

# How "viral" social media maps can be used in geography education: An experience at a basic education institution in Santa Maria, Rio Grande do Sul, Brazil

Como os mapas que "viralizam" nas redes sociais podem ser usados no ensino de Geografia. A experiência em uma instituição de educação básica do município de Santa Maria no Estado do Rio Grande do Sul, Brasil

Cómo los mapas que "se vuelven virales" en las redes sociales pueden ser utilizados en la enseñanza de Geografía. La experiencia en una institución de educación básica del municipio de Santa Maria en el estado de Rio Grande do Sul, Brasil

Comment les cartes devenues "virales" sur les réseaux sociaux peuvent être utilisées pour enseigner la géographie : l'expérience d'un établissement d'enseignement dans la ville de Santa Maria, Rio Grande do Sul, Brésil

### Carina Petsch®

Federal University of Santa Maria Santa Maria, Rio Grande do Sul, Brazil *carina.petsch@ufsm.br* 

## Franciele Delevati Ben®

Federal University of Santa Maria Santa Maria, Rio Grande do Sul, Brazil *francielidelevattiben@gmail.com* 

#### Natália Lampert Batista®

Federal University of Santa Maria Santa Maria, Rio Grande do Sul, Brazil *natalia.batista@ufsm.br* 

# ABSTRACT

This study investigates the potential of maps circulating on social media for geography instruction at the high school level, serving as an introductory exploration of School Cartography and Viral Cartography. Methodologically, a theoretical discussion was conducted concerning the relationship between geography and social media. Students were tasked with interpreting four viral maps, followed by a validation questionnaire. The students reported spending approximately 10% of their daily time on social media and consuming minimal content related to geography or maps. When encountering geography-related posts, they preferred those associated with curiosities and





memes. Regarding the viral maps analyzed, students identified a lack of cartographic elements, which resulted in difficulties in cartographic communication and raised concerns about potential misinformation or "fake news". The findings suggest that viral maps can serve as engaging resources to enhance

**KEYWORDS**: fake maps; cartographic literacy; social media; Brazil.

geography lessons and support cartographic literacy through digital spaces.

### RESUMO

O objetivo da pesquisa é investigar as potencialidades dos mapas que circulam em redes sociais para o ensino de Geografia no Ensino Médio, como uma primeira aproximação da Cartografia Escolar e da Cartografia Viral. Metodologicamente, foi feito um debate teórico sobre a relação entre a Geografia e redes sociais, os alunos interpretaram quatro mapas virais e foi aplicado um questionário de validação. Os alunos apontaram que passam 10% dos dias nas redes sociais, consomem pouco conteúdo ligado à Geografia e mapas, e quando observam *posts* de Geografia, preferem aqueles ligados a curiosidades e memes. Quanto aos mapas virais, os alunos visualizaram a ausência de elementos cartográficos, o que causou problemas na comunicação cartográfica e possibilidade de gerar *fake news*. Por fim, destaca-se que os mapas virais podem ser elementos para deixar a aula de Geografia mais entusiasmante e fomentar aspectos de Alfabetização e Letramento Cartográfico a partir do ciberespaço.

PALAVRAS-CHAVE: mapas fake; alfabetização cartográfica; redes sociais; Brasil.

#### RESUMEN

Esta investigación tiene como objetivo investigar las potencialidades de los mapas que circulan en redes sociales para la enseñanza de Geografía en la Educación Secundaria, como una primera aproximación a la Cartografía Escolar y la Cartografía Viral. Metodológicamente, se llevó a cabo un debate teórico sobre la relación entre la Geografía y las redes sociales y se realizó un taller con los alumnos de una institución de educación básica del municipio de Santa Maria, en el estado de Rio Grande do Sul, quienes interpretaron cuatro mapas virales. Los alumnos indicaron que pasan el 10% de sus días en redes sociales, consumen poco contenido relacionado con la Geografía y los mapas, y cuando observan publicaciones sobre Geografía, prefieren aquellas relacionadas con curiosidades y memes. En cuanto a los mapas virales, los estudiantes identificaron la ausencia de elementos cartográficos, lo que ge-



neró problemas en la comunicación cartográfica y la posibilidad de difundir fake news. Finalmente, se destaca que los mapas virales pueden ser elementos para hacer la clase de Geografía más atractiva y fomentar aspectos de Alfabetización y Letramento Cartográfico a partir del ciberespacio.

PALABRAS CLAVE: mapas falsos; alfabetización cartográfica; redes sociales; Brasil.

## RÉSUMÉ

L'objectif de cette recherche est d'étudier le potentiel des cartes diffusées sur les réseaux sociaux pour l'enseignement de la géographie dans les écoles secondaires, en tant que premier point de convergence entre la cartographie scolaire et la cartographie virale. Sur le plan méthodologique, un débat théorique a d'abord été mené concernant la relation entre la géographie et les réseaux sociaux, suivi d'un atelier avec des étudiants d'un établissement d'enseignement de la ville de Santa Maria, dans l'État du Rio Grande do Sul, au Brésil, qui ont analysé quatre cartes virales. Les étudiants ont indiqué qu'ils passaient 10 % de leur journée sur les réseaux sociaux, qu'ils consommaient peu de contenu lié à la géographie et aux cartes, et que, lorsqu'ils voyaient des posts sur la géographie, ils préféraient ceux qui étaient liés à des anecdotes et à des mèmes. Concernant les cartes virales, les étudiants ont constaté l'absence d'éléments cartographiques, ce qui a entraîné des problèmes de communication cartographique et la possibilité de générer de fausses informations. En conclusion, il est à souligner que les cartes virales peuvent être utilisées pour rendre les cours de géographie plus engageants et pour promouvoir l'alphabétisation et la littératie cartographique à partir du cyberespace.

MOTS-CLÉS : fausses cartes ; alphabétisation ; réseaux sociaux ; Brésil.

## INTRODUCTION

Cartography is an essential and inseparable language for geography, as it seeks to understand the relationship between society and the environment (PISSINATI and ARCHELA, 2007; BATISTA, BECKER, and CASSOL, 2018; CAS-TELLAR and DE PAULA, 2020). In an educational context, cartography helps concretize geographic knowledge from the early stages of schooling, promoting geographic reasoning through spatial thinking (CASTELLAR, 2017). Additionally, cartography plays a crucial role in facilitating the comprehension of lived space (CASTELLAR, 2017; RIZZATTI, CASSOL, and BECKER, 2020; RIZZAT-TI, 2022).

Within this perspective, School Cartography emerges at the intersection of cartography, education, and geography (ALMEIDA, 2011; RIZZATTI, 2022), focusing specifically on the school setting and aiming to address questions and challenges inherent to this environment (RICHTER and BUENO, 2013; CASTELLAR, 2017). Regarding this, Castellar (2017) emphasizes that "[...] it is not about inventing special and miraculous methods for teaching geography. Rather, it is about devising meaningful strategies, so students learn to read maps and interpret reality" (CASTELLAR, 2017, p. 215).

Although cartography has been part of geography education for some time, recently there has been a notable expansion and deeper integration across various levels of education, from early childhood through higher education (ALMEIDA and ALMEIDA, 2014; CASTELLAR and DE PAULA, 2020). Such discussions remain current and necessary because many individuals struggle to interpret map information, precisely due to a lack of understanding regarding the relationship between cartographic products and their everyday lives (PISSINATI and ARCHELA, 2007; CASTELLAR, 2017). Therefore, it is crucial to reflect on how to meaningfully integrate maps within educational settings (CASTELLAR and DE PAULA, 2020).

Today, maps are ubiquitous, embedded in numerous *smartphone* applications, including ride-hailing services like Uber and 99, food delivery platforms like *iFood*, and navigation systems like *Google Maps* and *Waze*, among others (RIZZATTI, BECKER, and CASSOL, 2020; RIZZATTI, 2022; CANTO, 2022). Batista, Becker, and Cassol (2018, p. 20) emphasize that "[...] whether on social networks, leisure activities, or in the workplace, maps are always present". Currently, there is a greater variety of ways to engage with maps, new cartographic products have emerged, and new map users have appeared. Consequently, School Cartography faces the challenge of understanding these GEOGRAFARES

evolving forms of interaction with space in a contemporary context (ALMEIDA and ALMEIDA, 2014; RICHTER, 2017; BATISTA, BECKER, and CASSOL, 2018; FRANCO, 2019; CANTO, 2022).

In this study, we highlight maps circulating on social media. Indeed, millions of users were introduced to maps through the *Internet* (PETERSON, 2008) and cyberspace. Thus, "[...] cyberspace is a reality derived from the workings of the physical world through human interactions with computers; however, it manifests as pure information" (CANTO, 2022, p. 64).

Consequently, creating and sharing maps has become easier than ever, and social networks enable a diverse and extensive audience to access these maps (ROBINSON, 2019; SHANNON and WALKER, 2020; ROBINSON and ZHU, 2022). Therefore, space can be analyzed with the support of various emerging technologies, languages, and networks (BATISTA, BECKER and CASSOL, 2018; CANTO, 2022). Accordingly, maps circulating on social media constitute a valid field of study within Geographic Science (RIZZATTI, BECKER and CAS-SOL, 2020; SHANNON and WALKER, 2020; PETSCH *et al.*, 2023).

Thus, to investigate maps circulating on social networks, some authors have developed a theoretical framework for Social Media Cartography starting in 2014 (MUEHLENHAUS, 2014; FIELD, 2014). More recently, however, the term "viral cartography" was proposed in research dedicated to establishing a methodology for evaluating viral maps concerning the 2016 U.S. presidential elections and the 2017 solar eclipse (ROBINSON, 2018). Shannon and Walker (2020), in turn, analyzed maps created by themselves, identifying internal and external factors in posts that contributed to their virality on *Twitter* (recently renamed "X").

Therefore, viral maps can be defined as those which rapidly achieve popularity when shared across social media platforms (ROBINSON, 2019; SHAN-NON and WALKER, 2020; ROBINSON and ZHU, 2022), reaching diverse audiences. Nonetheless, little is known about how these audiences interpret the information communicated by these maps. Considering that students nowadays are constantly interacting with maps on their social media, can we establish a connection between School Cartography and Viral Cartography?

Shannon and Walker (2020), in their research, already highlighted some differences in map interactions according to educational background, for instance, between lay audiences and *university-trained*<sup>1</sup> mapmakers. Hence,

<sup>1</sup> The authors refer to *mapmakers* and *map readers*, with the first term describing those who produce maps, and the second, those who consume or interpret maps.

academic research in this area remains incipient, but viral maps will undoubtedly be an increasingly relevant issue in the coming years (ROBINSON, 2018; SHANNON and WALKER, 2020), demanding deeper investigations. In Brazil, some studies have already been conducted within the scope of Viral Cartography, but further details and advancements are still necessary.

Thus, the aim of this research is to investigate the potential of maps circulating on social networks for Geography education at the high school level. The specific objectives are: (i) to assess how students interpret selected viral maps posted on social media; and (ii) to foster critical thinking among students by demonstrating how maps may communicate false information, commonly known as fake news.

# **MATERIALS AND METHODS**



Figure 1 – Flowchart illustrating the methodological stages of the research

Source: Organized by the authors (2024).

This study employs a qualitative approach, capturing observations made by the workshop facilitators, as well as comments and written responses from participating students. The workshop was organized into three distinct segments: maps on social media; "liking" maps on social media; and activity evaluation (Figure 1). It should be noted that the workshop was conducted over two class periods of 50 minutes each. Participants included twenty-nine first-year high school students from an educational institution located in the city of Santa Maria, in the state of Rio Grande do Sul, Brazil.

## Maps on social media

GEOGRAFARCES

In the first segment, the facilitators and the regular geography teacher engaged students in a discussion regarding their daily smartphone usage, exploring how they interacted with their devices and identifying the social networks they commonly used. Subsequently, participants were asked if they consumed any geography-related content, mainly maps, on their social media platforms.

## "Liking" maps on social media

To identify viral maps suitable for presentation to students, a search was conducted *on Instagram* using hashtag mechanisms. PETSCH *et al.* (2021) previously indicated *Instagram* as the most suitable social network for analyzing maps, as it primarily emphasizes image sharing, unlike platforms such as *Facebook* and *Twitter*. Regarding the use of hashtags, Petsch *et al.* (2021) successfully applied this method in searching for viral maps.

Thus, the *hashtags #geografia*, *#cartografia*, *#mapas*, *#mapastematicos*, and *#*instageo were employed, leading to the selection of four trending maps as of June 25, 2022 (Figure 2): the first map, according to the posting profile, provides a curiosity comparing the size of Tokyo and London (Figure 2A); the second is an anamorphic map created from COVID-19 cases (Figure 2B); and the third depicts the duration (in hours) between sunset and sunrise, referencing winter and summer solstices (Figure 2C). The fourth map represents land use and occupation in the municipality of Cachoeira do Sul (RS) and was included in the analysis because it contained all fundamental cartographic elements and had been posted on the "Cartografia Viral" project page (Figure 2D).

The maps were distributed to the students, who were initially asked to interpret the cartographic products by identifying the fundamental elements present and absent. Subsequently, they were requested to formulate a response to hypothetical comments made by *Instagram* users (Table 1). The participants' comments were organized into a word cloud, generated through the *Mentimeter* application, to facilitate visualization in this article.







Source: Instagram.

**Table 1 –** Summary of the main characteristics of viral maps presented to the participants

Мар	Fundamen- tal elements present	Purpose of the post	Profile Type	Possible Instagram user comment	Possible student response
Comparing the areas of London and Tokyo	Title	Curiosity	Personal profile	"Where's London? I can't see anything clearly"	The map not only has poor graphic quality, but also lacks a legend, and uses similar colors to represent Tokyo and the sea, severely impairing interpretation



Anamorpho- sis depicting COVID-19 cases <sup>2</sup>	None	Data dis- semination	Page	"This isn't even a map"	It is a map lacking any elements to assist interpretation. Additionally, as it employs an anamorphosis technique, it could be mistaken for a fake map due to distorted country areas
Winter and summer solstice	Legend and title	Data dis- semination	Personal profile	"If I might suggest, the graph title is misleading. It says, 'between sunset and sunrise', implying night duration, but the graph actually shows daytime duration"	Although the map contains some cartographic el- ements, the title and legend refer to different infor- mation, leading to misinterpreta- tions regarding daylight hours.
Land use and occupation in the municipality of Cachoeira do Sul (RS)	Title, source, legend, scale, orientation, geographical coordinates, DATUM, and projection	Data dis- semination	"Car- tografia Viral" Page	"This map is TOP"	This map contains all necessary elements for proper interpretation

<sup>2</sup> In the description, the page cites data sourced from the World Health Organization (WHO). Source: Organized by the authors (2024).

It is worth highlighting that Robinson (2018) proposed ten factors for evaluating viral maps. However, this study focuses exclusively on the criterion "visual variables and symbology", which addresses how social media users interpret maps. This choice was made because Robinson (2018) emphasizes that *design* issues can negatively impact how certain users interpret visual information, leading to misinterpretation rather than enhancing the viral potential of the map.

# **Evaluation of the activity**

At this stage, students responded in writing to two questions: (i) which elements of the map assisted them in reading and interpreting it? and (ii) how can one identify if a map is *fake*? This data was subsequently organized into Excel graphs for clearer visualization.

## RESULTS

In the first part of the workshop, focused on a discussion regarding students' *smartphone* and social media usage, most students actively participated with the workshop leaders and the responsible teacher. The students reported using various location-based apps on their smartphones, such as *Google Maps*, 99, Uber, and location sharing via WhatsApp.

Regarding social media platforms, students indicated regular use of *Insta*gram and *TikTok* during leisure time, spending more than two hours a day on these platforms. According to their responses, the content they usually pay the most attention to includes photographs posted by acquaintances or viral videos (*Reels* on *Instagram* or *TikTok*).

When asked if they followed pages or content related to Geography, some students stated they followed *Instagram* pages, preferring content related to geographical curiosities, natural disasters, or memes about topics discussed in class. They also highlighted their preference for content that could be quickly understood, such as memes, without needing to read detailed captions.

Regarding maps, most students indicated that when browsing their *Insta*gram feeds, they typically do not pay close attention to such content. However, following this workshop, they expressed interest in becoming more attentive. Examples of viral maps mentioned by most students included those displaying data on COVID-19 cases and deaths between 2020 and 2022. Additionally, they recognized that these maps often employed strong and weak color schemes or "little circles", demonstrating their understanding of choropleth and proportional geometric figure mapping methods, respectively. Others mentioned seeing maps depicting weather forecasts, particularly those spatially displaying temperature or rainfall data.

Overall, students indicated that they typically did not pay attention to fundamental map elements when viewing this type of content on *Instagram*. Consequently, it was necessary to revisit these concepts with students during this workshop segment. The most frequently remembered elements were legend and title, as students explained these elements were helpful "in case the map wasn't clear enough from just the Instagram feed". Other elements, such as scale, geographical coordinates, source, and projection, prompted little initial discussion among students, but were nonetheless explained by the facilitators and the classroom teacher.

In the second part of the workshop, students generally identified promptly the absence of fundamental elements in the maps and recognized how such omissions could hinder data interpretation. Thus, the previous review session proved helpful for supporting their map-reading skills.

In Map A (Figure 2 A), comparing the areas of London and Tokyo, students highlighted that the main missing element, which impaired their understanding, was the legend—since the same blue color was used to represent both the sea and Tokyo. Consequently, several students expressed difficulty locating the two capitals on the comparative map (Figure 3).

Some participants also noted the absence of geographic coordinates and inset reference maps, reporting difficulties finding London and Tokyo without a world map for context. Additionally, some students expressed a desire for more detailed information to better identify the areas of Tokyo and London and to learn more about these cities.

**Figure 3** – Main student comments made during the interpretation of the map comparing the areas of London and Tokyo



Source: Organized by the authors (2024).

GEOGRAFARCES

In comments concerning Map B (Figure 2 B), an anamorphosis based on CO-VID-19 cases, students noted that they could not even consider the image as a map due to the total absence of fundamental cartographic elements. They described it as "a bunch of scribbles", "a strange shape", or "just distortion" (Figure 4). Students emphasized that, without a legend or accompanying graphs to clarify the theme, *Instagram* users might incorrectly interpret these distortions as representing the actual shapes of countries. Additionally, they highlighted the potential for generating *fake news*, pointing out that the colors used could lead to confusion, possibly mistaken for a heat (temperature) map by *Instagram* users. Figure 4 – Main comments made by students in relation to the anamorphosis map, prepared from cases of COVID-19



Source: Organized by the authors (2024).

Regarding Map C (Figure 2 C), representing hours of daylight during winter and summer solstices in Brazil, students initially stated that the title and legend, combined with their previous knowledge of the country's administrative boundaries, provided sufficient information for interpreting the data presented. However, upon closer inspection of the map, they noted ambiguity, prompting vigorous debate among students.

Approximately 65% of the students highlighted confusion due to the map's title, as it indicated the duration of the night (the interval between sunset and sunrise), whereas the legend suggested daylight duration (from sunrise to sunset). Furthermore, six students mentioned that the chosen colors also led to misinterpretation. For instance, they associated yellow with daytime and darker colors with nighttime, mistakenly interpreting that "during the winter solstice, there would only be night, and during the summer solstice, there would only be daytime in southern Brazil" (Table 2<sup>2</sup>). Another student mentioned difficulty understanding the legend due to the lack of indication of a complete 24-hour cycle, stating that "this information would better clarify whether the map represented hours of daylight or nighttime". The remaining 35% of students expressed general confusion, either refraining from responding or simply agreeing with the *Instagram* user's comment provided.

12

<sup>2</sup> For this map, the choice was made not to generate a word cloud, since the comments contained a large number of words.

**Table 2** – Two student comments illustrating erroneous interpretations derived from the viral map showing daylight hours during winter and summer solstices in Brazil

Student comments				
"The colors made me associate night and day instead of winter and summer"				
"This map is wrong because the times don't add up to 24 hours"				

Source: Organized by the authors (2024).

Regarding the interpretation of Map D (Figure 2 D), depicting land use and occupation in the municipality of Cachoeira do Sul (RS), all students recognized it as a complete map, as it included all fundamental elements previously discussed during the activity. Concerning the students' comments, most indicated an excessive amount of information and overly small graphical elements. Given its posting *on Instagram*, students suggested that it would likely not attract users' attention, as its detailed interpretation would require considerable time (Figure 5). Some students raised specific questions about two elements: whether the compass rose could simply be represented by an arrow, stating they had never seen such a representation; and whether the placement of the legend below the map on the left meant it referred exclusively to that map and not to the map on the right.

**Figure 5** – Principal comments provided regarding the land use and occupation map of Cachoeira do Sul, Rio Grande do Sul

muita coisa pro instagram falta uma legenda rosa pequena muita informação muito pequeno rosa é uma seta

Source: Organized by the authors (2024).

Regarding the evaluation stage, most responses (20) indicated that the legend is the primary element aiding map interpretation. Students emphasized that without a legend, it is impossible to understand the information presented, exemplifying their point with the previously analyzed anamorphic map. Conversely, they also recalled that legends could lead to incorrect interpretations, as observed in the solstice map of Brazil. Other elements were also considered helpful in comprehension, particularly the source of information (11 responses) and supplementary graphs (11 responses) (Figure 6A).

Concerning identifying *fake* maps, most responses (13) suggested that the absence of fundamental cartographic elements might indicate carelessness or intentional manipulation of the information. Additional responses (8) indicated that the inclusion of graphs might be used to provide false credibility to the information presented, while another eight responses emphasized the importance of always verifying the map's source (Figure 6B).





Source: Organized by the authors (2024).

## DISCUSSION

Maps and location-based applications are increasingly prevalent in students' lives through smartphone functionalities; however, this does not necessarily imply effective consumption or interpretation of such content. It is insufficient that maps merely reach individuals' daily lives; they must also be capable of reading map information and comprehending the themes represented (RICHTER, 2017; BATISTA, 2019; RIZZATTI, 2022). To understand a map, students need to master cartographic language and establish relationships between the mapped elements and their represented themes. This requires critical reflection on the mapping process itself, and the meanings constructed through cartographic representations.

This reality becomes even more evident when students indicate spending approximately 10% of their day on social media, yet seldom consuming maps, since only some posts involving curiosities or memes manage to stand out amid the large volume of information shared on their *feeds*. These findings

GEOGRAFARCES

align with research by Petsch *et al.* (2021), Petsch *et al.* (2023a), and Santos *et al.* (2023a and 2023b), which highlight the potential of memes for teaching Cartography, as memes combine current issues with geographic and cartographic content. All these authors reinforce the need to recognize memes as a process of knowledge synthesis, thus requiring prior understanding and reflection on the presented topics.

In this regard, it is necessary, from an academic perspective, to more deeply understand how to create map-based memes and promote research in this direction, overcoming potential biases toward this form of communication. Given that social media represents a space widely occupied by students today, Geography and School Cartography could leverage this characteristic to enhance geographic education within schools. Richter (2017) asserts that "thinking that only one type or proposal of map could encompass the plurality of contexts, thoughts, and conceptions existing in social environments would amount to denying a specificity of humanity itself—diversity" (RICHTER, 2017, p. 286).

Understanding what students perceive as interesting content on social media constitutes the first step toward creating posts capable of effectively disseminating scientific knowledge and promoting the viral spread of accurate data. The land-use map of Cachoeira do Sul includes all essential cartographic elements, potentially facilitating information interpretation. Nevertheless, students identified the map's excess information as a factor detrimental to its virality and comprehension. Robinson (2018) has also expressed concern about this matter, stating the need to better understand what makes a map viral so that mapmakers can apply this knowledge to create contemporary maps that resonate with the public, thereby enhancing their dissemination and engagement.

Furthermore, School Cartography is commonly perceived as a "difficult" subject due to its reliance on mathematical concepts, leading teachers to face challenges when incorporating spatially oriented activities into Geography classes. Students, in general, often associate Geography with a monotonous discipline detached from their everyday experiences, thereby assigning limited relevance to its study. In this context, integrating social media could offer Geography and School Cartography a different approach, one more closely linked to the daily experiences and leisure activities of both teachers and students, thus making lessons lighter and more enjoyable.

Therefore, throughout the workshop, it became evident how viral maps contributed significantly to poor cartographic communication. The absence of essential cartographic elements and the difficulty in interpreting these maps can serve as a starting point for the process of Cartographic Literacy and Numeracy. In the map comparing Tokyo and London, for example, many students struggled with location due to the absence of a global reference map. Several wondered about the position of Africa, as its boundaries could have helped them better situate themselves and understand the map. This issue emerges because students often memorize maps and subsequently struggle to apply this spatial knowledge practically—such as comparing two capitals— highlighting deficiencies in Cartographic Literacy and Numeracy development. Rizzatti, Becker, and Cassol (2023) further elaborate:

Therefore, there has been a growing use of dynamic digital maps by citizens. Keeping this in mind, teachers must recognize that although students may grasp certain cartographic content through daily use of such tools, it remains crucial to contextualize and study Cartography within the school environment. Even if informal learning occurs, students must cultivate a critical and inquisitive approach to map interpretation and usage, enabling them to draw meaningful comparisons with known or lived spaces, particularly as cartographically literate individuals. (RIZZATTI, BECKER, & CASSOL, 2023, p. 1018).

Additionally, students are accustomed to readily available maps using specific symbologies, facilitating instant interpretation, which, in the case of comparing Tokyo and London, led to inaccuracies. It is important to note that in this instance, the map contained an error by representing distinct elements using identical symbology. Thus, maps do not represent incontrovertible truths; they never reach a definitive state and can be revised over time, as territories themselves continuously change. Consequently, maps must adapt accordingly to better represent evolving realities (GIRARDI, 2012; RICHTER, 2017).

Hence, the frequent process of instant map reading, coupled with insufficiently consolidated Cartographic Literacy, compromises the accurate understanding and interpretation of the presented information. For this reason, comprehensive engagement with maps and representations is imperative, as "one manner of geographical thinking is through cartographic language since a student capable of interpreting maps and satellite images can also arrive at conclusions about their lived reality" (RIZZATTI, BECKER, and CASSOL, 2023, p. 1032).

Moreover, concerning the map depicting the spatial distribution of COVID-19 cases, it becomes possible to discuss aspects of Thematic Cartography and Viral Cartography, as the data exhibited substantial variations due to the global evolution of the disease. In this context, each day presented a different scenario from the previous one, meaning that a map shared on social media and becoming viral would cease to accurately represent reality within 24 hours. Thus, even if the source cited by the page is the World Health Organization (WHO) a respected institution, the temporality inherent to a viral map must be considered, as indicated by other authors (ROBINSON, 2018; SHANNON and WALK-ER, 2020; PETSCH *et al.*, 2021). This means that fostering a critical approach among students as *map readers* on social media remains essential.

## **CONCLUDING REMARKS**

This research aimed to introduce preliminary discussions about integrating School Cartography with Viral Cartography as a potential way to promote debates on geographic space in the classroom using viral maps from social networks. Notably, the COVID-19 pandemic and the resulting rapid transition to virtual classes significantly increased our contact with the virtual environment. This environment is integral to students' daily lives, being the space in which they entertain themselves, access information, and communicate with friends and family. Why not continue exploring the virtual environment by integrating Viral Cartography into schools?

Such an approach has great potential; however, unfortunately, maps still do not occupy a central role in the viralization of geographic content. As students highlighted, memes offer a greater possibility for rapid communication on social networks. Clearly, commitment to scientific cartographic standards can still be maintained, but more immediate and factual forms of communication must be considered. As Viral Cartography scholars have emphasized, understanding how a map can be intentionally designed to become viral is a crucial step toward its effective use in scientific dissemination.

Fake news originating from erroneous interpretations of maps is a reality, either due to a lack of commitment or misinformation by the page or profile responsible—failing to provide sufficient cartographic elements—or due to deliberately manipulated data. Consequently, students must develop strong cartographic literacy and numeracy, enabling them to critically assess these new instruments—viral maps—that disseminate misinformation within society.

Furthermore, teachers must be prepared to address demands related to cyberspace, which will increasingly permeate classroom contexts. This preparation should not be limited to initial teacher education but should extend into ongoing professional development, ensuring alignment with contemporary student realities. Finally, School Cartography should not be confined within school walls. Understanding spatiality is fundamental for student mobility and interaction with apps, games, and other tools available *on* smartphone devices constantly in their hands. School Cartography can effectively engage these virtual spaces, increasingly extending beyond computer and *smartphone* screens, thus becoming hybrid and constituting a mixed reality that integrates the virtual with the real. Consequently, comprehending the relationship between cyberspace and everyday experiences is central to effective teaching practice, particularly in Geography education, with specific attention to maps and School Cartography.



## **BIBLIOGRAPHICAL REFERENCES**

ALMEIDA, Rosângela Doin. *Novos rumos da cartografia escolar*. 1. ed. São Paulo: Contexto, 2011. v. 1. 192p.

ALMEIDA, Rosângela Doin.; ALMEIDA, Regina Araujo. Fundamentos e perspectivas da CartografiaEscolarnoBrasil.*RevistaBrasileiradeCartografia*,RiodeJaneiro,n.63/4,p.885-897, 2014. Disponível em: <u>https://seer.ufu.br/index.php/revistabrasileiracartografia/article/download/44689/23703</u>. Acesso em: 11 jan. 2024.

BATISTA, Natália Lampert; BECKER, Elsbeth Léia Spode; CASSOL, Roberto. Multiletramentos e Multimodalidade na Cartografia Escolar para o Ensino de Geografia: Considerações Gerais. *Para Onde*?, v. 12, n. 2, p. 01-10, 2019. Disponível em: <u>https://seer.ufrgs.br/index.php/paraonde/article/view/97186/56315</u>. Acesso em: 11 jan. 2024.

BATISTA, Natália Lampert; BECKER, Elsbeth Léia Spode; CASSOL, Roberto. Mapas híbridos e multimodais: em busca de multiletramentos na Cartografia Escolar. *PESQUISAR-Revista de Estudos e Pesquisas em Ensino de Geografia*, v. 5, n. 7, p. 19-35, 2018. Disponível em: <u>https://periodicos.ufsc.br/index.php/pesquisar/article/view/66673/40541</u>. Acesso em: 10 nov. 2023.

BATISTA, Natália Lampert. *Cartografia Escolar, Multimodalidade e Multiletramentos para o ensino de Geografia na contemporaneidade*. 181 páginas (Tese de Doutorado) – Universidade Federal de Santa Maria, Centro de Ciências Naturais e Exatas, Programa de Pós-Graduação em Geografia, RS, 2019. Disponível em: <u>https://repositorio.ufsm.</u> <u>br/handle/1/19065</u>. Acesso em: 11 jan. 2024.

CASTELLAR, Sonia Maria Vanzella. Cartografia Escolar e o Pensamento Espacial Fortalecendo o Conhecimento Geográfico. *Revista Brasileira de Educação em Geografia*, v. 7, n. 13, p. 207–232, 2017.

CASTELLAR, Sonia Maria Vanzella; DE PAULA, Igor Rafael. O papel do pensamento espacial na construção do raciocínio geográfico. *Revista Brasileira de Educação em Geografia*, v. 10, n. 19, p. 294–322, 2020. Disponível em: <u>https://revistaedugeo.com.</u> <u>br/revistaedugeo/article/view/494</u>. Acesso em: 20 nov. 2023.

CANTO, Tania Seneme. *Cartografia e tecnologias digitais:* novas abordagens e linguagens para a sala de aula. Curitiba: CRV, 2022.

CAVALCANTI, Lana de Souza. *Geografia e práticas de ensino: Geografia escolar e procedimentos de ensino numa perspectiva socioconstrutivista.* Goiânia: Alternativa, 2002.



FIELD, Kenneth. A cacophony of cartography. *The Cartographic Journal*, v. 51, n. 1, p. 1-10, 2014. Disponível em: <u>https://www.tandfonline.com/doi/full/10.1179/00087041</u> <u>14Z.000000000120</u>. Acesso em: 11 out. 2023.

FRANCO, Juliana. *Cartografias Criativas:* da razão cartográfica às mídias móveis. Curitiba: Appris, 2019

GIRARDI, Gisele. Mapas alternativos e educação geográfica. *PerCursos*, Florianópolis, v. 13, n. 2, p. 39–51, 2012. Disponível em: <u>https://www.revistas.udesc.br/index.php/percursos/article/view/2759/2196</u>. Acesso em: 11 jan. 2024.

MUEHLENHAUS, Ian. Going viral: The look of online persuasive maps. *Cartographica: The International Journal for Geographic Information and Geovisualization*, v. 49, n. 1, p. 18-34, 2014. Disponível em: <u>https://www.utpjournals.press/doi/abs/10.3138/</u> <u>carto.49.1.1830</u>. Acesso em: 11 out. 2023.

PETERSON, Michael. Maps and the Internet: what a messit is and how to fix it. *Cartographic perspectives*, n. 59, p. 4-11, 2008. Disponível em: <u>https://cartographicperspectives.org/index.php/journal/article/view/cp59-peterson/pdf</u>. Acesso em: 11 jan. 2024.

PETSCH, Carina; BATISTA, Natália Lampert; KIEFER, Ana Paula, SAVIAN, Carla Pizzuti; BEN, Franciele Delevati; ALTERMANN, Francisco Augusto; ARRIAL, Gustavo Soares. Cartografia Viral e Hashtags: Como um #mapa pode ganhar engajamento nas redes sociais? *Estudos Geográficos: Revista Eletrônica de Geografia*, v. 19, n. 2, p. 103-122, 2021. Disponível em: <u>https://www.periodicos.rc.biblioteca.unesp.br/index.php/</u> <u>estgeo/article/view/15879/12136</u>. Acesso em: 11 jan. 2024.

PETSCH, Carina; BATISTA, Natália Lampert; KIEFER, Ana Paula; BEN, Franciele Delevati. O que um mapa precisa para ganhar likes, comentários e compartilhamentos no Instagram e no Facebook do Projeto Cartografia Viral?. *GEOgraphia*, v. 23, n. 51, 2 dez. 2021. Disponível em: <u>https://periodicos.uff.br/geographia/article/</u> <u>view/47205/30516</u>. Acesso em: 26 out. 2023.

PETSCH, Carina; BATISTA, Natália Lampert; BEN, Franciele Delevati; SAVIAN, Carla Pizutti; ARRIAL, Gustavo Soares; ALTEMANN, Francisco Augusto; BRANDS, Amanda Rech. Mapas e Memes: Será que "Da Match" nas redes sociais? *Caminhos de Geografia*, Uberlândia, v. 24, n. 93, p. 261–278, 2023.

PETSCH, Carina; BATISTA, Natália Lampert; ALTEMANN, Francisco Augusto; CASTILHO, Andressa Maia; BEN, Franciele Delevati; KIEFER, Ana Paula; HABOWSKI, Jhennifer Tais Vieira; FERNANDES, Janine Borges. Mapas en las redes sociales: un



estudio de caso del proyecto Cartografía Viral en Facebook y en Instagram. *Revista de Geografía Norte Grande*, n. 85, 2023. Disponível em: <u>https://www.scielo.cl/pdf/rgeong/n85/0718-3402-rgeong-85-00110.pdf</u>. Acesso em: 11 jan. 2024.

PISSINATI, Mariza Cleonice; ARCHELA, Rosely Sampaio. Fundamentos da alfabetização cartográfica no ensino de geografia. *Geografia*, v. 16, n. 1, p. 169-95, 2007. Disponível em: <u>https://ojs.uel.br/revistas/uel/index.php/geografia/article/view/6579</u>. Acesso em: 26 out. 2023.

RICHTER, Denis. A linguagem cartográfica no ensino de Geografia. *Revista Brasileira de Educação em Geografia*, v. 7, n. 13, p. 277-300, 2017. Disponível em: <u>https://revistaedugeo.com.br/revistaedugeo/article/view/511/252</u>. Acesso em: 11 jan. 2024.

RIZZATTI, Maurício; CASSOL, Roberto; BECKER, Elsbeth Léia Spode. A Cartografia Escolar e a Teoria das Inteligências Múltiplas no ensino de Geografia: contribuições das geotecnologias no Ensino Fundamental. *Ateliê Geográfico*, v. 14, n. 3, p. 239-267, 2020. Disponível em: <u>https://www.revistas.ufg.br/atelie/article/download/65949/36320/</u>. Acesso em: 10 jan. 2024.

RIZZATTI, Maurício; BECKER, Elsbeth Léia Spode; CASSOL, Roberto. Cartografia Escolar Multi(Geo)Modal: Contribuição das Inteligências Múltiplas, Multimodalidade e Neurociências para o Ensino de Geografia. *Caderno de Geografia*, v. 33, p. 1010-1034, 2023. Disponível em: <u>https://periodicos.pucminas.br/index.php/geografia/article/download/30270/21128</u>. Acesso em: 9 jan. 2024.

RICHTER, Denis.; BUENO, Míriam Aparecida. As potencialidades da Cartografia Escolar: a contribuição dos mapas mentais e atlas escolares no ensino de Geografia. *Anekumene*, n. 6, p. 9-19, 2013. Disponível em: <u>https://revistas.pedagogica.edu.co/</u><u>index.php/anekumene/article/view/3397</u>. Acesso em: 16 dez. 2023.

ROBINSON, Anthony C.; ZHU, Xi. Visualizing Viral Cartography with MapReverse. *GI\_ Forum*, v. 10, p. 91-97, 2022.

SANTOS, Vitor Coletto dos; LOPES, Milena Ilha; RIZZATTI, Maurício; BATISTA, Natália Lampert. (Ciber)Espaço geográfico da política: O potencial educativo por detrás dos memes sobre as eleições presidenciais. *Metodologias e Aprendizado*, Blumenau/SC, v. 6, p. 450–464, 2023a. Disponível em: <u>https://publicacoes.ifc.edu.br/index.php/metapre/article/view/3749/3278</u>. Acesso em: 9 jan. 2024.

SANTOS, Vitor Coletto dos; RIZZATTI, Maurício; PETSCH, Carina; BATISTA, Natália Lampert. Memes de cartografia: Uma proposta didático-pedagógica para o



ensino de geografia. *Metodologias e Aprendizado*, Blumenau/SC, v. 6, p. 261–277, 2023b. Disponível em: <u>https://publicacoes.ifc.edu.br/index.php/metapre/article/view/3062/2902</u>. Acesso em: 11 jan. 2023.

SHANNON, Jerry; WALKER, Kyle E. Ventures into Viral Cartography: Waffle House, Educational Attainment, and the Social Life of Maps. *The Professional Geographer*, v. 72, n. 1, p. 66-77, 2020. Disponível em: <u>https://publicacoes.ifc.edu.br/index.php/metapre/article/view/3062/2902</u>. Acesso em: 11 jan. 2023.

#### **AUTHORS' CONTRIBUTIONS**

*Carina Petsch:* First draft. Searching for references to analyse and read, according to the necessary filters based on the aim of the article; writing the introduction based on the bibliographical survey; defining the methodology; drawing up the figures; reviewing the discussion of the results; writing part of the conclusions.

*Franciele Delevati Ben:* Structuring the article; bibliographical survey; general writing of the article; contribution to the methodology; general revision of the article.

*Natália Lampert Batista:* Supervision. Structuring the article; contribution to the methodology; part of the introduction; bibliographical survey; general review of the article; writing part of the conclusions.

#### **ARTICLE EDITOR**

Cláudio Luiz Zanotelli Federal University of Espírito Santo Vitória, Espírito Santo, Brazil claudio.zanotelli@ufes.br

Received: 15/03/2024 Accepted: 25/02/2025 Available online: 21/03/2025