017), that proposes

> overcoming the radically disciplinary fragmentation of knowledge, encouraging its application in real life, the importance of context to give meaning to what is learned and the protagonism of the student in his learning and in the construction of his life project (BRASIL, 2017, p. 15, our translation).[2]

According to Selbach et al. (2010, p.167), what is intended with this integration is to exercise the practice as a transformation of the students. The form of communication is the facilitating action of the entire innovative process that unites the two student universes, their life outside and inside the school. In this way, interdisciplinarity makes the connection between these two worlds, transforming what would be monotonous into something stimulating and pleasurable.

In Biology, Cytology is an area dedicated to the study of cells, it is essential the use of laboratory instruments such as microscope, the making of slides for observation of the subject under study with the optical microscope, that is, it is necessary an entire apparatus for the development of the practical class. However, when applied in High School, in one hand, the lack of those resources sometimes prevents the

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[2] Original: A superação da fragmentação radicalmente disciplinar do conhecimento, o estímulo à sua aplicação na vida real, a importância do contexto para dar sentido ao que se aprende e o protagonismo do estudante em sua aprendizagem e na construção de seu projeto de vida. (BRASIL, 2017, p. 15).

teacher from achieving success in the way of presenting the theme; on the other hand, even when technology is available, due to difficulties in the approach, good learning results are not achieved.

As it presents several particularities such as the various study ramifications that do not always correlate, this being a potential factor for students' difficulties, the discipline of Biology becomes unique in relation to the other areas of the exact and human sciences (SILVEIRA, 2013, p.23).

Hearing and seeing yourself are poorly developed practices in disciplines in the Natural Sciences field such as Biology. This integration with the language area allows the student to experience something different. The example of this integration of areas was the use of comic strips as a method to learn about the cells. In this theme, the comic strips allowed students to awaken their creativity, causing sensitivity, sociability and also a critical sense (OLIVEIRA, 2005, p. 24).

When studying the cell, the student is faced with scientific names, biochemical functions, molecules and interaction of complex contents that make the topic exhaustive and with some degree of difficulty. How to approach a topic like this in a more assertive way? This is a challenge that has been and is intensified during the current pandemic moment. With social isolation and face-to-face classes suspended, the need to search for new expressions and didactic formats, which would reduce the damage of the interrupted teaching-learning process, was the trigger to the entire creative process which is still under development. The integration of two distinct areas, Writing and Biology was carried out with a single focus, the study of a more accessible and attractive language that would allow the association process (analogy) to the content presented.

It should be noted that, in addition to the teaching diverse content, the school must promote the development of various student skills, which involves cognitive, social, neuropsychological and communicative issues. Therefore, school activities must contribute so that the student can learn to code, relate and organize ideas; learn to think, generalize and use knowledge effectively both at school and in the social context. This way, works using interdisciplinary that seek to break with the excessive fragmentation of disciplines stimulate the contextualization and application of knowledge in the student's real life.

Thus, the use of comic strips becomes a successful strategy in the process of building knowledge, especially in the context of the application of highly complex scientific concepts, facilitating understanding and aggregating the two areas of knowledge, Writing and Biology, since, as it will be presented in the next section, this genre mixes multiple languages, such as verbal and visual, which can provide the student with an approximation of the concept to more concrete situations.

3 Comics in High School

In communicative situations, texts are materialized in textual genres, which, according to Marcuschi (2008, p. 84), are models corresponding to recognizable social forms in the communicative situations in

which they occur. In this perspective, the genres have socio-communicative characteristics defined by content, functional properties, style and characteristic composition (MARCUSCHI, 2010, p. 23).

Comics are a very popular genre among children, teenagers and even adults. With a different theme, they circulate, above all, in newspapers, in specific publications - the comic books - and also, currently, in the virtual environment. In these communicative situations, they are easily recognizable, given the peculiarity of their composition in panels, drawings and bubbles. However, in relation to their socio-communicative and discursive characteristics, they are quite complex.

According to Ramos (2009a, 2009b, 2013), comics compose a hypergender[3], which includes common elements from different autonomous genres, among which, cartoons, comics strips and many others. In this section, however, we seek only to characterize comics more generally, without pretending to establish a typology or subdivide into subgenres.

The common characteristic of all genres that belong to the hypergender comics is the use of the language, which is a broader language, as it integrates written codes both visual and verbal. Thus, when reading a comic book, the student needs to be familiar with this language and know how to relate the verbal, the visual, as well as considering a series of other information implicit in the text. According to Ramos (2013, p.116), seeing a comic book as text implies working with a more comprehensive text meaning, which includes the dialogue between different written codes both visual and verbal - multimodal or multisemiotic text[4].

Another characteristic is the predominance of the textual narrative sequence. The narrative sequence can occur in one or more panel, depending on the genre's format. One of the elements of the comic book narrative is the dialogue, that is, the speeches, represented by balloons, with constant use of interjections, vocabulary reductions, the use of a more colloquial language (often simulates an informal, everyday conversation).

In order to master the reading and production of this genre, the student, in addition to paying attention to these characteristics, must observe that not all information is explicitly stated in the verbal text. Thus, the student must relate the verbal and visual language of the text to his worldly wisdom in order to make inferences.

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[3] Regarding the notion of hypergender, it is recommended to read Maingueneau (2005).
[4] According to Rojo (2012, p. 19), a multisemiotic text is composed by many languages (or modes, or semioses) and requires skills and practices of understanding and producing of each one of them (multiliteracies) to make it mean.

Figure 1: Garfield, Jim Davis.[5]

Source: Site Tirinhas do Garfield. Available on: https://tirinhasdogarfield.blogspot.com/.

Garfield's comics have a wide reach in Brazil and in the world, being published in several newspapers and social networks. In the comic strip shown in Figure 1, there are three scenes. To understand the narrative sequence, it is necessary to notice that the lines of the hidden character belong to John from the verbalized thought of the cat in the third scene. However, to understand that John is trapped in a mousetrap, in order to understand the snap onomatopoeia of the first scene and the physiognomy of the cat, the reader needs to use his worldly wisdom about the fact that mouse traps are mousetrap.

It can be said that, besides to the superficial information present in the text, there are others to be processed. Inferences, which are suggested and understood through shared, prior and worldly wisdom, are connected to the situation that the text presents. Although they seem simple and very accessible, comics condense a range of knowledge that must be recovered in the act of reading. For this reason, in spite of lefting out of a more systematic work, this genre deserves more attention in schools.

In High School, it is often prioritized the study and production of argumentative genres, due to the entrance exams and even the National High School Examination (ENEM), in which the student needs to produce the Enem Essay, a predominantly argumentative genre, as main requirement to obtain an excellent grade and have access to the university.

However, reading and the production of different genres should be encouraged in the Portuguese language classes, especially genres that use multiple languages, such as comics. According to Brazil's National Common Curricular Base - BNCC (BRASIL, 2017), using different languages to express yourself

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[5] Translation: First panel: Ouch! Ouch! Ouch!
Second panel: One more
Third panel: Ouch! Well, John found all the mousetraps.

is one of the ten general competences of High School that should not be developed only by teachers in the field of languages, but from all areas of knowledge. Thus, according to the document, the student must be able to

> Using different languages - verbal (oral or visual-motor, such as Libras[6] (and written), body, visual, sound and digital languages - as well as knowledge of artistic, mathematical and scientific languages, to express and share information, experiences, ideas and feelings in different contexts and produce meanings that lead to mutual understanding (BRASIL, 2017, p. 9, our translation).[7]

The mastery of reading texts in their different modalities is one of the skills expected from students attending High School. As an example of this requirement, it is possible to notice that several entrance exams and even ENEM, explore issues that apply multisemiotic texts, including comic strips, as in the following examples.

Figure 2: Question with Comic *Mafalda* by Quino, used in FUVEST 2021, 1st phase - general knowledge[8].

O efeito de humor presente nas falas das personagens decorre

(A) da quebra de expectativa gerada pela polissemia.
(B) da ambiguidade causada pela antonímia.
(C) do contraste provocado pela fonética.
(D) do contraste introduzido pela neologia.
(E) do estranhamento devido à morfologia.

Source: Site FUVEST. Available on: https://www.fuvest.br/wp-content/uploads/fuvest_2021_primeira_fase.pdf.

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[6] Brazilian sign language

[7] Original: Utilizar diferentes linguagens – verbal (oral ou visual-motora, como Libras, e escrita), corporal, visual, sonora e digital –, bem como conhecimentos das linguagens artística, matemática e científica, para se expressar e partilhar informações, experiências, ideias e sentimentos em diferentes contextos e produzir sentidos que levem ao entendimento mútuo (BRASIL, 2017, p. 9).

[8] Translation: Felipe: What about you? What do you take to feel better? Mafalda: I take distance.

The comics shown in Figure 2 was used in the general knowledge part of the test of the first phase of FUVEST entrance exam, held in January 2021. The text was written by Quino, creator of one of the most iconic characters in comics: Mafalda. The question included the following statement "*the effect of humor present in the characters' speeches is due to*". The answer was the option A: "*the breaking of the expectations generated by the polysemy*".

In this comic strip it can be inferred that Felipe was sad. He asks Mafalda a question hoping for a better solution. The effect of humor occurs precisely because of the break in the reader's expectations in Mafalda's response, which was only possible because of the double meaning of the verb "to take". The student should read both the written and the visual part. From the articulation of the two textual information, added to the inferences, he would build the meaning(s) of the comic strip.

In addition to Figure 2, we can exemplify another case of comics that circulates among students, through ENEM questions, which proof that, each year, this genre has gained greater importance in the country. The tests interfere, in a certain way, as already mentioned, in the content worked on throughout High School. As noted, this genre is present not only in language test topics and its areas. In the test of Natural Sciences and its technologies of ENEM 2020, applied in January 2021, there is also a question using a comic strip of the character Garfield, by Jim Davis.

Figure 3: Question with comic strip *Garfield*, by Jim Davis, used in Enem 2020. [9]

DAVIS, J. Disponível em: http://garfield.com. Acesso em: 10 fev. 2015.

Por qual motivo ocorre a eletrização ilustrada na tirinha?

Ⓐ Troca de átomos entre a calça e os pelos do gato.
Ⓑ Diminuição do número de prótons nos pelos do gato.
Ⓒ Criação de novas partículas eletrizadas nos pelos do gato.
Ⓓ Movimentação de elétrons entre a calça e os pelos do gato.
Ⓔ Repulsão entre partículas elétricas da calça e dos pelos do gato.

Source: Site INEP. Available on: https://www.gov.br/inep/pt-br/areas-de-atuacao/avaliacao-e-exames-educacionais/enem/provas-e-gabaritos.

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[9] Third panel: I hate static electricity.

The asked question *why the electrification occurs in the comic strip*, to answer, the student should mark the option D: *Movement of electrons between the pants and the cat's hair*. In the opening scene, Garfield comes close to his owner. In the next scene, he rubs himself on the man's pants, an action evidenced both by the cat's facial expression and by the expression *purrr*. This action is what resulted in the electrification process (hair shiver) in the last scene. Thus, in order to answer the question, the student could not only apply his technical knowledge in the field of natural sciences but should have mastery of reading and understanding the language of comics, since, to find the answer, he should articulate information from written codes both verbal and visual languages.

Hence, the mastery of reading and understanding the language of comics should integrate the High School content, not only in the disciplines of language area, but also of other areas of knowledge, because developing the ability to express yourself through different languages is a task of all curricular components of High School not only regarding Portuguese or Writing classes. However, developing linguistic expression skills is not just a process of reading and analyzing. If the student only reads or analyzes a text, but never adopt a "hands-on attitude" in order to be able to experience the whole process of build meaning, his language skills will never be fully developed.

Thus, for a broader development of this competence, Kleiman, Ceniceros, Tinoco (2013 p. 74) propose to work with genres based on "literacy projects", as the authors consider that "reading and writing are not practices limited to the school sphere. We read and write to act in (and on) the world". For them, there is a difference between reading the genre, which will necessarily be an analytical exercise, the purpose of which is to define the phenomenon, even if the student reads and analyzes his own text; and producing a real text whose purpose is not only analysis, but the success in social practice.

Therefore, it can be said that there is a difference between the student being informed about the characteristics of comics, by definition, after having read examples – however relevant, the notion that he will have is just an item of information - and the learning of comic genre by the student, also via definition, after producing a real story that can be read by colleagues. Considering this proposal to build a literacy project, a sequence of activities was created to allow the students of the first year of High School to produce comic strips in which they told the story of the organelles. As it will be noted in the next section, in order to produce their texts, the students had to analyze and assimilate the characteristics of the comics, as well as relate their storytelling process to the contents studied in the discipline of Biology. Some of these texts, as it will be shown, were published in the institution's virtual magazine.

4 Methodological considerations and contextualization

Even in the school sphere, the production of text must be a socio-communicative practice, performed to act in the social context. Thus, it is important to specify the textual genre that will be produced because each genre has its structural, stylistic and socio-communicative characteristics, as already mentioned. To develop the production contemplated in this paper, we chose to work with comic strips, considering that they add elements that can favor the student's interest, since many students like to read and already know this genre well. In addition, this genre would allow the use and development of digital tools, such as Canva[10], which the students were getting to know, experimenting and/or improving during the ERE. Thus, in this section, we seek to describe how the production the comic strip activity was developed, as well as the challenges faced by both teachers and students. Furthermore, we seek to analyze two comic strips produced by the students in order to exemplify the extent to which the students employed, in their productions, the characteristics of comic books textual genre discussed in Writing class, articulating with a narrative that demonstrated mastery of concepts about the functions and characteristics of organelles learned in Biology classes.

In order to analyze the productions developed by the students, we consider as a reference a qualitative approach. According to this approach, the researcher is inserted in the investigated context (DENZIN; LINCOLN, 2006), he approaches the phenomenon that can be better understood in this context in which it occurs and of which he is part and should be analyzed in a more integrated perspective (GODOY, 1995). Within this perspective, this work can be characterized as a case study, as it is a specific research context, in real life, and which does not aim to generalize the data. However, according to Telles (2012, p.110, our translation), the results of a case study "can provide readers with useful vicarious experiences for reflecting on their pedagogical practices[11]". Thus, the discussions presented in this paper may arouse the interest of researchers who develop works in the area of teaching and learning of writing and text correction.

The interdisciplinary activity of textual production was carried out with 80 students from the first High School year of integrated technical courses from a federal public institution, in online classes of Writing and Biology during the ERE. The aim of the production was to create a comic strip through which a story of the organelles in the cellular universe would be told. Through the linguistic resources of this genre, students should tell a story that highlights the characteristics and functions of the chosen organelles.

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[10] Available at < https://www.canva.com/ >. Accessed on 15th mar. 2021.
[11] Original: "podem fornecer aos seus leitores experiências vicárias úteis para a reflexão sobre suas práticas pedagógicas".

In Biology classes, students were asked to carry out a previous research on the study of cells (cytology), choose cell structures (such as organelles) and study the functions and characteristics of each one. After the research, during the classes, the students were divided into groups and grouped between those who would study animal cells more deeply and those who would study plant cells, since, from this study, students should create and transform the cells into a character that would come to life, play a role and thus socialize in the stories they created. The only requirement was that the functions they perform in the imaginary life were a representation of the functions they perform in the cell, trying to bring the characteristics of the organelles closer to the characteristics of the characters.

In Writing classes, the characteristics of the textual genre were developed. Students were able to read examples from several comics, with different sizes, from comic strips with two or three panels, to larger stories. They discussed everything from the communicative objectives to the structural elements of this genre in which comics are the minimum unit of a narrative. The various media on which comics circulate were analyzed, from magazines, known as comic books, such as newspapers and even social networks. In addition, the visual resources that the genre applies for the creation of dialogues were explored, such as the different types of balloons, also linguistic resources that students could use to create the stories, such as onomatopoeia and interjections, were analyzed.

Apart from to the communicative and structural characteristics of comics, in Writing classes, students were able to learn a little about digital tools through which they could create their texts. First, the teacher presented the simplest way, that would be to use a text editor or slide show program (such as PowerPoint), through insertion of tables and drawing, it would be an option for students who had more difficulty accessing other tools.

The second option was Pixton, an online tool that allows the creation of comic strips and that has a wide variety of scenarios, objects and characters. To create personalized characters, there is the possibility to purchase a specific profile, in the paid version. The teacher provided the link for access[12] and the link to the instruction manual[13], as well as brief demonstration of use in the synchronous class. The advantages are the wide variety of characters, including in the free version, the possibility of shared creation, easy registration and access. The disadvantages would be that the platform is in English, even if it is very intuitive to use, and it is difficult to download the texts. Some students, especially students of the Informatics course, already knew and used this tool and used it to make the text.

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[12] Available at < https://www.pixton.com/ >. Accessed on 15th mar. 2021.
[13] Available at <https://inovaeh.sead.ufscar.br/wp-content/uploads/2019/04/Tutorial-Pixton.pdf >. Accessed on 15th mar. 2021.

The most indicated and discussed option in the synchronous class was Canva[14]. Canva is a graphic design platform that allows the creation of comics, social media graphics, presentations, infographics, posters etc. This tool (available online) assists mobile devices and integrates millions of images, fonts, templates and illustrations. The teacher made a template with the students in the synchronous class to show the functioning of the platform, as well as provided links, such as tutorials on YouTube on how to use Canva. This was one of the most used platforms by students, since many of them already knew it by previous activities carried out with mind map. In addition, the platform has some advantages such as easy registration and the chosen language can be Portuguese. There are several pre-assembled models of comics, with many possibilities of designs, shared work and free download of the project.

As this activity was carried out at the beginning of the ERE, a time when not all student support policies for the purchase and/or loan of devices had been fully implemented, there was also the possibility of making the comic strip on paper by using paper and registering it on a photo if the student did not have any type of internet access or any device. Due to the socioeconomic condition and even the lack of knowledge/skill in dealing with digital tools, of the 20 productions created, six (30%) were handwritten and one (5%) mixed digital and manuscript excerpts. However, all students who actively participated in the classes made the productions, according to the results reported in the next section.

5 Presentation and discussion of results

After producing the comic strips, the students sent them to the Writing teacher who made the first correction. In this correction, it was analyzed whether the students applied their knowledge about comic books to build their texts. The first criterion would be the use of panels and bubbles, which are clearly the main characteristic of this genre, as well as other typical Comic languages such as onomatopoeia, interjections, sequences of scenarios. Considering that the predominant textual type of comics is the narrative, although we could find other types such as descriptive, the second criterion of correction was to perceive if the students really created a narrative, a story for the organelles, and not only listed their functions or just explained their characteristics in an expositive form, which would not be appropriate for the genre. After the correction and analysis of the 20 comic strips created, it was observed that only three (15%) productions did not meet those requirements of adequacy to the textual genre: one made a prose narrative (in a similar way of a short story) with only one drawing; the other two, only described the organelles, without developing a narrative.

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[14] Available at <https://www.canva.com/>. Accessed on 15th mar. 2021.

Beyond the construction of the narrative, textual cohesion was also analyzed, in order to check if there was a logical sequence of idea and meaning through the articulation between the first and the last panel, and if the story was coherently related to the theme, since the actions developed by the characters of the comic strip - the organelles - should, in a way, be related to the functions that they play in the animal or plant cell.

Of the 17 productions that met the requirements for adaptation to the comics textual genre, only one comic strip had showed coherence problems. Although this text created a narrative in which the organelles were the characters, the story came out of the script, since it was restricted to the chosen model, not changing according to the proposed text project. The other productions created a text with a logical sequence, relating the action of one panel to the other, as well as the actions of the characters (the organelles) were relevant to their functions and characteristics in the cell - this will be better observed in the examples analyzed below.

We also analyzed the interaction between verbal and visual codes, the use of resources such as colors, drawings and expressions in order to contribute to the construction of the narrative. Spelling and punctuation were also considered. Finally, it was verified whether the indicated virtual platforms were used in order to digitally construct the comic strips.

In relation to the interaction between the verbal and non-verbal codes, as it will be shown in the analysis of the examples, the students were able to relate the images and other resources with the verbal text inserted in the balloons. Regarding the spelling and punctuation, all the comic strips were adequate, showing only one or other deviation, as expected for students of the first High School year. None of those deviations impaired the reading or comprehension of the text. If there was a need for any changes, the teacher presented the guidelines in the returned file of the activity.

From the 20 comic strips produced, six (30%) were handwritten; one (5%) mixed digital excerpts and manuscripts and 13 (65%) were exclusively digital. From those 14 productions that used some digital resource, four were produced in slide show programs, such as PowerPoint and 10 were created in Canva or Pixton, the digital tools indicated during classes, which have several pre-assembled comic books designs.

After making the corrections according to the mentioned criteria, the students were able to access the file with the rewriting guidelines available to each group on the institution's virtual teaching platform. Furthermore, they had the opportunity to rewrite their text in order to make the changes suggested before the oral presentation of the comic strips to the class which was held in the Biology class. At that moment, the students were able to present their text to the other colleagues, explaining the motivations for the choices they made, such as why that story and the relationship between the content of their narrative and the functions and characteristics of the organelles in the cells.

Then, two comic strips (*the animal cell* - Figure 4 - and *the cellular contest* - Figure 5) will be presented. They were created by the students in order to exemplify how they used the different linguistic resources, written codes both visual and verbal to build their narrative.

**Figure 4:** Exemple of comic strip produced by the students.

Source: *Corpus.*

As seen in the comic strip exemplified in Figure 4, the students understood the proposal to create a narrative whose main character was the organelles. To create the images and the panels, the students used one of the indicated digital platforms. The narrative sequence was composed by six panels and the metaphor of a company was used to simulate the functions and characteristics of the organelles. The caption

feature was explored to assist in the process of telling the story, as well as the use of bubbles with lines, using a language that is typical of comic books, such as the use of onomatopoeia in the sixth panel. Non-verbal language was also used alongside with verbal language for the construction of the meaning, as in the fourth panel in which they drew boxes, representing the products transported, which symbolized the products transported by the Ribosomes and Endoplasmic Reticulum. Finally, it is observed that students appropriated the characteristics of the genre to build meaning in the text.

The comic strip presented in Figure 4 shows a common representation in some stories: the use of the company's metaphor. Several students explored the daily life of a company or the search for a job to represent the functions of organelles. In addition to this metaphor, some students explored current situations on the internet with *Cell Tube* in which organelles became influencers of the YouTube platform. We can also observe the simulation of a virtual contest in the example below. The comic strip *Cellular Contest* presents 12 sequences of three panels each.

Figure 5: Example of comic strip made by the students.
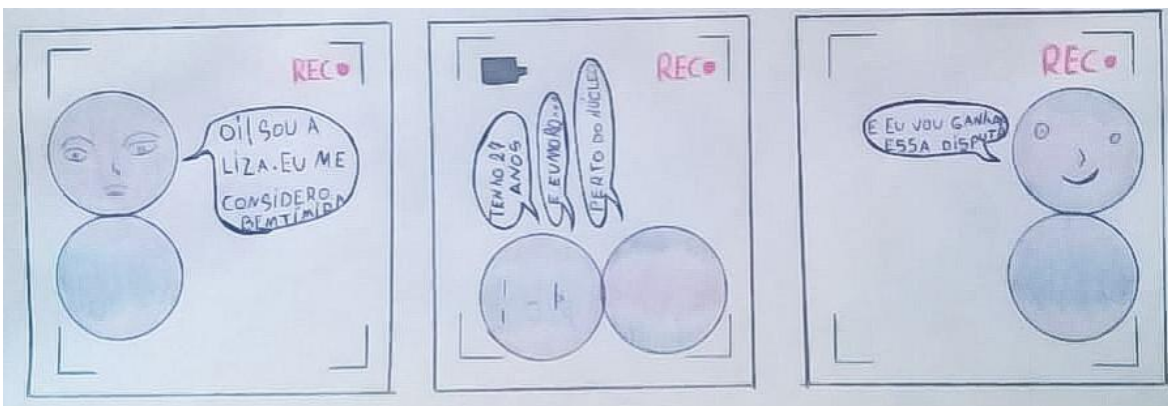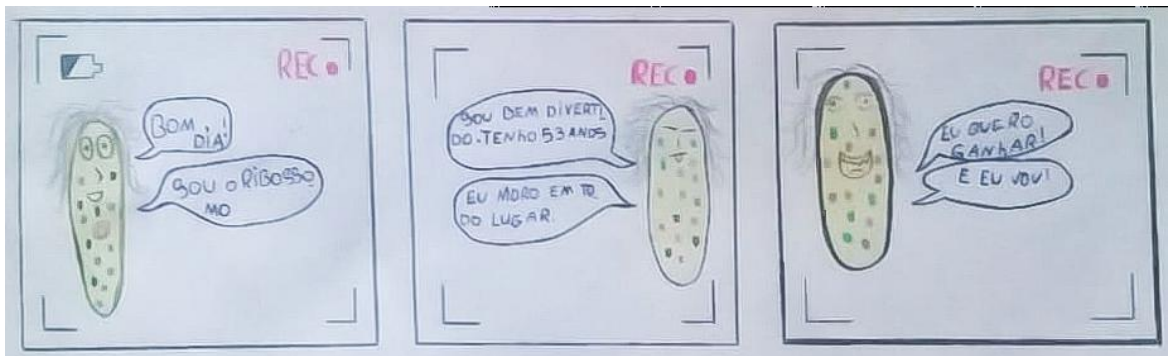
Source: *Corpus.*

It can be seen that the production of Figure 5 mixes excerpts written on paper with excerpts created using digital resources. For the reasons already mentioned, it was not mandatory for the comic strip to be fully digital. Although the text mixes the form of construction, there is a unity, an internal coherence. The visual aids are standardized in all sequences, including the use of the expression *rec* in the upper right corner that is repeated in all panels. These indications suggest that, although the text was written by different team members and through different resources, there was a single, integrated text project. It should be noted that this was an activity from the beginning of ERE, which also coincided with the first academic term, a time when not all students were fully integrated in order to produce a collaborative text without subdivisions.

In the example above, it can be observed that the story they produced followed the organization of the comics regarding their visual language. Visual aids were explored, such as the use of recording symbols and the expression *rec* to show that it was a recording, in the 1st panel of the 2nd sequence, we observe the line *is recording* that helps in setting the situation, as well as, in the last panel, we can observe the final scene that simulates the *loss of the battery power*, which makes it impossible to announce the award for best organelle. This last resource also demonstrates that the authors created a situation in which the reader will have to infer through his worldly wisdom that the battery has run out of power, so it was not possible to continue the transmission. Besides that, it allows a reading that all the organelles have won, so all of them

are important. That said, it is clear that the students, when leaving implicit information, showed mastery of the Comic language in which information is not always verbally explained, leaving the reader, through his worldly wisdom, to infer and build the text's meaning. We can also note that the language in the speech bubbles, with the use of reductions such as *tá*, expressions such as *pessoal*, among others, is characteristic of comics, more colloquial, close to speech.

Regarding the use of technology, we noticed that the digital platforms for the creation of comic strips were used as tools for the creation of texts. As noted, in a way, the students appropriated the technological resources, explored the images available on the platforms as well as used the digital resources to create the effects in their texts. Regarding the submission of the work, the students saved and posted on the institution's platform, as indicated in the instructions. We also noticed that technology was used as a theme in the comics, as in Figure 5 in which the contest appeared to be virtual and also in the comic strip *Cell Tube*, which simulates a cellular contest on YouTube. This shows how much this theme is present in the lives of teenagers and is part of their daily lives.

Regarding the difficulties in using technology, we noticed that the few students who delivered the handmade text, drew and took pictures. This option was chosen, since not everyone had access to a computer, but only a cellphone. Using text-based building platforms on cellphones, although possible, it is very limited, as the screen is small, which makes it difficult to edit the text. Thus, we observed that the use of cellphones only, as the single resource for the ERE is the biggest challenge faced, especially in the production of texts, since the cellphone, being small, makes it difficult to read, in addition, the text editor features on the phone are less than what is available on the computer.

However, regarding the evaluation, none of the students was negatively affected for having done the manuscript work, if he fulfilled all the requirements of the comics genre and if there was a relationship between the story and the characteristics of the organelles, his text was considered adequate. However, it should be noted that the full and effective use of ICT in education still has a long way to go and that public policies on access to technology are necessary. Furthermore, digital literacy is fundamental, a task that should not be restricted to language teachers but should be present in all areas.

Besides the linguistic development of the use of multisemiotic resources as a mean of communication, students were able to improve their knowledge of Biology content. As shown in the examples, students mastered the functions and characteristics of organelles in such a way that they were able to create metaphorical representations of this concept, like scenes from a company. Thus, this work contributed to, in addition to the use of digital technologies, an approach specific to the sciences, which included research, critical analysis, imagination and creativity.

According to Kleiman, Ceniceros, Tinoco (2013 p. 77, our translation), literacy projects must culminate "in some product and in the socialization of that product to the other students and teachers at the school, to the parents and members of the community"[15]. Thus, to conclude the activity, we selected some comic strips to be published in the school's institutional magazine. This magazine, that is financed by the Bolsa de Complementação Educacional (BCE) program, is a space used for the circulation of texts from the entire community, whose goal is the publication of authentic textual genres, which fulfill their social function and not merely school essays.

Final considerations

Due to the development of this interdisciplinary project, it can be observed that it is possible to use digital technologies in class, including to carry out textual production activities and provide assertiveness in understanding the concepts applied to Biology. Although students who are in High School at this moment are considered as the generation that *was born with technology* and that master its resources, it is still necessary to think to what extent this mastery is effective and in what spheres of those students' life this knowledge is used: professional, leisure, communication, learning etc. It should also be debated to what extent education has appropriated ICT. In ERE, what we see is that these digital resources were pushed to teachers and students during the pandemic, without preparation, without structure. Although it was possible to carry out a work with digital media, such as the one described in this paper, it appears that the use of ICTs implies challenges and, above all, adequate infrastructure.

One of the biggest challenges faced in carrying out this work was having access to devices (computer, cellphone). Even though the majority had it available, there was still a part (even if small, that should not be excluded) that could not perform the task digitally and had to choose the written option.

Another challenge was the familiarity with the tools. Regarding this aspect, it is not possible to consider only students, as teachers are also not prepared to use those resources and teach about them. Graduation courses still do not effectively seek teaching and development practices for digital literacy and many young teachers still do not make effective use of those technological tools.

Interdisciplinarity is another issue that is often restricted to isolated projects. Less fragmentation of knowledge and more integration are needed, because only with contextualized and integrated teaching, it is possible to create opportunities for the students to reflect critically from their interaction as an individual with the society. In this way, it is possible to develop the global knowledge of the student, to the point of

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[15] Original: "em algum produto e na socialização desse produto aos demais alunos e professores da escola, aos pais e membros da comunidade".

providing the competence that allows him to move around the cultural goods that society has created, to reflect on them and to act critically as a citizen aware of his rights and duties.

Reading and analyzing texts in any area is important, as knowledge is built through texts that circulate in society. However, producing a text aims not only at analysis, but also at success in social practice. Despite the challenges, the students produced in a creative and interdisciplinary way a text of the comics genre.

It is worth mentioning that the text correction process, in this work, did not only analyze aspects of orthographic or grammatical adequacy, but also considered aspects of adequacy to the proposed genre and to the communicative objective.

Therefore, it can be said that this online comic strip production activity proved to be of great importance both for the analysis and development of the textual genre and for the learning of scientific knowledge related to cytology. The feedback obtained through students' statements at synchronous meetings and also through an assessment of integrative activity was surprising. Most students had no difficulty in learning cellular content in this new perspective and considered this practice of learning to be much more "easy" than traditional methods. In addition, the final product of this activity could be shared with the school community through the institution's electronic magazine.

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