

PRACTICES IN GEOGRAPHICAL CLIMATOLOGY FOR THE TRAINING OF GRADUATES IN GEOGRAPHY, UNDERSTANDING THE CLIMATE OF THE TERRITORY

PRACTICES IN GEOGRAPHIC CLIMATOLOGY IN THE TRAINING OF GEOGRAPHY TEACHERS, UNDERSTANDING THE CLIMATE OF THE TERRITORY

Claudio Eduardo de Castro¹

Climate is one of the approaches that Geography should be concerned with offering students the apprehension-learning skills in teaching from the 6th grade to the end of high school, in short, the understanding of concepts, phenomena of weather, meteorology, climate, and what geographic climatology is. In the basic teaching books of this area, in teacher training, Ayoade (2003) already says that it is necessary to understand the contemporary world and climate is central, since atmospheric processes are related to numerous phenomena that have repercussions on society, the biosphere, the hydrosphere, and the lithosphere. Examples of this intrinsic relationship can be felt in extreme events, in heavy rains, untimely droughts, timeless cyclones, recurrent tornadoes in latitudes where they are rarely seen, and many other manifestations that affect areas that do not experience them routinely.

Climatology content should be a concern in elementary school education, so that the constituents of climate can be understood, as Meneguzzo and Meneguzzo (2010) say, in order to form a critique of the anthropism present today, based on what can be observed in climate manifestations at various scales. Thus, the training of a teacher with a solid foundation in climatology, as well as prepared to promote a critical understanding of reality, is fundamental. Silva and Cardoso (2019, p. 2 and 3) state that due to inaccurate preparation or not very specific training, some teachers do not address this topic in the classroom, often reproducing what is conveyed by the media unrelated to Geography, and in certain cases, they do not even address geographic climatology, distancing it from the classroom.

¹ State University of Maranhão. Adjunct Professor IV of the Bachelor's and Licentiate's degrees in Geography, Postgraduate studies in Geography, Nature and Dynamics of Space. ORCID: <https://orcid.org/0000-0002-1224-5019>. E-mail: clanaros@yahoo.com.br.

class. For the authors, one of the problems “is related to the initial training of teachers. In most cases, undergraduate training is deficient in relation to the content of Geographic Climatology, being restricted to one or two subjects in the curriculum”. Thus, teacher training requires good training of professionals to deal with this topic, and not only.

Teacher training “needs to provide conditions so that future teachers feel qualified to teach them, which should be guaranteed in the initial teacher training” (STEINKE, 2012, p.79). Dantas (2016) states that the contents inherent to this discipline are more interesting if linked to reality, requiring that the teacher be able to bring everyday life closer to teaching in his/her practice, at the three levels. Therefore, studying the climate, understanding its manifestations through related content, can improve critical thinking, contributing to reflections on these issues. In particular, training for graduates should be provided that allows them, when practicing their profession, to articulate the contents aiming at a critical understanding of geographic space, since in the “[...] classroom, it is necessary for the teacher to approach the elements in an integrated manner, associating climatology with other elements, such as relief, regions and the society-nature relationship. Thus, the student can understand the climate as an integral part of the environment (SILVA; CARDOSO, 2019, p.3).

In this sense, we present here an experience of the Geographic Climatology discipline of the undergraduate courses of the State University of Maranhão, in two cities in the interior of the state, Pastos Bons, in the South and Governador Nunes Freire, in the northwest of the state. The main objective was to substantiate the local differentiation of the weather, under the same climate, requiring secondarily that one understand relative humidity of the air, albedo, clouds and their relationship with the weather, weather differentiations and geomorphology and winds, in addition to seasonality, maritime and continentality and the imbrications with the physics of nature related to climate and weather. As well as, provide an experience of using the technologies available in everyday life, in this case, portable telephones and APP applications.

Geographic Climatology and Teaching

Some problems related to teaching and learning in climatology arise from the baggage brought by students from their previous school education, and on the other hand, from the higher education of the graduate, as Melo (2015) attests. This process, teaching and learning, refers to a complex system of interactions between teachers and students that may apparently seem to be just that, but go much further, as if they were independent processes (KUBO; BOTOMÉ,

2001). In this way, the learning mediator must have sufficient knowledge of the contents and their complex relationships at different levels in geographic space. In this sense, the documents that guide teacher training in climatology are found in the National Curricular Parameters (BRASIL, 1998), in which this theme appears in the 3rd cycle of elementary school, in the axis *The study of nature and its importance to man*. Topics such as water and climate; atmospheric circulation; seasons of the year; Brazilian climates, day-to-day climate; the forest-climate relationship; weather forecasting are all discussed at this stage to establish what climate is and to underpin the understanding of climatology that will be implemented from then on.

The 4th cycle has axis 3, *Modernization and environmental issues*, climatology that begins to deal with the changes arising from contemporary society, thus, the city is the protagonist, the industry and the social organization of the contemporary way of life. In this way, air pollution and urban climate are addressed; thermal islands in the urban environment; impacts of soil waterproofing in cities and the effects of drainage (BRASIL, 1988).

In high school, the *Curricular Guidelines for High School* In your notebook *Human Sciences and their technologies*, the contents and concepts of Geography are articulated by axes and climatology is related to the analysis, construction and application of "geographical concepts, as well as related areas, for the understanding of natural phenomena, geohistorical processes, technological production, cultural and artistic manifestations", (BRASIL, 2006, p.56). As a rule, geographic climatology is articulated with the more physical contents, applied in the first year, now with a greater systematization than in fundamental II, taking the scale to the globe and contemporary times.

It is observed that many times the main, if not the only, instrument that aligns learning is the textbook or something similar, such as handouts, which can limit climatology to content, without giving due importance to cognitive development and critical and relational learning, necessary for the understanding of geographic climatology. As for the value of the textbook, its role in the classroom routine is that it "[...] constitutes an important link in the chain of competence discourse: it is the place of defined, ready, finished, correct knowledge, and, thus, the ultimate source of reference and counterpart to the errors of life experiences", but the author draws attention to the fact that it should be used

[...] critically the manual, relativizing it, comparing it with other books, with information from newspapers and magazines, with reality surrounding. Instead of accepting the "dictatorship" of the textbook, the good The teacher must see in him [...] only a support or complement for the teaching-learning relationship that aims to critically integrate the educating the world. (VESENTINI, 2003, p. 166-167)

It is then up to the teacher to 'awaken' the students' cognitive interest, in this way he [...] must act in didactic mediation, which implies investing in the process of reflection on the contribution of Geography in everyday life" (CAVALCANTI, 2010, p.3). Silva and Cardoso (2019, p.6) conclude in their research on geographic climatology in textbooks that "[...] it is necessary to associate the teaching of climatology with everyday practice, its influence, consequence and application of this content to reality, providing the student with reflection on their reality and bringing theory and practice closer together".

A first step towards learning is good training for Geography teachers, already in their undergraduate studies, focused on the perspective of working in the student's universe, qualified to develop this learning and cognition. Oliveira, Chagas and Alves (2012) state that undergraduate students lack understanding of climatology, but that there is another contributing factor, in elementary education, the poor conditions offered. Steinke (2012) addresses meaningless learning by saying that

When we learn something without knowing why, especially at school or in college, we usually attribute this "because" to the fact that the subject be an academic obligation, which often becomes just something more to be memorized and then forgotten [...] when we study something that is experienced by us, the chances of learning are much greater become more consequential. (STEINKE, 2012, p. 13).

For Silva and Cardoso (2019, p. 7), this training of graduates, future teachers, "[...] is essential for teaching climatology to have some meaning for elementary school students". Thus, it is essential that in the Geography undergraduate course, "[...] the subject of Geographic Climatology is not just another academic obligation to be fulfilled. It must have an application and a meaning for the student". This is necessary, especially with regard to teachers in areas in which the deficiencies related to socioeconomic disparities do not offer material, economic and social conditions, where the school can assume an aggregating role. Cavalcanti (2002) attests that the school is a meeting place of cultures, knowledge, scientific knowledge and knowledge

everyday life, under the basic reference of scientific knowledge. In this way, proposing teaching practices focused on everyday life can provide improvements in teaching and learning in geographic climatology at all levels of education.

It is also worth highlighting an issue regarding what is learned and what (little) is taught, this concerns the training of the graduate and him/her as a teacher. To clarify, Sant'anna Neto (2000), when addressing the problem, states that there are several factors: the training of teachers themselves, which do not address this gap; the curricular structure; the lack of integration of climatological content with other geographic science content and the universe of everyday reality, that is, space.

Applying activity in geographic climatology with a focus on the place to develop learning among future teachers.

The climate has the most varied influences, and its characteristics are present daily in our lives. Sorre (2006) drew attention to the need to understand the meteorological elements that differ in time and space, influencing us, from a geographical perspective. For him, when studying these geographical variations

[...] of the sheet of water precipitated on the surface of the soil, when we compare the differences in the rate of thermal oscillation of a region to another, when we characterize the atmosphere of a place by combination of meteors, when we investigate the relationship between these facts and other geographical facts such as distribution of plants, animals or men, we work imbued with another spirit. We do climatology, general or descriptive as the case may be. (SORRE, 2006 p.89)

In other words, the understanding of the inseparability of climate and the biosphere with results in life, therefore in each location, regardless of scale, there is a climate-life relationship that generates space that geographic climatology can, based on the understanding of climatic factors, correlate. It is no coincidence that climatology advanced in the 1970s with Monteiro (1976), who systematized climatological studies in urban environments through the General Theory of Systems, thus the city began to be understood as a system with elements, behavior and production seen in an integrated manner, above all, with effects on society. Sant'anna Neto (2008), on the other hand, draws attention to the fact that this view of geographic climatology encompasses the territory, considering the quality of life, which is inexorably integrated by environmental comfort, which accompanies social segregation in cities, as the author points out.

attests, when citing areas with a high concentration of pollutants that, because they require high investments, end up receiving activities that are less valued by capital and serving as housing for the low-income population.

Understanding the climate on a space-time scale allows us to have a better quality of life, as stated by Alcoforado (2006, p.169), since the climate affects human activities in a positive or negative way, and can also be a beneficial resource. The author says that climates have a great influence on the availability of natural resources and on human societies. In this context, the climate can be seen as one of the most important natural resources, which, if well understood and adequately managed, contributes to the quality of life of all.

One of the most important parameters in assessing climate quality in territories is given by thermal discomfort, that is, what we seek to assess is thermal comfort, which for Pagnossin, Buriol and Graciolli (2001) expresses

[...] satisfaction with the thermal environment, with several factors that influence, among them the physical aspects related to the processes of heat exchanges: conduction, convection, radiation and evaporation that cause the organism to gain and lose energy with the environment, through the influence of meteorological variables such as temperature, humidity, air movement and radiation responsible for a greater or less sensation of thermal comfort. It should also be considered, the physiological and psychological variables that vary from individual to individual according to thermal perception and preferences (PAGNOSSIN, BURIOL; GRACIOLLI, 2001, p. 151).

Therefore, by studying environmental variables, we can understand the constituent elements of the active climate which, according to Frota and Schiffer (2003, p. 15), have “[...] close relationships with rainfall patterns, vegetation, soil permeability, surface and groundwater, topography, among other local characteristics that can be altered by human presence”.

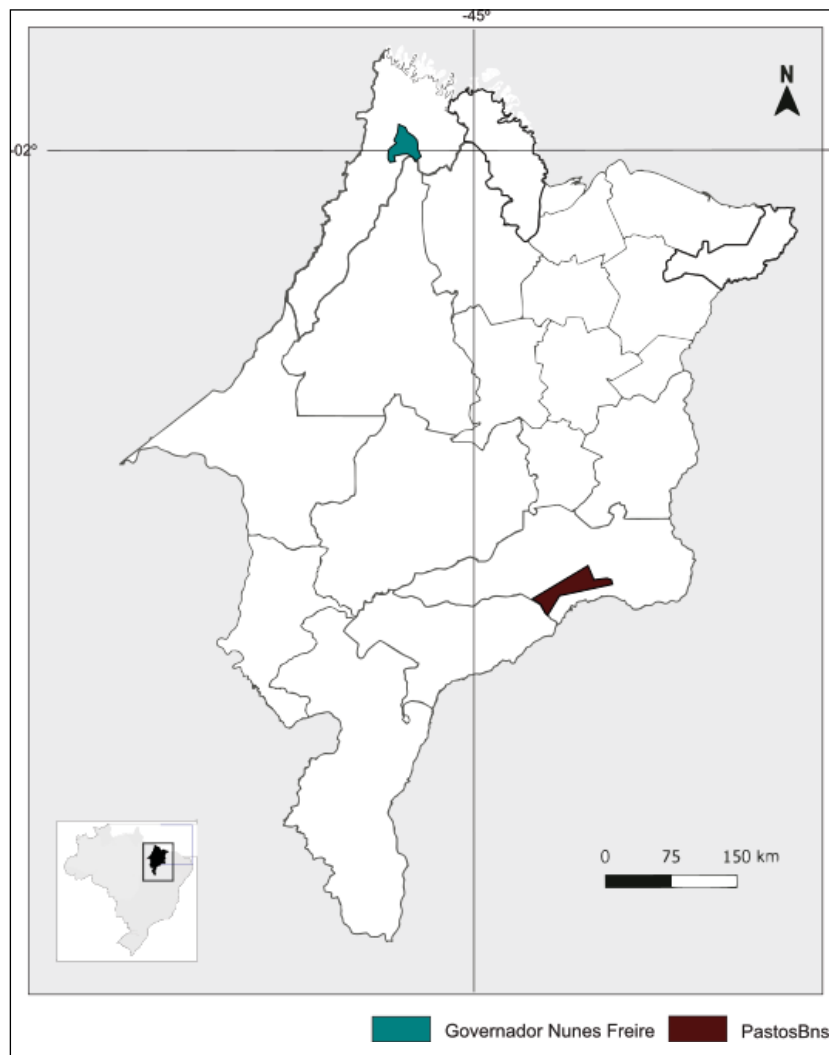


Figure 1. Location of municipalities.

Therefore, it was proposed, through the evaluation of thermal comfort variables, to seek learning and sedimentation of climatology content among Geography undergraduates from two classes in the interior of Maranhão, in the cities of Pastos Bons and Governador Nunes Freire (Figure 1). The choice is based on what Ruas (2005, p.5) states that the comfort index “[...] is a parameter that represents the combined effect of the main intervening variables. Through it, it is possible to evaluate the thermal comfort situation of an environment, as well as obtain subsidies to better adapt it to human needs”.

The proposal was based on urban climatology, but to contribute with speed and practicality, the practice was based on the works of Gomes and Amorim (2003), Garcia (1985) and Souza and Nery (2012), which allowed working with thermal comfort classification tables, mainly from Garcia (1985) and Terjung (1966). Also Fialho (2007), who proposed sensitive observation of the weather as a teaching practice in climatology through three practical activities, in this last work the “Annotation spreadsheets” were used.

of the Elements of Climate” (FIALHO, 2007, p. 118-120), but only in relation to land, since it presents observations for places bathed by the sea. The observation resulted in a spreadsheet associated with thermal comfort in which it was also proposed to observe the types of clouds, temperature and wind (direction and intensity), providing this learning in practice (Table 1).

Initially, after addressing the climatic elements (AYOADE, 2006; VAREJÃO, 2006; CASTRO, 2018), the text by Zorzeto (2003) was read, which illustrates the differences in the climates of the city of São Paulo, illustrating the climatic variability arising from the correlations of the factors. The choice was made because it is a journalistic text, in which the results of the research are presented in a less detailed manner, with language more appropriate to the understanding of the results than to the intimate fragments of academic climatology. This was done because it represented an initial stimulus to awaken the search for climatic differences and their factors.

Table 1. Local weather observation spreadsheet.

LOCATION	DAY / TIME		oW	THERMAL COMFORT			WEATHER STATE *
				TERJUNG	GARCIA		
					THERMAL	COMFORT	
1							
2 ... (up to 4)							

Source: Research, 2022. * Column intended for notes on wind/clouds/precipitation.

This text was used to discuss how direct observation of weather conditions could be carried out on a daily basis using simple and easy-to-make instruments, so that future teachers could propose projects that would consolidate the preparation of constant data in the territories in which the school where they teach is located with their students. From this, the constituent elements of the climate and the factors associated with weather conditions, climatic domains, construction of climograms and local differences were discussed.

The observations in each location were made by groups of up to 3 students who carried out the observations in 4 different locations in the municipality, the choice of which should consider distinctions regarding greater or lesser urbanization, position regarding the slope and presence of vegetation. The first part of the activity was the description of the landscape, considering the aspects mentioned, as well as the position of the slope;

direction of drainage; coating, sidewalks, classification of housing on public roads. To measure the landscape and temperature, software available on cell phones, a camera and a temperature meter were used (Figure 2).



Source: extracted from student work

Figure 2.APP Thermometer used to read air temperature.

To measure the temperature, the telephones were left for 10 minutes on a piece of wood or a plastic container and without direct sunlight. In all locations, the reading and observation of the weather elements was carried out three times a day, at 7 am, 1 pm and 9 pm, for 4 weeks and three times each week, totaling 12 days of readings for each chosen location. It was necessary to choose thermometers that measured the temperature of the device, since many of these APPs use daily temperature data from the internet.

Each sampled point had its data treated with line and bar graphs, individually and comparatively, the purpose of which was to discuss which factors acted predominantly to change the values at the same time, in the averages in situations such as rainy, sunny, windy days, with a lot of traffic, etc. The reports presented all the elements obtained, including the spreadsheets and a map of the municipality with the locations.², photos of the clouds at each observed moment and their description, graphs and discussions regarding the main elements that could contribute to the discrepancies and similarities in the observed weather. The results were debated on a day of classes, contributing dialogically to learning.

Each group also had to try to interview two residents of each location researched, aiming to establish the perception of climate change, thus intending to establish social perceptions for this issue that is so debated today and which aspects of the climate may have changed, since there is not enough data in terms of observation time and spatialization to allow this to be measured.

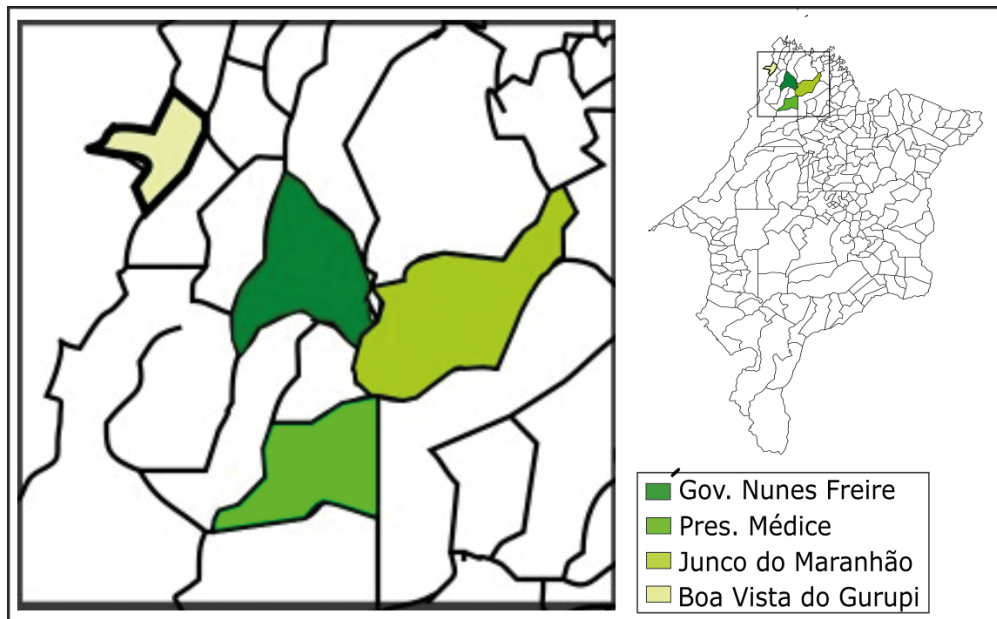
The practice of geographic climatology activities in Geography undergraduate classes in the municipalities of Governador Nunes Freire and Pastos Bons, Maranhão

The municipalities in which the activity took place, as can be seen in Figure 1, have greater and lesser influences in terms of maritime-continentality, with a predominance of rainforest and cerrado in the landscape; gentle hills and low altitudes and plateaus and terraces in the geomorphology; historically, the founding of the cities took place after the construction of the road that connects Maranhão to Belém in the second half of the 20th century and the occupation of the south of the state by livestock farming during the colonization, respectively, in Governador Nunes Freire-GNF and Pastos Bons-PB (CPRM, 2013).

The Geography undergraduate classes are part of the program *To teach*, from the State University of Maranhão, which through partnerships with city halls, offers training for teachers in the interior of the state, meeting the demand for teacher training, as well as offering higher education, aiming to “strengthen the teacher training policy for basic education in the State of Maranhão”³, the classes consisted of 25 students in GNF and 22 in PB, resulting in 8 and 7 groups respectively. In the first, there were also students from 3 other contiguous municipalities, in the second, 4, which allowed extending the relational understanding of weather-climate according to local factors on a broader scale. Fieldwork was carried out between October 2018 and May 2019.

In the four municipalities surveyed in GNF, the temperatures obtained between 6 and 7 am showed the greatest variation between the temperatures recorded at each point, 3.6°C, among all the studies carried out, in the area of the BR 316 highway, on the edge of which the city was created in the 1970s. In the others, the variation remained below 2.8°C in the morning. The smallest variations occurred in the outskirts, where there is a landscape where the ‘presence of green areas is still very present’ (class research report). Among the municipalities surrounding GNF (Figure 3, on a map created by one of the groups), the highest morning temperature occurred in Presidente Médici (28.2°C), on the edge of the highway, as in GNF, and the lowest in Junco do Maranhão (23.1°C), in a rural village.

The difference between the highest temperature observed, in Presidente Médici, and the lowest, in Junco do Maranhão, was 5.1°C, for the same day.



Source: Students Mara Dielly – Maria Almada – GNF.

Figure 3. Municipalities researched in the Governador Nunes Freire hub.

The temperatures obtained in the middle of the day, between 1 pm and 2 pm, showed greater homogeneity at each sampled point, but with greater amplitude between points, varying between 36.2°C (Presidente Médici) and 29.1°C (Junco do Maranhão) for the same day. In Presidente Médici, the central area showed the greatest difference among all temperatures, the lowest occurred in Boa Vista do Gurupi, on the banks of the river of the same name.

Nighttime temperatures also varied widely between the points sampled within the municipalities and between them on the same days. In GNF, the greatest differences occurred between the center, on the side of the road, 35.6°C, and the west side, 29.7°C, where the precarious urbanization shows dirt roads, open houses, without walls and lots of tree and shrub vegetation. Among the municipalities, the highest temperature was recorded in Presidente Médici, 35.9°C, and the lowest in Junco do Maranhão, 26.9°C.

The results for the municipalities of PB (Figure 4, produced by one of the groups) indicated higher and lower temperatures than those in the GNF area. There, the continentality is more pronounced and the natural landscape is that of cerrado. The highest morning temperatures for the same day occurred in São Domingos do Azeitão, on the side of the road, 28.9°C, the lowest in the historic center of Pastos Bons, 21.8°C. The amplitudes for each point were higher in the first city and lower in Nova York, on the shore of the dam lake on the Paranaíba River.

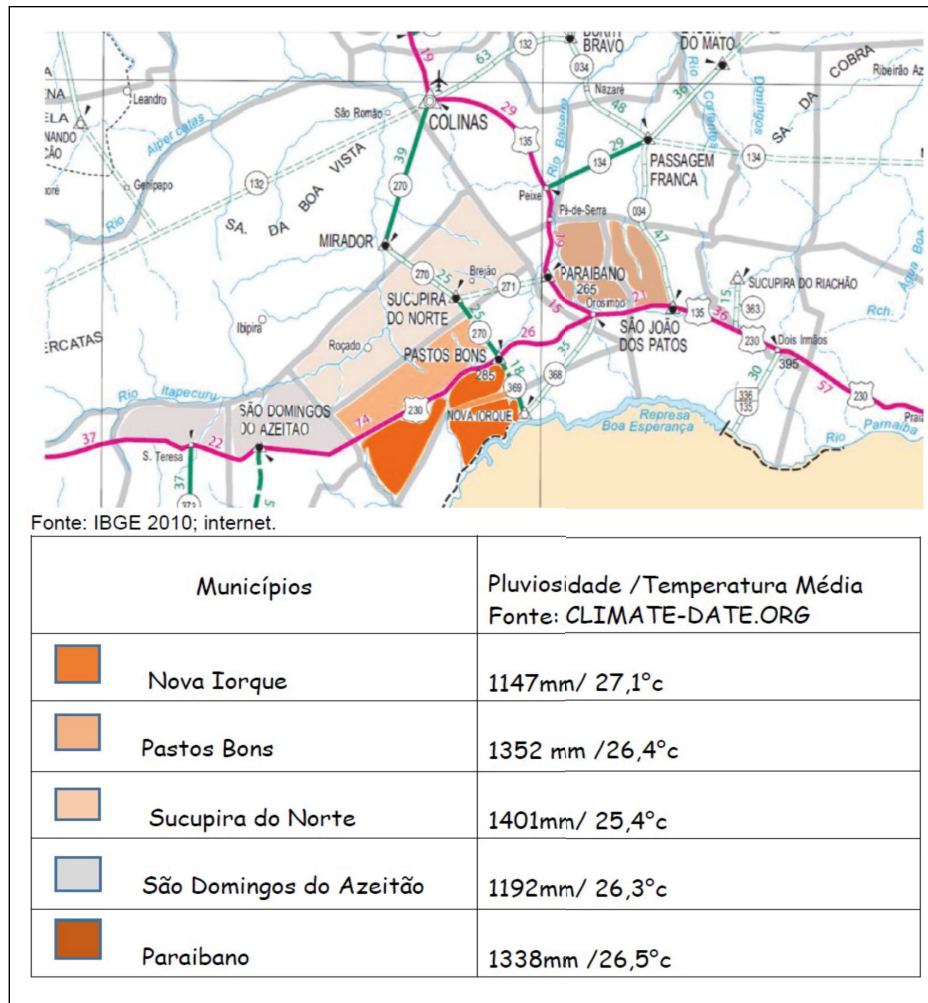





Figure 4. Municipalities researched in the Pastos Bons hub.

The afternoon temperatures showed significant differences compared to the morning temperatures, with São Domingos do Azeitão showing the highest maximum, 37.6°C, and the lakeshore in New York, the lowest, 30.7°C. On the same day, the amplitude between the points varied by 5.2°C, with the maximum in São Domingos do Azeitão (36.5°C) and the minimum in the historic center of Pastos Bons (31.3°C). The nights showed a similar trend to what occurred with the morning temperatures, with higher values for São Domingos do Azeitão and lower values for Pastos Bons (35.4°C and 29.9°C, respectively, on the same day). Regarding the daily differences between each point, the greatest homogeneity in New York and the lowest in Sucupira do Norte stand out.

Regarding the observation of the weather, the description aimed to associate clouds as a way of fixing knowledge and stimulating the context of the occurrence of each type to the weather. Thus, the photos and the description of what had occurred and what occurred after reading can show which clouds accompany and/or indicate the weather. Figure 5 shows some images obtained by the groups and the classification of the clouds.

When discussing and correlating all the results, the errors in cloud classification were corrected by the classroom group, with little intervention from the mediator-teacher, since they used the materials made available digitally (AYOADE, 2006; VAREJÃO, 2006; CASTRO, 2018), as well as the reasons for the disparities in the values of each point, which were discussed and noted by the future teachers on the board and then reported and approved by everyone. Thus, factors such as higher and lower areas; more and less densely urbanized areas; areas with greater vehicle circulation; close to water reservoirs, rivers, marshes; fields, secondary forests or forests; with exposed soil; wind direction and other factors were dialogically raised among the students and discussed to arrive at the reasons for these differences.

	<p>November 26: CUMULUS (CU), clouds of this type have vertical development. They are often isolated clouds with a horizontal base and a top that is generally not very high. They are commonly white in color and, sometimes, a lighter gray, almost always indicating calmer weather without rain. (Artur Oliveira, Francisco Raivan, PB)</p>
	<p>October 24th. NIMBOSTRATUS (NS), a very rainy day, strong winds before the storm occurred. At the time of the temperature reading, the rain was arriving and then a deluge came. These clouds are from heavy rains. (Rita Simone and Steffany Martins, PB)</p>
	<p>STRATOCUMULUS (SC): These are classified as low clouds. They appear in the form of rows and look like cotton flakes. They bring light rain.</p> <p>They were observed on the following days: 21st, 22nd, 26th and 28th of November and 5th of December.</p> <p>Authorship: Maria Cristina and Regilene (GNF)</p>

Source: Extracted from student work.

Figure 5.Photos of clouds observed at sampling points in GNF and PB.

Regarding thermal sensation and comfort, the classes agreed that there was a discrepancy between the theories and the true sensation they felt, since in the mornings, with temperatures that indicated thermal comfort, many of them felt cold, but they all agreed with the classification of discomfort obtained in all the readings in the afternoon, noting that

On rainy days, despite the high temperature, when the rains lasted for more than a day, they felt comfortable. Figure 6 shows a table filled with the results of the discomfort/comfort classification.

DIA	5/10 5:28hs	12/10 5:28hs	19/10 5:28hs	26/10 5:28
TEMPERATURA	24°C	24°C	25°C	24°C
THOM	50% da população total sentem desconforto	50% da população sentem desconforto	50% da população sentem desconforto	50% da população sentem desconforto
THERJUNG	Leve desconforto	Leve desconforto	Leve desconforto	Leve desconforto
GARCIA	Ligeiramente fresco à Neutro	Ligeiramente fresca à Neutro	Ligeiramente fresco à Neutro	Ligeiramente fresco à Neutro
HENTSCHEL	Calor moderado	Calor moderado	Calor moderado	Calor moderado
IAG/USP	Confortável	Confortável	Confortável	Confortável
MARIA CRISTINA REGILENE	Clima agradável	Clima agradável	Pouco frio	Pouco Frio

Source: Extracted from student work.

Figure 6. Thermal Comfort in GNF.

The issue of climate change should be investigated through research with residents (143 were interviewed). In all 52 locations where the survey was conducted, at least one interviewee reported that there were weather-climate events that seemed to be different. In all of them, there was more intense and concentrated rainfall and a feeling of more intense heat. Other categorized manifestations indicated: less rainfall; more intense periods of drought; shorter length of days during the rainy season; colder nights; warmer nights; and rain occurring at random times. Both classes agreed by consensus that there were climate changes in these locations, but with reservations about what they were and what causes they had. In Pastos Bons, the class suggested studies that could demonstrate these changes with greater precision, with more accurate research. This proposed approach did not obtain results that could be considered reliable given the lack of methodological preparation that the students still had, since they were at the beginning of the course, with little affection for the universe of research in the humanities, directly with society.

With the intention of evaluating the learning provided by the proposed activity, a test was applied with open questions regarding the necessary content for a good background that a Geography teacher should have in

teaching practice. The following concepts and cause-effect relationships were asked: thermal amplitude, temperature and its behavior with geomorphology, proximity to the sea, latitude, different types of occupation and land use; clouds and their indicators; albedo; radiation; effect of particulates in the atmosphere; weather and climate; seasonality; winds and pressure zones; circulation of the atmosphere; meteorological equipment; meteors. The results indicated an overall average learning among all students of 8.72, with the least learned content being seasonality and thermal differences and the most learned, the effects caused on temperature by geomorphology and occupation-land use and temperature variation throughout the day related to atmospheric conditions. The cloud-weather relationship had good learning, above the general average.

Final considerations

The proposed activity of observing the weather, with temperature and discomfort measurements, can lead to the perception of the climate, in its daily and annual succession, among undergraduate students, since it directly placed them in the comparison of the weather and the feeling of discomfort-comfort. Based on the observed data, the search for an explanation for the differences found in each location researched, encouraged them to seek answers, which contributed to launching themselves into the contextualization, through praxis, of the factors that form the weather-climate that are preponderant, for what is perceived. This is in line with what Silva (2014) tells us, that the teacher must identify the interactions that his students have with the content, seeking [...] to find some connection between what is being taught and the life that pulsates in their daily lives. Such consideration requires the investigation of how the student learns, how he constructs concepts, how he appropriates languages and makes his readings of the world effective". (SILVA, 2014, p. 222).

Praxis, especially when the disciplines can be more applied, such as geographic climatology, is an inseparable tool for learning. In this case, the results indicated that the contents related to local weather production relations contributed to learning with great efficiency, stimulating, through dialogicity, the sedimentation of the contents, demonstrated by the assertive preponderant causes discriminated by the students for the results of each researched location. This positivity was corroborated by the results of the content assessment, in which the general average was above 80% of correct answers.

It is worth highlighting that seeking learning alternatives in teacher training is a step towards consolidating a long-standing practice in future teachers.

to be advancing in knowledge and in the search for how to teach, and that this is a precursor stage, as Santana Filho (2014) said, and that it would be contradictory to expect the teacher to be finished when he/she finishes his/her academic training. For him/her to be an educator it is necessary “[...] fundamentally, to awaken in the teacher the awareness of incompleteness, offering him/her, however, theoretical and methodological foundations for decision-making (SANTANA FILHO, 2014, p. 235).

In this way, strengthening the relationship between content and place lived is of vital importance for learning-apprehending and from there abstracting and prospecting other places and scales, being a starting point from which to move forward. And the activity presented here can demonstrate that this search for the connection between place and science, through Geography, is a way of achieving learning and, not only, of enabling the leveraging of the applicability of knowledge, a fundamental point of teaching.

Notes

2The discipline is offered at the beginning of the course, which did not allow the maps to be better prepared, but this element was used to familiarize students with the use of the *Google Earth* and InkScape graphics program, both free. 3 Available at: <https://www.ensinar.uema.br/?page_id=8>.

References

- ALCOFORADO, MJ Climate as a resource at the World Meteorological Organization technical conference. **Finisterre**, XLI, v. 82, p. 169-172, 2006. Available at: <http://www.ceg.ul.pt/finisterra/numeros/2006-82/82_13.pdf>. Accessed on: 01 June 2008.
- AYOADE, JO **Introduction to Climatology for the Tropics**. 11th ed. Rio de Janeiro: Bertrand Brasil, 2006.
- BRAZIL. Secretariat of Elementary Education. **National Curricular Parameters: geography**. Secretariat of Elementary Education. Brasília: MEC/ SEF, 1998.
- BRAZIL. Secretariat of Basic Education. **Curricular Guidelines for High School: Human Sciences and their technologies**. Brasília: MEC, 2006.
- CASTRO. CE **Climatology** [[e-Book] – São Luís: UEMA; UEMAnet, 2018.
- CAVALCANTI, L. de S.. Geography and the contemporary school reality: Advances, Paths, Alternatives. In: **Proceedings of the 1st national seminar: curriculum in motion - current perspectives**. Belo Horizonte, November 2010.
- CAVALCANTI, L **Teaching Geography at School**. Campinas, SP: Papirus, 2012.
- CPRM. **Geodiversity of the State of Maranhão**. Brazil Geology Program

survey of geodiversity. ORGANIZATION, Iris Celeste Nascimento Bandeira. Teresina: CPRM, 2013.

DANTAS, SP Teaching Geographic Climatology: an intervention approach on the basic concepts of Climate and Weather. **Northeast Geosciences Journal**. v. 2, n. Special, 2016.

FIALHO, ES Climatology teaching practices through sensitive observation. **Now**, v. 13, no. 1, p. 105-123, Jan./Jun. 2007.

GARCIA, FF **Handbook of applied climatology**: climate, environment and planning. Madrid: Editorial síntesis SA 1985.

GOMES, MAS; AMORIM, MCCT Tree Planting and Thermal Comfort in Urban Space: case study in public squares of Presidente Prudente (SP). In: **Geography Paths**, v. 4, n. 10, p. 94-106, Sep. 2003. Available at:

<www.caminhosdegeografia.ig.ufu.br/include/getdoc.php?id>. Accessed on: May 12, 2018.

KUBO, O.; BOTOMÉ, M. Teaching-learning: an interaction between two behavioral processes. **Interaction in Psychology**, v. 5, n. 1, 2001. MELO, DM **Learning Climatology in Geography in High School Based on Ausubel's Theory**. Master's Dissertation in Geography, Center for Philosophy and Human Sciences, Federal University of Santa Catarina, Florianópolis, 2015.

MONTEIRO, CAF. **Theory and urban climate**. São Paulo: IGEOG/USP, 1976. (Theses and Monographs Series, 25).

MONTEIRO, L.M. **Predictive models of thermal comfort: quantification of relationships between microclimatic and thermal sensation variables for evaluation and design of open spaces**. 2008. Thesis (Architecture and Urbanism) – University of São Paulo. Available at: <<http://www.teses.usp.br/teses/disponiveis/16/16132/tde-25032010-142206/pt-br.php>>. Accessed on: September 18, 2009.

OLIVEIRA, DJL; CHAGAS, FLR; ALVES, WS The challenges of teaching climatology in schools. In: **II Education Congress**-Teacher Training: a research proposal based on reflection on teaching practice, Iporá, Goiás, Brazil, 2012.

SANTANA FILHO, Manoel Martins de. Notes on School Geography: its contemporary relevance and the things that blur teaching practice. In: TONINI, Ivaine Maria *et al.* (orgs.) **Teaching Geography and its curricular compositions**. Porto Alegre: Mediation, 2014. p. 227-239.

SANT'ANNA NETO, J. Geographical Climatology in Brazil: from what has been produced to what has been taught. in: **BRAZILIAN SYMPOSIUM OF CLIMATOLOGY AND GEOGRAPHICS**, 4., 2000, Rio de Janeiro, Annals. Rio de Janeiro: UFRJ, 2000. CD-ROM.

SANT'ANNA NETO, J. From geographic climatology to climate geography: genesis,

- paradigms and applications of climate as a geographical phenomenon. **ANPEGE Magazine**, v. 4, p. 1-88, 2008. Available at: <<http://www.anpege.org.br/revista/ojs-2.2.2/index.php/anpege08/article/view/11/pdf4B>>. Accessed on: July 31, 2010.
- SILVA, JLB What knowledge constitutes a good Geography teacher? In: TONINI, IMet *al.* (orgs.) **Teaching Geography and its curricular compositions**. Porto Alegre: Mediation, 2014. p.215 - 226.
- SILVA, MS da; CARDOSO, C.. Challenges and perspectives for teaching geographic climatology at school. **GEOSABERES:Journal of Geoeducational Studies**, vol. 10, no. 20, 2019. , p. 1-17.
- SORRE, M. Object and method of climatology. **Journal of the Department of Geography of the University of São Paulo**, Translated by José Bueno Conti, São Paulo, n.18, p. 89-94, 2006.
- SOUZA, DM de; NERY, JT. Thermal comfort from the perspective of Geographic Climatology. **Geography**(Londrina), v. 21, n.2. p.65-83, May/Aug. 2012. Available at: <<http://www.uel.br/revistas/uel/index.php/geografia/article/view/9798/13484>>. Accessed on January 12, 2022.
- STEINKE, ET Pedagogical practice in climatology in elementary education: sensations and representations of everyday life. **Geographical ACTA**, Ed. Esp. Geographical Climatology, p. 77-86, 2012.
- VAREJÃO-SILVA, **Meteorology and Climatology**. Recife, 2006. Digital version 2. Available at: <https://icat.ufal.br/laboratorio/clima/data/uploads/pdf/METEOROLOGIA_E_CLIMATOLOGIA_VD2_Mar_2006.pdf>. Accessed on February 2, 2017.
- VESENTINI, José W. (org). **Geography and Education**–Critical Texts. 7th ed. São Paulo: Papirus, 2003.
- ZOEZETO, The city of 77 climates. **Fapesp Magazine**, v.92, Oct. 2003.p.53-57.



Author: © Mardilson Torres (Bujari-Acre-BR)