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TO ENGAGE IN THE CREATIVE PROCESS OF A SEQUENTIAL ART FOR THE DEVELOPMENT OF TEACHER TRAINING

ENVOLVER-SE NO PROCESSO CRIATIVO DE UMA ARTE SEQUENCIAL PARA DESENVOLVIMENTO DA FORMAÇÃO DOCENTE

CONTRIBUCIONES DE LAS TICs A LA PLANIFICACIÓN ESPACIAL MARINA EN LA REGIÓN COSTERA BRASILEÑA

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ABSTRACT

Creativity has been pointed out as an important element in today's professional and personal training, and this also applies to teachers, including considering that it is teachers who will train new generations of creative people. This work focuses on the analysis of a teacher training process based on the promotion of creativity taught to undergraduate students in Biological Sciences at a Brazilian federal university. The proposed dynamic took place in a mandatory course that discusses imagery languages and the teaching of Biology, with a practical exercise of creating Comics for the purpose of scientific dissemination; the context of this production was that of the Covid-19 pandemic, when the phenomenon of fake news gained alarming contours referring to scientific denialism and anti-vaccine movements. The results pointed to different approaches given by the students: (a) political-social, through narratives that denounce public policies and greater vulnerability of poor people, (b) environmental, referring to the impact of the disposal of protective equipment widely used in this period and (c) technical-scientific seeking to explain the performance of the immune system and the role of vaccines. The creative processes involved bibliographic and documentary research to gather reliable information, search for various references as a source of inspiration for the elaboration of characters, scenarios and scripts of the stories, as well as the need for synthesis and adaptation of the language to communicate to a wide audience, which certainly contributed to the training of future teachers.

Keywords: Comics. Science Teaching. Biology Teaching. Anthropomorphization.

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Revista ARACÊ
ISSN: 2358-2472

RESUMO
Criatividade tem sido apontada como um elemento importante na formação profissional e pessoal da atualidade, e isso se aplica também para o professorado, inclusive considerando que são os professores que irão formar as novas gerações de pessoas criativas. Este trabalho se debruça na análise de um processo de formação docente pautado no fomento da criatividade ministrado para licenciandos em Ciências Biológicas de uma universidade federal brasileira. A dinâmica proposta aconteceu numa disciplina obrigatória que discute as linguagens imagéticas e o ensino de Biologia, com um exercício prático de criação de Histórias em Quadrinhos para fins de divulgação científica; o contexto dessa produção foi o da pandemia da Covid-19, quando o fenômeno das fake news ganhou contornos alarmantes referentes ao negacionismo científico e movimentos antivacina. Os resultados apontaram diferentes enfoques dados pelos alunos: (a) político-social, através de narrativas que denunciam políticas públicas e maior vulnerabilidade de pessoas pobres, (b) ambiental, referente ao impacto do descarte de equipamentos de proteção amplamente utilizados nesse período e (c) técnico-científico buscando explicar a atuação do sistema imunológico e o papel das vacinas. Os processos criativos envolveram pesquisa bibliográfica e documental para levantamento de informações fidedignas, busca de referências diversas como fonte de inspiração para elaboração de personagens, cenários e roteiros das histórias, assim como a necessidade de síntese e adequação da linguagem para comunicar a um público amplo, que certamente contribuíram para formação dos futuros professores.

Palavras-chave: História em Quadrinhos. Ensino de Ciências. Ensino de Biologia. Antropomorfização.

RESUMEN
La creatividad se ha destacado como un elemento importante en la formación profesional y personal actual, y esto también se aplica a la docencia, considerando que son los docentes quienes formarán a las nuevas generaciones de personas creativas. Este trabajo se centra en el análisis de un proceso de formación docente basado en la promoción de la creatividad impartido a estudiantes de grado en Ciencias Biológicas de una universidad federal brasileña. La dinámica propuesta se desarrolló en una disciplina obligatoria que aborda los lenguajes de la imagen y la enseñanza de la Biología, con un ejercicio práctico de creación de Historietas con fines de divulgación científica; El contexto de esta producción fue la pandemia de Covid-19, cuando el fenómeno de las fake news adquirió contornos alarmantes en relación con el negacionismo científico y los movimientos antivacunas. Los resultados indicaron diferentes enfoques dados por los estudiantes: (a) político-social, a través de narrativas que denuncian políticas públicas y una mayor vulnerabilidad de las personas pobres, (b) ambiental, referente al impacto del descarte de equipos de protección ampliamente utilizados durante este período y (c) técnico-científico buscando explicar la acción del sistema inmune y el papel de las vacunas. Los procesos creativos involucraron la investigación bibliográfica y documental para reunir información confiable, la búsqueda de referentes diversos como fuente de inspiración para el desarrollo de personajes, escenarios y guiones de historias, así como la necesidad de síntesis y adaptación del lenguaje para comunicarse con un público amplio, lo que sin duda contribuyó a la formación de los futuros docentes.

Palabras clave: Historietas. Enseñanza de las ciencias. Enseñanza de la Biología. Antropomorfización.

Revista ARACÊ
ISSN: 2358-2472

INTRODUCTION

Nowadays, resorting to innovative methods for teaching and learning has become fundamental, as we live in a time where teaching means involving the student in classes that compete for attention with posts on social media. Teachers must keep in mind that, in order to capture the attention of their students, it is necessary to invest in strategies that promote the participation and interest of those they want to reach (Moran, 2015). It is in this context that creativity points out as an essential theme for the present day, a time when it is important to develop the ability to be creative, whether in professional demands, artistic expression and the challenges of daily life. The school and teachers are at the center of these discussions, as they are faced with the challenges posed by technologies.

Considering the new profile of students and the demands arising from current digital technologies, there is a need to stimulate students' creative potential. Teaching methodologies are as important as content; According to Moran (2015), in order to have students committed to their learning, it is up to teachers to adopt methodologies that involve such students, with complex proposed activities, with decision-making and that can evaluate their results, supported by relevant methodologies, because if we want students to be creative, they need to experiment with possibilities to show initiative (Moran, 2015). Developing new strategies, modifying the ways of preparing and applying classes and activities, are a beginning to open the student's interest, and the preparation for this must happen from the initial training of teachers, the context in which this work is situated.

The (so-called) initial teacher training – the one that takes place during the teaching degree course – is not capable of contemplating a full training, since, despite moments of (punctual) contact with the school reality during the supervised internships, it lacks moments for full immersion in this reality. This initial teacher training moment is, however, a privileged moment for teacher training: if, on the one hand, it does not allow a full appropriation of teaching practice and development of experiential knowledge (Tardif, 2002), on the other hand it allows for a deeper theoretical discussion and approximation with more current and innovative ideas and conceptions regarding education, as well as for the exercise of disseminating updated scientific information - and in this exercise building knowledge for teaching.

It is in this context that the present work is situated: it is a reflection on activities developed with undergraduate classes in biological sciences in which image communication is discussed - especially photography and drawing - practicing the reading of images and

Revista ARACÊ
ISSN: 2358-2472

their production for the teaching of Biology. The moment for these discussions takes place during a mandatory course, in which students are invited to produce and discuss sequential arts such as photographic narratives, comic books and multimedia productions. Especially focused here on the production of comics intended to compose the magazine GIBIOzine (ISSN 1984-610X), a comic fanzine intended for scientific dissemination.

The importance of this pedagogical proposal lies mainly in the exercise of creativity practiced by future teachers of Biological Sciences from this work of producing a sequential art in the HQ format, whose content is developed considering the rigor of scientific concepts, since they are intended for a scientific dissemination magazine, but using an accessible language and a narrative that enables a better understanding of the concepts.

The use of Comics in teaching has been evidenced in several works, as they associate verbal and imagery languages, and have great acceptance among young people (Caruso; Carvalho; Silveira, 2002; Rama; Vergueiro, 2007) because it is an accessible language with a humorous and informal narrative, which facilitates the understanding of its content. According to Eisner (2005, p.10) comics are a type of sequential art defined from their "printed arrangement of art and balloons in sequence", or as McCloud (1995, p. 9) puts it, "Comics are pictorial and other images juxtaposed in a deliberate sequence intended to convey information and/or to produce a response in the viewer".

Thus, comics, as a methodological tool, can contribute to the teaching experience as a transformative possibility, which can promote creativity through authorship and place the student as the protagonist of their learning, justifying their use as an engaging teaching methodology that can enhance creativity.

Working with comics involves openness, because you can't have everything planned beforehand, art doesn't happen in a timed way. Salles (2006; 2013) states that in the process of artistic creation there is no way to establish a starting or ending point, just as it is not possible to fully predict the results, because creating a work of art is not a static process. The forms of recording the production, the course of the process, are pointed out by Salles (2006; 2013) as clues left by the artist, which denounce how creative thinking occurred. The objective of this proposal is to discuss the creative process in the production of comics presented by Biology students in a teacher training process.

The present research began in March 2021, when the world was under the deadly threat of the Covid-19 viral pandemic and many fake news, specifically anti-vaccine denialist movements, went viral on social networks. The proposal presented to the undergraduates at

Revista ARACÊ
ISSN: 2358-2472

this time was to think of a scientific dissemination material, using the language of comics, with the objective of informing about the pandemic in a more comprehensive way, bringing the technical aspects about biology (immune system, vaccines), but also bringing the cultural, social and environmental aspects associated with the pandemic. As the classes went on, several points were outlined to approach, the students divided themselves into pairs or trios to carry out the activity, and at first a larger narrative was thought of in which each of the stories created by the pairs were articulated in a single narrative. Each group prepared a written script, considering the description of the characters and scenarios, later made a drawn sketch of this script and finally the final art. The course had a total of 30 students enrolled, which generated about 17 comics, but only six works were analyzed here.

The creative process of the undergraduates

The undergraduates started the activities by reading a comic about Dengue, a local viral epidemic, developed by the professor of the discipline and another group of students a few years ago, which was used to inspire the activity of the comic about the Covid-19 pandemic. After reading, they began the process of creating the scripts, which were designed based on the topics generated in the previous classes, considering the viral dynamics and the immune system, the environmental imbalance, social, cultural and economic aspects associated with the pandemic, considering everything from a systemic view.

The scripts, as well as the sketches and artwork, were socialized with the others; In this first moment, events, environments and the characterization of the characters were described. The final stage of creation involved the art of the drawings, digitization, writing of the texts and colorization of the work. For this work we present the initial ideas of each duo/trio:

Topic 1 - Economy, Vaccines and Jobs (trio of undergraduates).

The students created characters with a ridiculous humor, among them, the President, the scientists, the Covid virus (personified), the jobs (personified) and the Supervaccine. In the story, the character of the President appeared inert in all the comics, doing nothing, blindfolded, ears covered, while the Covid virus ravaged the population and jobs, but with the help of scientists a vaccine emerges - the "Supervaccine" - as a superhero who would be able to fight the Covid virus, saving the population and jobs. And the president continued to sit doing nothing, denying everything that was happening. In the end, the population together with the Supervaccine expelled the president who allowed the Covid virus to advance

Revista ARACÊ
ISSN: 2358-2472

claiming the lives of many people.

In the account of the authors of the script, they say that when writing the part of the character of the President: "*we wanted to make the comics look surreal, so we put in all the comics a character who did nothing and was only with a silly face, generating a nuisance*!"

As for the characterization of the characters, how they were physically and psychologically, the authors thought of bringing the surreal to the comics, in addition to the crass humor, represented by the figure of Supervacina, a character inspired by another crass superhero, Captain Presence by Arnaldo Branco (Branco, 2006).

The creation of this comic was very much based on the Brazilian political reality of the time and presents itself as a satire, using fantastic elements such as the supervaccine, which symbolically represents the desire of that moment, which was a vaccine capable of stopping the advance of the virus; There was no active search for new information, and its plot was built from the group's worldview.

Topic 2: Hospital Waste (individual student).

The comic was designed mainly by demonstrating the use of hospital objects (syringes, masks, cotton, bottles, gloves, etc.) being discarded (incineration, improper disposal on beaches, parks and streets, etc.) by humans and the impact of these same objects on the environment. In one of the comics the drawing represents an intubated human being, without air, with an air tube in the airways, and in the other comic, the drawing of a turtle with a disposable mask in its airways, both with the same title "Shortness of breath" or "Suffocation". In the next comic, the drawing of a person without a mask inhaling a cloud of virus, in the next comic, a bird inhaling the smoke of a medical waste incinerator, both with the title "Inhale".

The author thought of the following arrangement of comics and drawings:

Comic 1: "Lack of air", intubated human being x turtle suffocating with mask;

Comic 2: "Inhale", human being inhaling a cloud of virus x a bird inhaling smoke from the incinerator;

Comic 3: "Needle", arm being vaccinated x stray animal being pierced by needle/syringe in wasteland garbage;

Comic 4: "Testing", a person taking a disposable Covid test x a rat gnawing on the test abandoned on the street;

Comic 5: "Social isolation", a sick isolated person, in a crowd x bird with its beak stuck in a hospital glove, isolated from the rest of the birds;

Revista ARACÊ
ISSN: 2358-2472

Comic 6: "Face shield", a person putting a mask on their face x a coral with several masks attached;

The author thought of making 10 comics in total, with vertical layout, of two columns and 5 lines, each square of the same size or divided into 2 groups the total of comics, for a better visualization of the page.

The draft *storyboard* was done on the computer, but the final project was done by hand on paper and digitally colored. McCloud (1995) talks about the importance of colors in comics, the author explains that "colors objectify the subjects and that readers are able to be more aware of the shape of objects than in black and white" (p.189). In this way, the importance of coloring was considered, because, according to McCloud (1995), colors assume an iconic power in the reader's mind: symbolizing the characters.

According to the creator of the script, *"the idea came from a report by Repórter Record Investigação (TV RECORD, 2021) that I watched about the disposal of inadequate medical waste in Bahia, Covid tests being found on the streets, masks found on the beach... I kept thinking about all these means of protection being used by us in a beneficial way, but that in a counterpoint, this material can kill other living beings, causing a chain effect, in the same way that it solves some problems, it can cause others."*

In this case, the author, who worked individually, was inspired by news published in various media, particularly in certain images that denounced the impact of discarded PPE on the environment, and made her synthesis from this inspiration, composing a narrative that presents in a composition of antagonism the ambiguity of the necessary use of protective equipment and the negative impact of the (final) destination of this equipment.

Topic 3: Origin of the virus (trio of students).

The creators thought of impersonating the virus, and presenting himself, explaining the origin of the Coronavirus, but not telling the truth, quite nebulous, but the hypotheses raised by scientists:

Hypothesis 1: It is "possible or probable" that the origin was direct animal-to-human contagion;

Hypothesis 2: It is "probable or very likely" that there was an intermediate animal between an infected animal and man;

Hypothesis 3: It is "possible" that the virus reached humans through food products;

Hypothesis 4: It is "highly unlikely" that the virus reached humans due to some laboratory incident;

Revista ARACÊ
ISSN: 2358-2472

Regarding the characterization of the character, they thought of putting him directly in dialogue with the reading public, using dark humor (the character is evil), and leaving his character in evidence. Its physical appearance is rounded with spicules all over its surface, green hue; Ramos (2019) says that "the resource of color is used to characterize the character, that is, to stand out in relation to the others" thinking in the sense of bringing more information about the character, the colors chosen generate a sensation that can be good or uncomfortable; penetrating, evil look, arched in most of the scenes, an ironic smile.

We think of the construction of the character with a dark humor, the virus uses slang used by us humans, speaking in a way that is not serious, making "jokes" about its origin; and he says he knows how it came about, but he won't talk about it because he doesn't like to give anything away to anyone, and then, he describes the theories that scientists are investigating; And everything he says is in the tone of "mockery". He says it's bad! There is a moment when he says that it is not cool! We think of a toxic personality for the virus, even because it is causing so much harm, it is because it is not good, cuddly! The idea is when he talks about his family, draw the other viruses in the comic!

In this work, the authors focused attention on the various explanations that were then being conveyed about the possible origins of the virus, and for which there was (and still is) no consensus. They portrayed the viruses as malignant due to their association with the effects caused in the human population, which does not find any scientific support in the sense that it is not possible to associate any personality or emotion with the virus. To make the malignancy explicit, and also to create a close relationship with the reader, the viruses were anthropomorphized, receiving expressive faces, which despite being a widely used resource in comics also lacks any scientific foundation, since viruses do not have eyes, mouths or even speak.

The anthropomorphization strategies used, which gave a humanized aspect and personality to the viruses, although far from finding support in science, collaborate in the creation of a bond with the reader, facilitating the imaginary dialogue with the viruses to be understood.

Topic 4: Immune System, its cells and antibodies (pair of undergraduates).

The creation process involved extensive and diverse research on cells and on the immune system itself (Abbas; Lichtman; Pober, 2008; Barardi; Carobrez; Pinto, 2010; Lopes; Amaral, 2011; Murphy; Weaver, 2017). The artistic conception was first idealized based on the work *Cells at Work* or *Hataraku Saibō* (Shimizu, 2015), as well as drawing inspiration

Revista ARACÊ
ISSN: 2358-2472

from the work Manga Guide Molecular Biology (Takemura, 2012), from these influences, the comic was formulated with the personification of cells.

The story takes place in the immune system of a human body and features an omniscient narrator; traveling readers are guided by him. They travel through the lymphatic system, on the way there is information about the innate and adaptive systems, and the cells that are part of them as well as exploring other organs of the system. This *guided tour* ends with a demonstration of the performance of antibodies.

The characters develop the plot and give life to what is transmitted, highlighting their own non-verbal explanations and the easy distinction between characters. There are several cells in our immune system that are very important and complex information, as well as their varied forms. The strategy used to face this difficulty was the creation of anthropomorphized cells, symbolically based on scientific references but, at the same time, not very faithful to their real shape, using geometric shapes and different colors to facilitate their association. The cells pictured are the main cells for the basic understanding of the immune system: dendritic, T and B lymphocytes, monocytes, macrophages, neutrophils, basophils, mast cells, eosinophils, and natural killer (Murphy; Weaver, 2017; Lopes; Amaral, 2011).

In addition to the iconographic creation described, representations of other molecules that leukocytes use for intercellular interaction were created, represented as tools used by cellular characters. The antibodies were characterized as robots with a shape similar to immunoglobulin M.

Some organs linked to immunology were also addressed: spleen, lymph nodes, thymus and bone marrow, represented as active cities, with specific characteristics. Oliveira (2008) explains that it is important to pay attention to the scenario, because the choice of a way of seeing the scene creates an approximation with the reader, in this sense it is important to create a good organization of the scenarios.

The conductive vessels contain distinct characterizations: the lymphatic vessels were represented as meters, while the blood vessels, because they have greater pressure, are portrayed as fast water slides. Despite this symbolization, the capillaries are narrower and have less flow, while the arteries have a much greater flow and are represented larger and thicker, in order to differentiate between them and veins, and all receive different colors.

In this work, the pair of students did a deep and intense research on information about the immune system, its constituent cells and dynamics of action, as well as the environment where they act, and sought to synthesize all this information in simplified graphic

Revista ARACÊ
ISSN: 2358-2472

representations, with geometric shapes and colors that would facilitate identification; They also made use of anthropomorphization, attributing elements such as eyes, mouth, and limbs, as well as particular personalities, to the characters.

From the point of view of the creative process associated with scientific dissemination, it was the most sophisticated work, considering not only the appropriation of scientific information but also the adequacies and syntheses of this information in the language of drawing and the continuous search to improve the narrative. Each of the versions presented in this work presented innovations and adaptations, in a growing process of improvement.

Topic 5: Social Issues (trio of students)

One of the most serious problems of the pandemic was the ability of the virus to spread among the poor population, due to the structural conditions in which they are inserted, which facilitated the spread. From the fact that there are more people living in the same house, the route taken from home to work and back, the public transport used, which facilitates the spread of the virus. Thus, this topic of the comic intended to focus on the issues presented, and, mainly, to highlight how we observe a scenario of social hierarchy of the disease. Furthermore, initially the spread of this virus happened among the upper class layers of the population, who used airplanes as a means of transport, and then began to spread to the lower classes, where conditions were conducive to dissemination, as already pointed out.

Thus, the character Maria (maid) was created, who works in Carlos' house (a very fortunate person). Carlos was infected (asymptomatic) and did not know it, he did not wear a mask, even when Maria was around doing household chores. Maria, despite wearing a mask, was contaminated at a moment when Carlos coughed in her direction. To complicate matters, Maria uses public transport to get from home to work and from work to home, where there is the possibility of contaminating other people. Maria takes the virus home, contaminating her husband and four children who are at home, because her husband and children do not leave the house, the children are in remote classes and her husband is unemployed.

This trio based their narrative on personal stories of friends and acquaintances, obviously adapting it to a fictional format, intending to discuss how the pandemic selectively affected people according to their possibilities of social isolation.

Topic 6: Mistaken medications, in the case of Ivermectin (trio of undergraduates).

The story begins with the first comic showing a man sitting reading a newspaper article about the drug Ivermectin. In the next comic, the same man takes the drug Ivermectin. The next comic shows the man talking to another infected person on the street, the two are without

Revista ARACÊ
ISSN: 2358-2472

masks, as they consider themselves protected by the drug. In the subsequent comic, it already shows the man with the symptoms of Covid 19. It then demonstrates the virus making its way through the respiratory system. In the other box, the cells of the immune system are activated. In the next box, the virus penetrates the lungs, while in the other box, the drug Ivermectin is shown being absorbed into the stomach and falling into the bloodstream in molecule form. In the next box, the molecule of the drug Ivermectin meets a cell of the immune system, it is confused, not knowing what those things are. Moving on to the next comic, the Ivermectin molecule reaches the lungs, but discovers that it does not have the right "tool" to stop the virus; since his specialty is protozoa. The next comic shows the liver not coping and sweating, only to collapse because of the excessive amount of the drug. Finally, the liver with hepatitis, the lung is collapsed and the cells are concerned about the increase in body temperature. And, to conclude, the last comic shows, after a few days, the man in the hospital room recovering, the doctor arrives and he tells the doctor that he did not know that hepatitis was one of the symptoms of Covid; and the doctor explains that it is not, that the cause of hepatitis was the excess of the drug Ivermectin that he took.

In this narrative, the trio of students focused their attention on the misinformation, widely disseminated by social media, that certain drugs would be effective in fighting the virus; This misinformation caused victims by dismantling people, including among students' families, which worked as the main motto for the production. There has been active research into the drugs and their true properties to support the narrative. Anthropomorphization in this case was more widespread, being applied not only to discrete entities that can be understood as an organism (cells, or even viruses), but also to molecules and organs, in which association with a living organism is not so direct, although possible. Once again, although it involves questions, the anthropomorphization strategy is valid in the sense of opening an efficient communication channel with the reader.

In relation to all the comics, after the scripts, the students developed an initial drawing, several drafts, including alternating other people from the same group and, finally, the final art was made with black pen, scanned and in some cases digitally colored. The colorization process was helped by tutorials on internet platforms and tutorials from the software used, Krita, in addition to using other platforms, such as Canvas. The designs were painted and then effects such as light and shadow were added for better dimensionality. Ramos (2019) states that colors are part of comics, although little studied in their language. According to the author, colors "are plastic signs that contain information that is sometimes more relevant to

Revista ARACÊ
ISSN: 2358-2472

the understanding of the narrative text, sometimes less" (Ramos, 2019, p.87), reinforcing that colors are important in the characterization of the characters. A similar process was developed for each of the drawings in this comic, but unfortunately, not all scripts were able to fully develop due to the completion of the course.

It is important to emphasize, in this general flight over the creation process, how the sources of information and inspiration of the participating students were varied: from common-sense, everyday information experienced by the participants (whether or not it involved *fake news*), to strictly scientific information obtained from academic works, through diverse and varied media sources. The syntheses and elaborations of this information for the language of comics, however, followed two main paths: one with a realistic tendency, with human (or animal) characters in possible situations in life, and another that drifts towards a fantastic universe, with improbable anthropomorphizations of viruses, cells or talking molecules.

Final considerations

Considering the initial objective of discussing the creative process in the production of comics presented by Biology students, we can conclude that the work with comics was complex, in some cases it required translating a very specific biology content, which ended up delimiting and losing much of the artistic freedom. But the visual resource that comics provide has made it possible to translate, or at least make more accessible, information in a non-verbal way, as suggested by Toledo et al. (2016) and Mehes and Maistro (2012). Thus, in the topic about the immune system, to facilitate the reader's understanding, adjustments were made so that all cells had easily identifiable characteristics of color and shape.

The creative process developed by the undergraduates included the development of technological knowledge in drawing and digital painting, such as light and shadow, technical adjustments, image and detailing edits; for better use of comics, that is, they demonstrated that for the creation of a comic it is necessary to develop or have knowledge of narrative, illustrations and layout. There was also a lack of material to reference the work with the perspective and three-dimensionality of some characters, especially in relation to the scenario where the virus acted, that is, the organism.

In addition, the comic started with a simple and very standardized idea and during creation meetings there were some "creative snaps" on the part of some undergraduates, who were more involved in the process; These "creative snaps" would be a combination of memories of previous repertoire with recent ideas, presented and discussed in the meetings. The freedom of the creation process together with the group's repertoire culminated in a new

Revista ARACÊ
ISSN: 2358-2472

complexity of ideas; In this way, it was possible to create a comic with greater depth of details and content, without losing its playful focus.

From the perspective of teacher training, it was evident that the creative exercise, which took place individually or in small groups, was later increased in collective socializations, leading to reflections on the communicative processes necessary in the process of scientific dissemination, objectively treated in the discipline, but also in the dynamics of teaching and learning that occur in the classrooms. A formative process, therefore, that gains relevance in the initial training of future biology teachers participating in this discipline, and that, we hope, can serve as inspiration for other educational proposals.

Revista ARACÊ
ISSN: 2358-2472

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