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Didactic Journey at School: A Collaborative Experience of Mediation in Geographical Thinking Formation

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Abstract

This article is part of the results of collaborative action research that, based on the Cultural-Historical Theory, aimed to analyze possibilities of contributing to the construction process of the students' geographic knowledge focusing on citizen spatial practices. It is part of the reflection on the importance of the interaction between universities and schools: the need to build theoretical and methodological elements that enable the formation of geographic thinking and the understanding that geographic knowledge is relevant to the fundamental education of all citizens. Thus, this work contributes to understanding individual and collective reality (social and natural) in different scales and contexts. We identified that when utilizing practical actions of collaborative intervention formalized during the elaboration and implementation of "Didactic Pathways for Mediation in Geography Teaching," self-training and inter-training of involved teachers (university and Basic Education) could be enabled. Such reflections also provide opportunities for the construction of learning and the formation of geographic thinking by students.

Keywords: geographical thinking, didactic journey, collaborative experience, mediation

1. Introduction

This article presents the theoretical and conceptual basis, the didactic course, and the results of the research entitled: "Geographic Science at School: formation of geographic thinking for citizen action". It was developed between

the years 2019 and 2022 as an integral part of the Education and City Teaching and Research Network (REPEC¹), which connects to the Laboratory of Studies and Research in Geographic Education (LEPEG) of the Federal University of Goiás (UFG). REPEC has as its main actions: research on Geography teaching; elaborate and carry out experiences with the use of didactic materials about the Metropolitan Region of Goiânia (RMG), in Goiás, in partnership with teachers of Basic Education²; and act in the formation of Geography teachers and students of Basic Education for citizen action.

The project's objective was to analyze the possibilities of contributing to the construction process of the students' geographic knowledge, having as a central focus the spatial citizenship practice. With this goal, we sought to develop mediation projects, including theoretical references of Geography and teaching materials on local reality prepared by REPEC, in elementary schools in the state of Goiás, in this case in the cities of Goiânia and Jataí.

The concept of Didactic Pathway for Mediation in the teaching of Geography (PDMGeo) by Cavalcanti (2019, p. 163) supports the research. It highlights the importance of teacher mobilization in preparing trails and materials that - when methodologically employed - address the spatial property of a fact or an object in the teaching of Geography. Thus, they promote the construction of students' geographic thinking to act in citizen practice.

This conception guides the methodological organization of the teaching work, i.e., intentionally planned. So that as Cavalcanti (2019, p. 164) points out: "the activity is directed in order to provoke, to intervene in the relationship of the subject (student) with the reality (object of knowledge), presenting (mediating with) material and symbolic instruments for the mediation of this subject/reality relationship."

Working with and considering the concerns of young people of school age about quotidian and social practices presuppose collective work that emphasizes the intersections between daily life and systematized geographic content. Moreover, they reinforce the need to understand that citizen practices are essential in forming geographic thought.

In this sense, some questions guided the research: how do young people in Basic Education build theoretical and conceptual thinking about the city and urban life capable of grounding their citizenship? Is it possible, through geographic contents, to promote reflection and the formation of concepts about the spatiality in which students live, consequently contributing to the exercise,

¹ REPEC and LEPEG are the original acronyms.

² By Basic Education, we refer to the compulsory schooling years in the structure of the education system in Brazil: elementary education, consisting of grades from 1 to 9, and secondary education, from 10 to 12.

consciously and critically, of citizenship in these spaces? To what extent do students understand that they exercise spatial citizenship practices in their city? Thus, based on these issues, for the present work, the following question was defined as the central study question: How to enhance classroom situations with Geography to promote the internalization of knowledge by students that qualify their spatial citizenship practices?

The need to build theoretical and methodological elements that enable the formation of geographic thinking motivates the project. To this end, it is essential to consider the reality of students so that they can build geographic concepts that lead them to understand their social reality in its multiple scales and interconnections. It also considers essential to have as reference a systematized conception of city and citizenship as a geographical principle since it is in the city that the dominant way of life in contemporary society is produced and lived.

In this context, the school contents related to the city in the teaching of Geography contribute to the understanding of urban space; to the citizen practice; and to the possibility of internalization of structuring concepts of geographic thought, such as landscape, place, and territory, present in the curriculum guidelines for the teaching of Geography in Brazil.

The collaborative action research method meets the methodological specificities of the research, which presupposes subjects with common objectives and goals. In other words, as Franco (2005, p. 7) points out: “within the perspective of being the pedagogical exercise, configured as an action that scientifies the educational practice from ethical principles that visualize the continuous formation and emancipation of all the subjects of the practice.”

In Brazil, the educational field has frequently conducted this kind of research. Assuming the character of collaboration, researchers from universities form teams with teachers from Basic Education schools to highlight, reflect and act seeking to collaborate with the changes to be made, in addition to leading the teaching action for the collective production of knowledge. The collaborative action research “aims to create in schools a culture of analysis of the practices that are performed, in order to enable their teachers, assisted by teachers from the university, to transform their actions and institutional practices.” (Pimenta, 2005, p. 523)

The development of this research used the methodological foundations outlined in the project “Geographic Science at School” in 2019. Moreover, it aimed at the basic assumption of interaction between subjects of universities (teachers, undergraduates, and postgraduates) and school subjects (teachers and students). In this understanding, the first stage carried out (1) was the establishment of partnership relations, i.e., the formation of the working group with members of two universities (Federal University of Goiás and Federal University of Jataí) and the Basic Education network of two cities of Goiás: Goiânia and Jataí).

Consequently, the other stages emerged, as follows: 2) Study, reflection, and discussion to understand the type of methodological approach that would direct the research; 3) Restructuring of the project in a collaborative way employing periodic collective meetings with the participating members, branching out into 3.1) Definition of the meetings' recording mode, with the choice of memory as the instrument; 4) Deliberation of the meetings' structure and for the execution of the activities in the schools, as well as for the choice of materials and study references. It is essential to mention that, throughout these collective meetings, there were discussions and studies on the theoretical conceptions; reports and reflections of a practical nature about the daily routine of the classroom; study and choice of didactic and pedagogical materials; analysis on the conceptions and ways to evaluate the impacts of the proposals and activities carried out for the student's learning; and organization of the information and data collected for publication and dissemination. Finally, 5) contributions of the research: the group constituted a learning community, which contributes to the training processes of the researchers, initial and continued training of Geography teachers, and scientific training of Basic Education students.

With the finalization of the work, the research contributed significantly to understanding the possibilities of didactic mediation for developing the student's geographic thinking. The experience showed elements of the dimensions of creative teaching work in the sense of the potentiality and the commitment of geographic science to citizenship practices through practical intervention actions in elementary school students learning process. The process of study, planning, and realization of the project provided the development, by Basic Education students, of a geographic way of reading and understanding the world, which is called geographic thinking (Cavalcanti, 2019).

2. Theoretical and methodological foundations that guide the formation experiences of geographic thinking

There is an initial premise that guides the actions of this investigation: teaching Geography is not about solely transmitting content once the purpose of the content is to help students make a geographical analysis of facts and phenomena of reality. This analysis is a specific capacity provided by a type of thinking, the geographic one. In other words, Geography teaches envisioning the development of students' geographic thinking, which is the general ability to perform this analysis. This goal, in turn, allows the contents of this discipline to be more meaningful to students.

This premise requires an explanation of what is meant by geographic thinking. Geographical science produces a distinct type of knowledge that provides essential and specific elements for understanding this reality, whether physical or social. These elements have emerged in geographic research and production throughout the history of this science. They have constituted as their

own based on questions peculiar to this reality. These questions have been considered one way to distinguish the specific contribution of a science (Unwin, 1995). According to scholars on this topic, some questions are typically geographical: Where? Why in that place? What does this place resemble? (Cavalcanti, 2019; Foucher, 1989; Gomes, 2013, 2017). Thus, such questions are fundamental to elaborate reasoning that triggers geographic thinking. In this way, Geography is a way of thinking, a particular way of producing knowledge, from questions that investigate the explanation of the locations, i.e., what is peculiar to Geography is to seek to know why things are where they are, that is, to give meaning to the order of things.

To understand reality from this specific point of Geography, authors such as Moreira (2007), Moraes (2014), Martins (2016), and Santos (1996) indicate articulating its categories, concepts, and logical principles, which built throughout its history, elaborate a coherent discourse (language). The internal coherence in this science forms systems of concepts, such as landscape, territorial configuration, territorial division of labor, rugosities, forms-contents, and performing spatial cutouts - region, place, networks, and scales. External coherence refers to the “relation with other pieces of knowledge, through the possibility of the respective field showing itself distinctly and being, at the same time, completed and complemented, in the common process of knowledge of the total reality” (Santos, 1996, p. 18).

These authors understand that reality has a structuring dimension, the spatial dimension. In this sense, space is fundamental to the dynamics of society, social relations, and the relations between society and nature. Therefore, understanding this dynamic is vital to understanding reality. From concepts (theories, categories, and specific concepts) and by analyzing reasoning exercises, it is possible to apprehend the spatiality of the facts and phenomena of reality.

The ability to grasp spatiality, developed by Geography professionals, is of interest not only to their specific field but to society in general, as it contributes to the analysis of essential aspects of reality, which is why their knowledge is present in Basic Education school. Thus, the development of geographic thinking is the primary goal of this disciplinary field. Geographical knowledge is relevant to all people, to the Basic Education of all citizens, since it contributes to a better understanding of their reality (social and natural) and that of others in different scales and contexts.

In this perspective, the goal is to teach thinking about reality through the contents, i.e., theoretical and conceptual thinking about this reality. To achieve this goal, students must have an active relationship with the context in which they live, problematizing it and trying to respond to the questions made with the help of intellectual tools produced by Geography. Thus, we sought to experiment with geographic approaches in teaching so that students would develop the ability to think geographically, which is not predominantly evident in current school

practice. To develop this ability, approaching geographic content in teaching requires a method. However, it is not a matter of directly transferring the method of geographic analysis made by science to teaching because the work to be done is the mediation of relations between students, the subject of knowledge, and the geographic contents, the object to be “known.” In this regard, Cavalcanti (2019) argues that this geographic science:

[...] is validated and is available to people as the legacy of systematic and rigorous scientific knowledge. And it is this science that needs to be available to the school, to all people. However, for it to be potent, powerful, to be internalized, to be part of the students’ body of knowledge, it is necessary to approach it not as something ready-made, a product, but also as a way of thinking, because it is this perspective that broadens the possibility of looking at reality. (pp. 95-6)

The purpose, then, is to articulate school education with life, that is, to train for everyday life, for urban life, with the contributions of Geography. In this sense, it is possible to accomplish this project by teaching about the city and citizenship. People’s lives are predominantly marked by the urban way of life, leading to the need to elect as important school content the themes of the city studied by Geography, emphasizing everyday urban problems. The city is a produced spatiality and produces/reproduces a certain urban way of life, a collective life that implies a specific social dynamic.

It is crucial, therefore, to understand the concept of city and citizenship from the geographic point of view. In Geography teaching, the theme of the city contributes to the understanding of the urban space, to the citizenship practice, and enables the work with the geographic concepts of landscape, place, and territory, which are very present in the curricular guiding documents for Geography teaching. According to Lefebvre (1991), Santos (1996), and Harvey (2000), social expression is predominant in the city, so studying the city is also studying society.

Concerning citizenship, besides the political dimension, we consider other perspectives, given the intense claims for social inclusion, respect for diversity, and rights for better living and survival conditions. This conception defends the exercise of the right to have rights, to create rights in the daily practice of communal life (Cavalcanti, 2001), highlighting its territorial dimension in terms of the right to enjoy, live and inhabit the city (Lefebvre, 1991). Thus, we think of citizenship that promotes the students’ critical consciousness about their rights: to more dignified survival conditions, their cultural manifestations, the knowledge of school geography, and the city spaces.

The purpose of the investigation, guided by these fundamentals, was to provide theoretical and methodological elements with themes about the city and

citizenship, enabling the formation of the students' geographic thinking to consider their reality.

Indeed, such thinking does not develop in teaching with content transmission practices, as those still present in the routine teaching of this subject. Differently, we understand that it is crucial to adopt active learning through which students can situate themselves as subjects of their learning process to advance in the practices to contribute to the overall development of students.

Due to this understanding, it was chosen in the investigation to work with a collaborative group and plan the direct actions in teaching practices with a proposal of a transformative Didactic Pathway for Mediation in Geography Teaching (PDMGeo), aligned to the Cultural-Historical Theory (Cavalcanti, 2019, p. 163). This pathway characterizes working with a unit of content following a dialectical method of knowledge construction. This approach has three main steps: problematize, systematize, and synthesize.

In this path, after defining the thematic unit to work on, the teacher must prepare a content map with the main themes and a correlated conceptual system in the form of a chart. This chart should hierarchize and articulate the main concepts guiding the approach of the themes. Based on these initial stages, the first step is to start working with the students by inserting a problem situation linked to the general subject or asking the students to do so. This action enables the students to get more involved with the themes, i.e., mobilizing them to study the aspects involved. By completing this step, the students will be better prepared to play the role of subjects of their background knowledge. Then, the teacher will proceed with presenting some of the elements/factors that explain the issues in question and their essential links, trying to get them to reflect and internalize the explanation so that, in the final stage, they can elaborate syntheses about them. In this last stage, therefore, the main activity, as in the first, belongs to the student, a mental action that seeks and requires the development of higher mental functions resulting in the development of theoretical-conceptual thinking about the general theme of the unit.

The proposal of a Didactic Pathway for Mediation in the teaching of Geography, briefly described, was the basis for the experience of working in the schools participating in the research in the two years mentioned above. This proposed course was discussed in the group and defined as a guide for the schoolwork, serving as a basis for preparing unit plans. These plans, which came into effect in each school involved, resulted from a joint elaboration within the group. We will present the methodology and stages of the research and its results in the following items.

3. In search of innovation in Geography teaching: a collaborative experience with a Didactic Pathway for Mediation in Geography teaching

The methodological approach adopted in the research allows an analysis of the object, considering the heterogeneity of the observation space and a greater possibility of methods and techniques for developing processes that consider the point of view of the subjects involved. According to Martins (2004, p. 01), “qualitative research is defined as that which favors the analysis of micro-processes, through the study of individual and group social actions, performing an intensive examination of the data, and characterized by heterodoxy at the time of analysis.” The author highlights how investigations based on such methodology allow for analysis flexibility according to the subject’s complexity and space of analysis, which is consistent with the research purposes referred to here.

This type of research also allows a more detailed analysis of several points of the central object of study, adopting a descriptive and interpretive approach, which enables the relationship between theory and practice. Furthermore, the research process is valued, not only its result(s). Understanding and valuing the space and context of the project’s insertion becomes fundamental. Furthermore, it brings about more significant contact with the participating subject(s) and insertion in their daily lives, pondering the different contexts and situations and the different subjects, thus assuming a holistic view of the investigated phenomena. (Alves-Mazzotti & Gewandsznajder, 2004; Flick, 2009; Lüdke & André, 1986; Moreira, 2002; Oliveira, 2007; Triviños, 1987; Weller & Pfaff, 2011)

We adopted collaborative research due to considering the diversity of modalities related to the research of qualitative nature. According to Ibiapina (2008, p. 25), collaborative research “is an activity of co-production of knowledge and training in which peers collaborate to solve problems that afflict education jointly.” The author reinforces the importance of such a modality since it provides activities proper to the subjects’ formation.

Collaborative research becomes essential for this investigation because it made possible the involvement of professors from the Federal University of Goiás, the Federal University of Jataí, graduate and undergraduate students from these two institutions, and teachers and students from the State of Goiás school network to carry out the project. This kind of research is also present in the work of Marcondes (2004). For the author, collaborative research can promote a self-investigation, which for her is completed in the shared reflection.

Based on these references, all subjects involved in the project “Geographical Science at School” were conceived as researchers. The project initially foresaw face-to-face work, both in the meetings of the group of researchers and in monitoring the activities carried out in the participating schools. However, due to the Covid-19 pandemic and general recommendations in Brazil, school activities at all levels were carried out digitally, with remote

meetings and guidance of synchronous and asynchronous school activities. In this context, we carried out the entire project remotely.

For the development of the project, which centers on the articulation of teaching and research, we considered five stages:

Stage 01 – Formation of the working group – the objective was to study, plan and execute the project collaboratively through periodic meetings at the university and in the schools. The group consists of all the project members: Ph.D. professors and undergraduate and graduate students in Geography from the Federal University of Goiás (UFG) and the Federal University of Jataí, and Geography teachers from Basic Education in Goiânia and Jataí. The group was a learning community that contributed to the training processes of the researchers, the initial and continued training of Geography teachers, and the scientific training of Basic Education students.

Stage 02 – Elaboration of project guidelines – the initial objective of the group's activities was to evaluate the concrete conditions of execution of the project and to adapt it to these remote working conditions. For its realization, we defined roles and activities distributed among the group members to rationalize and enhance each stage's development; we discussed methodological guidelines for the development of the project in schools and systematized them considering the specific characteristics of schools and students. The critical theories of Geography and Education were adopted, especially the Cultural-Historical theory. The central theme adopted was “the city and citizen spatial practices,” problematized from the themes of the didactic issues of the REPEC Network. This network has produced several issues to subsidize, precisely, the schools' works with reference materials in scientific research and with a focus on the local and regional scale. Among the topics covered by this material, there are city-rural relationships, cartography, urban space, urban violence, population dynamics, economic dynamics, and hydrographic basins.

The methodological path chosen allowed the option to work with research projects based on problem-solving, according to the following structure: theoretical foundation discussed in the group; didactic materials produced in LEPEG, especially the issues and the books of the Teaching in Geography Collection; the elaboration of the didactic mediation project – based on the proposal of innovative methodology – articulates: content maps (Díaz, Porlán, & Navarro, 2017) and Didactic Pathway for Mediation in Geography Teaching (Cavalcanti, 2019, p. 163). These methodological guidelines were developed, systematized, and discussed collectively with all project members.

Stage 3 – Carrying out the project activities in collaboration with the schools – The goal was to establish cooperative actions with two public schools in Goiás. We selected schools with which the researchers already had a partnership due to other teaching and research activities. The activities were developed, in two consecutive years (2020 and 2021), through three action plans:

1) Group discussion and definition of themes to be the object of didactic mediation projects in each school and readings for selecting materials to be used, as established in stage 01.

2) Elaboration of the didactic mediation project, according to stage 02 and considering the proposal above. In this action, we listed the themes to work on with specific purposes, emphasizing the monitoring of student learning. In the first year, this monitoring occurred during the presentation of the final papers prepared by the students. In the second year, this follow-up went through: diagnostic activities, problematizing evaluation, systematizing evaluation, and synthesis evaluation. For each evaluative activity, we used reference interpretation keys developed by the team members with definitions for the following learning levels: initial, proximal, and conceptual.

3) Work by Basic Education students, which were the didactic mediation projects, with the guidance and monitoring of team members.

Stage 04 – Providing schools with theoretical and geo-technological productions – this stage aimed to provide partner schools with theoretical material containing the REPEC's didactic issues, books from the Teaching collection produced by LEPEG members, and other books essential for a geographical reading of reality. We provided each school partner with equipment to work with geo-technologies, based on the demands raised and the possibilities of the universities, and with REPEC textbooks for each student participating in the project.

Stage 05 – Analysis and systematization of the project's contributions – the analysis of the project's results was carried out through working groups, monitoring scripts in the schools, and the development of the didactic mediation projects, understanding each stage of the process as a continuous with a focus on learning. We highlighted the contributions of discourse analysis and the challenges encountered in developing each stage. At the end of the two-year experience, we will present project analysis results in the next item.

4. The realization of proposals for a Didactic Pathway for Mediation in the teaching of Geography for the formation of Geographical Thinking

As already mentioned, we carried out the research in the years 2020 and 2021, and three PDMGeo activities were planned and executed with the accompaniment of the entire team. In 2020, based on initial discussions in the group, the two school fields (named here as School 01, located in Goiânia/Goiás/Brazil, and School 02, located in Jataí/Goiás/Brazil) selected two themes to develop the work. It is essential to emphasize that the needs experienced in the schools according to the decisions made by the schools' teachers (research members) oriented the selection of themes.

Table 1. Thematic proposals and classes to be implemented in the schools.

Schools	Class	Selected Theme
School 01	9 th grade	The centrality of the 44 th street region in Goiânia
School 02	3 rd grade	The Goianian Cerrado

Initially, the group performed the preparation phase, which involved the choice of theme, class, and approach (contents, concepts, geographic theories, teaching methodologies, evaluation, and didactic materials). This stage consisted of understanding the role of Geography and its teaching for the researchers, being a moment of self and inter-training (García, 1999). The initial choices are described in Table 1, elaborated by the authors.

To carry out the proposal of didactic mediation, after the selection of the theme, the second step was the search for material produced in books, articles, dissertations, and thesis, mainly in universities, which would help to understand better the theme in a local, regional, and national scale. For the theme of School 01, we selected materials that addressed the themes of centrality, socio-spatial practices, and 44th Street. The group selected the following material for reading and discussion: Sposito (2018) and Garbelim et al. (2020). Besides the reading and analysis of the didactic issues: “*Espaço urbano da região metropolitana de Goiânia*” (2010) and “*Dinâmicas econômicas da Região Metropolitana de Goiânia*” (2013), elaborated by REPEC.

In the sequence, the elaboration of the proposal for the construction of PDMGeo began. Located in the city of Goiânia, the capital of the State of Goiás, school 01 developed the goal of understanding the socio-spatial production of the centrality of 44th Street and its relationship with the regional, national, and global dynamics. It is worth mentioning that the choice of theme is due to the school’s location near the 44th Street commerce (significant centrality in the retail and wholesale clothing sector), which receives thousands of people from other states of the country.

For planning, we prepared the content map (according to Figure 1- The centrality of the 44th Street Region in Goiânia), which comprises a methodology for organizing thought. Thus, it presents a hierarchical structure that represents the understanding of the content (conceptual, attitudinal, and procedural) from its relationships with others.

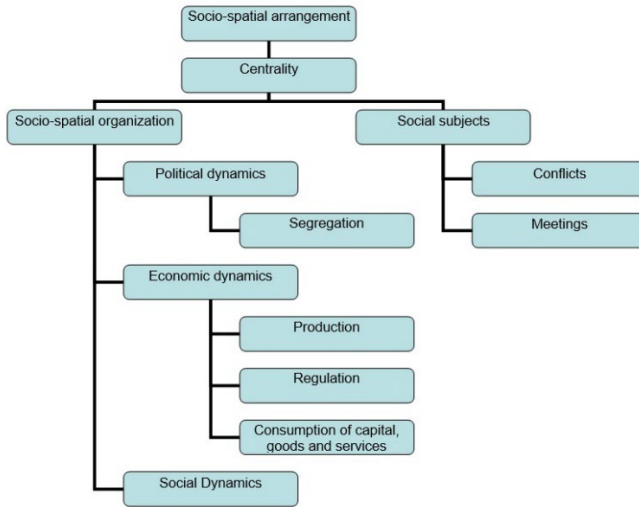


Figure 1. Content map about "The centrality of the 44th region in Goiânia"
Source: Prepared by the project team (2020).

After preparing the content map, the next step consisted of making the PDMGeo proposal. The proposal was based on Cavalcanti (2014 and 2019), as shown in Table 2.

The proposal made at School 02, located in the city of Jataí, 320 km from the capital, followed the same theoretical conception of School 01 for the elaboration of PDMGeo. At first, we selected the following themes: the concept of Biome-territory; the Cerrado as a Biome-territory³; physical-natural, socio-cultural, and political aspects of the Cerrado; the process of appropriation and use of the Cerrado and its consequences through the elaboration of a content map (Figure 2). From this selection, a search for bibliographic materials was conducted, resulting in the following texts: Moura Junior and Oliveira (2020); Oliveira (2019); Oliveira and Carvalho (2017); Brasil (2015); Chaveiro and Barreira (2010); Oliveira (2012), as well as the reading and analysis of the didactic fascicle "The city-countryside relationship in the Goiás territory" (2019) prepared

³ Contemporary studies analyze Cerrado through different approaches such as biome, ecosystem, and domain. According to Chaveiro and Barreira (2010, p. 29), this analysis considers "Cerrado only through the prism of nature." Another approach presented by these authors is that of Biome-Territory, which considers a "single perspective the physical-territorial dimensions, the socio-economic, and the cultural and symbolic" (Chaveiro and Barreira, p. 2010, p. 30).

by REPEC. The general objective of the didactic journey was to understand Cerrado as a Biome-territory, its appropriation process, and how the different forms of usage affect society.

Table 2. Didactic journey proposal for the theme “The centrality of the 44th Street Region in Goiânia”

Stages	Activities
<p>Problematization (Two 50-minute lessons)</p>	<p>Problematizing urbanization by relating economic dynamics and the impacts generated; presenting a problem situation that sought to lead students to reflect on the location, problems, and impacts (positive and negative) on their neighborhood and city; and asking the students to build a mental map of the 44th Street Region.</p>
<p>Systematization (Three 50-minute lessons)</p>	<p>Using Google Earth images and images to demonstrate the rapid expansion process of the 44th Street Region and to understand its historical formation process. Comprehending its constituent elements as centrality in the city of Goiânia-GO, the importance and function of transportation and communication networks in the city’s development, and its socioeconomic implications. We also used dialogued lectures to discuss key concepts in understanding the centrality of the 44th Street Region in Goiânia-GO. We asked students to organize an interview with former residents of the region to analyze the change in the form and function of the neighborhoods near the commercial area of 44th Street.</p>
<p>Synthesis (One 50-minute lesson – for presentation and discussion)</p>	<p>We asked students to produce a video showing the circulation, production, housing, segregation, types of work, the centrality of 44th Street, and the hippie fair. Students worked in groups of four. The goals consisted in understanding the socio-spatial production in 44th Street centrality and its relationship with the regional, national, and global dynamics; and analyzing how the social subjects organize themselves in the city and the role of these subjects in the production of space. After presenting the videos to the other classmates (via Google Meet), the students were invited to present the videos to the general research team.</p>

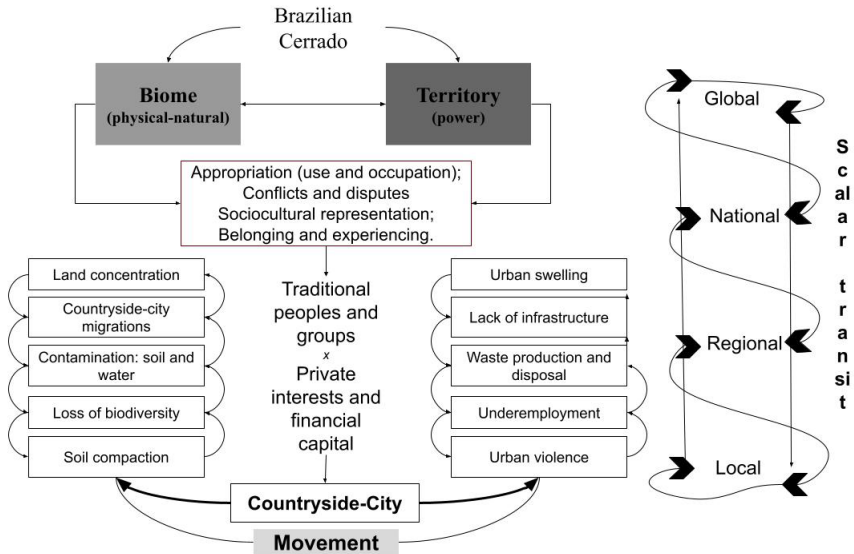


Figure 2. Content map about “Cerrado”
 Source: Prepared by the project team (2020) based on Moura Junior and Oliveira (2020)

The Cerrado occupies most of central Brazil and is home to the main Brazilian river basins: the Amazon, São Francisco, and Prata, and “there are also important recharge points for the Guarani Aquifer (the largest groundwater deposit in the world) and the water table” (IBGE, 2010, p. 95). Developing a sense of belonging reinforces the effects of anthropic action, such as urbanization, industrialization, deforestation, burning, etc. This fosters the discussion about the importance of its conservation for the dynamic balance in Brazil and the world.

We carried out the project in the 3rd year high school class - the last year in the Basic Education system in Brazil. We chose the Cerrado as a theme for the construction of knowledge and geographic thinking of the students because it is one of the contents contemplated in the guiding documents of the curriculum in the State of Goiás. Moreover, we consider that the Cerrado is part of the student’s everyday life, even though the students do not recognize it – a fact that reinforces the importance of this discussion to be promoted using PDMGeo.

Table 3: Didactic journey proposal for the theme “Cerrado”

Stage	Activities
<p>Problematization (Two 50-minute lessons)</p>	<p>Elaborating the problematizing activity aimed to diagnose the students’ knowledge about the Cerrado Biome-Territory and point out the main factors that justify its conservation. The activity consisted of:</p> <p>a) Asking students to write three words that represent the Cerrado, then separating the words according to Chaveiro and Barreira (2010) in “negative” and “positive” images of the Cerrado.</p> <p>b) Locating the city of Jataí-GO on a map containing the Brazilian Biomes-territories.</p> <p>c) Watching the documentary “<i>Ser Tão Velho Cerrado</i>” and dividing students into two groups for the production. The first should highlight information that guarantees the importance of Cerrado conservation. The second group should highlight forms of use that harm Cerrado conservation.</p> <p>d) Socializing students to talk about the video’s information and their considerations.</p>
<p>Systematization (Two 50-minute lessons)</p>	<p>Watching two videos: “A new country emerges in the Cerrado” and “Agribusiness in Brazil and its potential,” to sensitize students about them.</p> <p>Discussing the factors that contributed to the modernization process of Goiás. By analyzing the discourse, the activity aimed to understand the modernization process of the Cerrado biome-territory with the State of Goiás as a reference.</p>
<p>Synthesis (Two 50-minute lessons – for presentation and discussion)</p>	<p>Preparing individual content maps built at home and socialized in class relating it to the words presented in the first class.</p> <p>Researching traditional people(s) in Jataí using the statement: “In Goiás, the Cerrado has great social importance, the territory of many traditional populations that survive on its natural resources. These populations, composed of indigenous ethnic groups, quilombolas, raizeiros, ribeirinhos, babaçueiras, and vazanteiros, together, are part of the Brazilian historical and cultural heritage and hold a traditional knowledge of its biodiversity”.</p> <p>In this way, we organized the knowledge acquired during the classes about the Cerrado Biome-territory to understand the disputed meanings of using the Cerrado and how to see and represent it.</p>

In the year 2021, after elaborating, applying, evaluating, and discussing the PDMGeo previously presented in a collaborative way, we defined a new theme to work on in schools. This time, we decided to make a single proposal for the two schools, respecting the particularities of each one. The selected theme was “Urbanization and modernization of the Goiás territory.” Based on the established methodological path, we selected material that addresses the themes of urbanization, modernization of the territory, and city-countryside relationship. The selected bibliographies were Silva (2010), Souza (2019), Castilho (2014), and Castillo and Frederico (2010). The didactic issue produced by REPEC, “*Dinâmicas econômicas da região metropolitana de Goiânia*” (2013) and “*A relação cidade/campo*” (2019), were also used as theoretical and methodological reference.

After reading, analyzing, and systematizing the bibliographic material, we elaborated the content map in Figure 3 - Urbanization and modernization of Goiás territory.

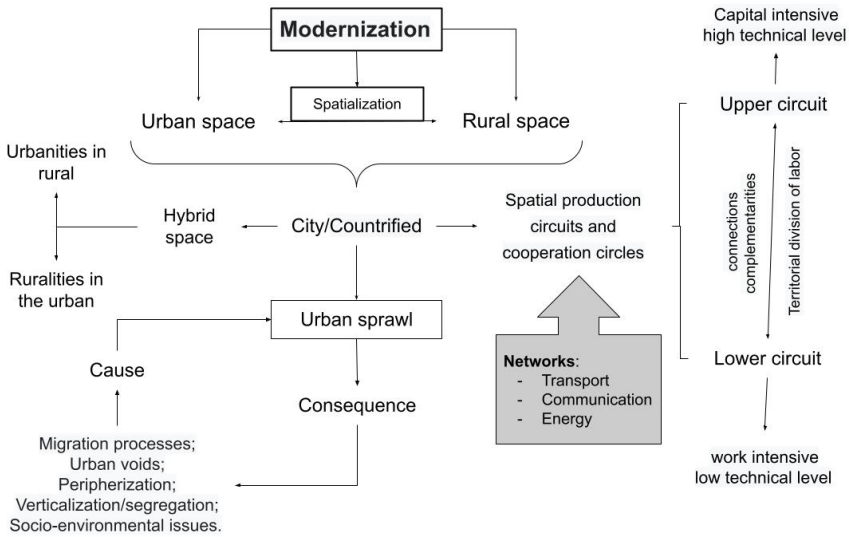


Figure 3. Content map about "Urbanization and modernization of Goiás territory"
 Source: Prepared by the project team (2021).

The developed content map presents the relation between modernization/space and (urban/rural)/urban expansion as a structuring axis. However, for constituting this relation, different contents and concepts were addressed as city/countryside, urbanities/ruralities, urban network and spatial

circuits of production, and circles of cooperation. PDMGeo was elaborated from these definitions, focusing on the formation of geographic thinking, as seen in Table 4 below.

Table 4: Proposal of PDMGeo for the theme “Urbanization and modernization of the Goiás territory”

Stage	Activities
Problematization (Two 50-minute lessons)	Problematizing and diagnosing students' background knowledge about a) the interference of agribusiness and b) the modernization process in their daily lives. We initially proposed a word cloud (using the Mentimeter application). Next, to analyze indicators of the modernization process and its consequences in rural and urban areas, we carried out an activity via Google forms with two images and two texts about agribusiness. The answers to these activities served as a subsidy for the organization of the next steps.
Systematization (Four 50-minute lessons)	1) Developing expositive dialogued classes based on the elements identified in the problematizing activities. We used two instruments to learn from a) students' understanding, b) the use of geographic concepts, and c) the indications of the formation of a geographic thought regarding the theme addressed. 2) Projecting Google Earth images (geo-technology) to point out the substitution of agricultural uses (agriculture and pasture, typical of rural areas) for urban usages (subdivision). In a second moment, we used maps and graphs of the urban population expansion of Goiás, Goiânia, and Jataí. 3) Asking students to present photos or images that portray urbanities and ruralities in their city. 4) Requesting students to write a letter to a fictional friend or relative who was born in the city but moved away more than five years ago and wants to know how the city is now.
Synthesis (One 50-minute lesson - for presentation and discussion)	Asking students to produce a podcast, pointing out possible actions capable of alleviating or reversing problems generated in the city by the modernization of the Goiás territory.

During the discussions, and based on previous experiences, it became evident the concern of all research participants to obtain evidence to measure the effectiveness of the proposals made in student learning from the perspective of the formation of geographic thinking. With this concern, the discussion about the formative evaluation started within the research group.

For this purpose, theoretical texts on formative assessment were read, among them Hadji (2001), Méndez (2003), and Barreira, Boavida, and Araújo (2006). Possibilities of evaluation were also discussed based on the proposals made by the group and by readings concerning the discourse analysis having Orlandi (2005) as a reference, searching for grounds and possible ways to interpret the data collected through the evaluative instruments. The intention was to measure whether the proposed teaching objectives were being achieved, considering the formation of geographic thinking.

To understand the impact of the proposal through evidence of learning, we collaboratively elaborated an evaluation proposal with formative intent. Initially, we reviewed the evaluative instruments and collectively analyzed four evaluative instruments. Also, we developed an interpretation key for these instruments, considering three levels of understanding of the themes/concepts.

In developing the interpretation key, we considered that the answers to the activities performed would have the following orientations: initial phase: recognition of the theme; proximal phase: recognizes the theme and establishes relations by identifying some contradictions; conceptual phase: manages to perform a geographical analysis of the theme addressed, as shown in Table 5.

The group widely debated this analysis so that everyone could read and discuss all the students' activities collectively. The expectation was to understand individually and collectively the impact of the proposal and rethink practices, considering that it is a formative process and presented innovative proposals. The following item will present the results and impacts of the proposals and, consequently, the research.

Table 5: Proposed interpretation key for the activities carried out.

Problemating evaluation Situation-problem - Google Forms	Systematizing evaluation Geotechnology	Systematizing evaluation Letter	Synthesis evaluation Podcast
<p>Initial: Identifies agribusiness, its characteristics, and developments.</p> <p>Proximal: Expresses contradictory answers because he/she sees agribusiness as bad and cannot explain how it interferes with his/her daily life.</p> <p>Conceptual: Understands that agribusiness is not suitable for everyone, generates problems, and perceives these urban problems in his/her daily life.</p>	<p>Initial: Understands the difference between urban and rural</p> <p>Proximal: Establishes relationship between urban and rural (Urbanity and Rurality)</p> <p>Conceptual: Identifies segregated spaces and urban voids in the landscape (photo/image)</p>	<p>Initial: Describes the urban landscape without problematizing, raising only visible aspects of the city, without conducting a geographic analysis, and without using different scales.</p> <p>Proximal: Describes the urban landscape, observes some contradictions, but still needs to explain why and/or make coherent use of geographic knowledge. They still need to make use of different scales.</p> <p>Conceptual: Describes and observes the landscape, identifies urban problems, and can perceive the interference of modernization. Uses the interpretation of geographic concepts to perform analysis at different scales.</p>	<p>Initial: Understands the relationship between countryside and city but still needs to identify urban problems and their correlations. Also, they still need to make proposals.</p> <p>Proximal: Relates modernization with urban problems materialized in the landscape and can identify environmental and social problems but still need to propose adequate solutions.</p> <p>Conceptual: Can perform a geographical analysis of the problem (using the concepts worked on and others), pointing out possible actions capable of mitigating or reversing problems generated in the city by the modernization of the Goiás territory.</p>

5. Results

The collaborative work developed brought contributions in several areas for the team participating in the research and for student learning. Also, we emphasize its significance in the constitution of an innovative proposal to think about the formation of Geographical Thinking. The teachers pointed out the regime of online and hybrid classes in the context of the Covid-19 pandemic as a hindrance to completing the steps. In particular, the steps included activities with school students because the teacher had to deal with several activities simultaneously. In addition, there were significant discrepancies in access to the internet and devices such as computers and cell phones to watch the classes, consult the available materials, and carry out the activities.

Even facing these challenges, students reported the potential of researching, especially at the presentation of the videos in 2020. In the analysis of the activities, the advances in relation to the understanding of the contents addressed from a geographical perspective are evident. Figure 4 below demonstrates the students' levels of understanding of the activities developed in 2021 and analyzed as mentioned above.

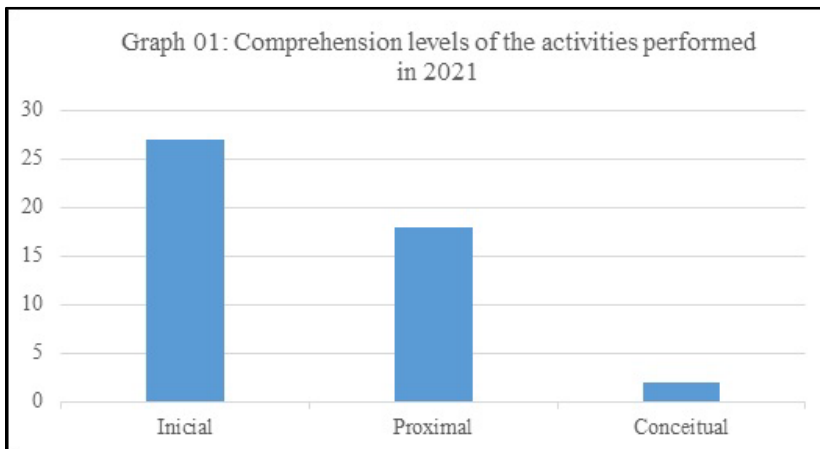


Figure 4. Graph on comprehension levels of the activities performed in 2021.

Regarding the continuing education of teachers, discussions evidenced exchanges and experiences made possible by the project. There was a maturation, highlighted throughout the meetings through spontaneous reports, such as: “thinking about the construction and systematization of the class including the theoretical basis enriches the development of the work”; “having a group thinking about the construction of the class, suggesting bibliographic references gives us the security to work”; “Receiving the support material for the home study was

very important and motivating”; “Receiving support material to work with students with such quality makes them interested in participating in the discussions.”

Another element highlighting the potentiality of the research was the report of one of the teachers when answering a questionnaire to evaluate the project:

I remade myself as a professional: A geography teacher. How to think in the classroom? How much Geography is in this content, and how important is it for the formation of the student's citizenship. [...] In my classroom practice, especially in didactic mediation. Before the project, I always started some content directly without problematizing it with the students. I thought it was enough to understand their previous knowledge and to start explaining the main concept. (School Teacher, 01, 2020)

In this sense, innovative methodologies and formative evaluation of learning in students' cognitive functioning concerning the proposal made it possible to understand how the student did, what procedure he used, and what his pedagogical interest was concerning the evaluated objectives/contents. Therefore, the presented proposal proved to be potentializing for forming geographic thinking.

We understand that collaborative action research, according to the pedagogical activity, configures an action that provides continuous training for the subjects involved. Action research holds reviews and reconstructions in collective processes to produce shared knowledge through discourses open to transformations. Also, the collaborative elaboration of PDMGeo enabled apprehending its meanings which provided the students' involvement, both from Basic Education and from higher education and post-graduation, in the formation of geographic thinking.

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