DIDACTIC AND CONCEPTUAL ERRORS IN THE TEACHING OF GEOGRAPHY: RECTIFICATIONS AND MEDIATIONS FOR THE CONSTRUCTION OF KNOWLEDGE[1]

ERROS DIDÁTICOS E ERROS CONCEITUAIS NO ENSINO DA GEOGRAFIA: RETIFICAÇÕES E MEDIAÇÕES À CONSTRUÇÃO DO CONHECIMENTO

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Abstract

Currently, one of the primary tasks is to deal with the Teaching of Geography, as well as of other disciplines. This fact implies epistemological processes relating to both the formation of teachers and students. The present paper analyses the process of knowledge construction in the Teaching of Geography, focusing on the presence of didactic and conceptual errors and in the teaching of this discipline. When analyzing about errors, we will argue the importance of rectifying them as an essential dimension to didactic mediation and the construction of geographical knowledge in the school context. The foundations of our analyzes focus on the philosophy of Gaston Bachelard, centered about the role of error in epistemic processes. If there are errors, there must be a rectification of them to then overcome epistemological obstacles and acquire new knowledge.
Keywords: geography teaching, didactic and conceptual errors, rectification and mediation.

Resumo

Uma das grandes tarefas postas atualmente é lidar com o Ensino de Geografia, assim como de outras disciplinas. Tal fato implica em processos epistemológicos tanto em relação à formação do professor quanto à do aluno. O presente artigo analisa o processo de construção do conhecimento no Ensino de Geografia, focando a presença de erros didáticos e erros conceituais no ensino desta disciplina. Ao analisar sobre os erros, argumentaremos a importância da retificação dos mesmos como dimensão importante à mediação didática e à construção de um conhecimento geográfico no âmbito escolar. Os fundamentos para nossas análises focam na filosofia de Gaston Bachelard, centralmente em relação ao lugar do erro nos processos epistêmicos. Se há erros, há que retificá-los para então superar obstáculos epistemológicos e ascender a um novo conhecimento.
Palavras-chave: ensino de geografia, erros didáticos e conceituais, retificação e mediação.

Resumen

Una de las grandes tareas que se propone en la actualidad es hacer frente a la Enseñanza de Geografía, así como de otras asignaturas. Ese hecho envuelve procesos epistemológicos tanto en relación a la formación del profesorado como a la formación del alumno. Este artículo analiza el proceso de construcción de conocimiento en la Enseñanza de Geografía, dando énfasis a la presencia de errores didácticos y errores conceptuales en la enseñanza de esa asignatura. Al analizar los errores, argumentaremos a respecto de la importancia de la rectificación de los mismos, como dimensión importante para la mediación didáctica y para la construcción del conocimiento geográfico en el ámbito escolar. Las bases teóricas para nuestro análisis se centran en la

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filosofía de Gaston Bachelard, centralmente en relación al lugar del error en los procesos epistémicos. Si hay errores, debe haber rectificación de los mismos para, de esa forma, superar obstáculos epistemológicos y ascender a un nuevo conocimiento.
Palabras-clave: enseñanza de geografía, errores didácticos y conceptuales, rectificación y mediación.

Introduction

We are certain that the construction of knowledge is based on the agent's cognitive actions and that these actions are the result of complex thought processes that enable the structuring of reasoning. Thus, reasoning, in turn, from our viewpoint is more consistent when the thought is motivated by the relation established between scientific knowledge and conceptions of the world that are present in the individual's everyday practices. In other words, the development of thought will have more solidity when the knowledge has a meaning so that the individual will be more interested in the social, natural, political, economic and cultural phenomena that occur in our society and, if possible, for the practical life. In this perspective, we advocate that for the learning of Geography is essential, on the one hand, the coherence and theoretical-methodological approach that is established among Geography, Philosophy and Education, centrally. On the other hand, it must be considered the psychological processes that enable students to internalize knowledge in addition to consistently and autonomously exercise their social practice. By understanding that the construction of knowledge is a process, and that the relations between the object of knowledge and the subject do not happen in a natural, simple, and/or mechanic way, it must be considered how the teaching is carried out, as well as that the teacher's mediation (in the Vygotskian sense) is what enables the development of thought. We also judge that the mediations for this process do not occur naturally and mechanically. They (the mediations) must be intentional, based on students' previous information and knowledge of Geography. In this way, they are mediations offered by the teacher – this is what we call didactic mediation (D'avila, 2008).

Under this perspective, we will reflect on the place of error in the construction of knowledge regarding the Teaching of Geography. In other words, we will consider the error as an essential dimension to the mediating action and the approach between previous information and the knowledge of Geography that we advocate. In this paper, we

will use the conception of error in Gaston Bachelard[2]'s perspective. From this groundwork, we propose to reflect on errors in the teaching of the discipline.

The studies about Gaston Bachelard in the Teaching of Geography, particularly the ones related to error rectification as a dimension capable of overcoming the epistemological obstacles present in the formation of Geography teachers, have been carried out on different occasions.

For many years, the professor Sônia Castellar has been studying the importance of this philosopher in her work as a researcher, professor, and post-graduate mentor. One of the Bachelard's important notions is related to the overcoming of obstacles and error. This idea is about departing from the contemplation of the self to seek out the other, to dialect the experience, which brings out the need of diversifying thinking and overthrowing certainties, reorganizing the thought and wisdom. In this sense, the author states that:

> the most challenging task is to put scientific culture in a state of permanent mobilization, to replace closed and static knowing with an open and dynamic knowledge, to dialect all experimental variables, to finally offer reason the motives to evolve (Bachelard, 1998, p. 24)

The understanding of a word or term requires several meanings, which can be factual or epistemological, showing that, from a concept one can obtain another or analyze its relation to the other. In this scheme, the empirical world, experienced by the student can provide notions about the theoretical world. The pupil's experience and the teacher's action – through the means of problematizations, research, lectures, and field work – will contribute so that he or she will be able to structure and construct scientific concepts in the field of the theoretical world (Castellar, 2010).

Another occasion occurred through the dialogues established by the Professor Vanilton Camilo de Souza with the group Didactic of Social and Experimental Sciences at the Universidad de Sevilla, during the doctorate course that he attended at that University. In these dialogues, Bachelard was the main object of theoretical discussions, particularly

[2] There are studies in the Teaching of Geography referenced by the "nocturnal" Gaston Bachelard, from reveries. In this work, however, we use as a reference the Epistemic Bachelard, "diurnal".

around the error category. Through this group; we had access to the work of the French author Pierre Astolfi, who first systematized the error contributions from the Bachelardian perspective on teaching. In Brazil, these didactic foundations are highly incorporated in science education.

In turn, the debates over the work of Bachelard for the Teaching of Geography gained new systematizations during the post-doctoral program at University of São Paulo-Faculty of Education (FEUSP), in which the authors of this paper had the opportunity to discuss the potentialities of this category in the educational process of Geography teachers[3]. In other words, we mainly aimed to analyze didactic and epistemological errors present in the educational process of Geography teachers, along with the possibilities to overcome them as a means of mediating the knowledge of future professors.

Given the above, we question: what is the relation established among educational theories, geographical theories and the foundations of Bachelardian philosophy in the process of developing a teaching methodology that is consistent with what you think and what you teach? What is the possible connection between such foundations and the socio-cultural and socio-spatial realities in School Geography? Do connections mobilize the thought? What theoretical, conceptual and didactic obstacles mislead the Teaching of Geography? To what extent the rectification of error is a didactic dimension capable of mediating knowledge in Geography?

In the attempt to reflect on those questions, this paper has the following structure: in the first part, we highlight the central elements of the foundations of knowledge building on the role of error in this process (and in the Bachelardian philosophy). Next, we underline which didactic and conceptual errors we consider to be frequent in the Teaching of Geography, and to what extent these errors may maximize the construction of knowledge of this subject in the School Geography.

[3] During this postdoctoral period in which the authors (postdoctoral candidate and supervisor) pored over research developed by both of them in recent years, including the ongoing investigations during the postdoctoral stage, focused their studies on what we call didactic and conceptual errors in the teaching of geography. We wrote this paper based on these reflections and on the grounds of Bachelard's (1968, 1996, 2004) and Astolfi's works (1988, 1994, 2003,).

The error in the construction of knowledge in School Geography

To think about the construction of knowings, a solid notion of epistemic processes through which they are built, a good understanding of Geographical Theories, and a concrete comprehension of other fields of knowledge (Education, Sociology, History etc.) are necessary. When considering the set of knowings conveyed in the social environment, we perceive that the knowledge-building process is more complex than it seems at first sight. Such complexity emerges from the diverse perceptions that guide people to look at the world, talk about it and act on it. The fact is that from our viewpoint and before the complexity of world views, the knowledge of sciences is considered as the one that enables a better articulation of that diversity of knowings in the education of people in a critical dimension.

One of the main problems in the field of Philosophy has been the discussion about the theory of knowledge, overall, since the birth of modern science. There is a recurring idea that rationality is the essential foundation of knowledge. Reason constitutes one of the most used forms for explaining the world and for the production of concepts and theories. Currently, there are several legacies of science for the understanding the phenomena found in the literature related to the fields of Philosophy, Social Sciences, and Education. In these legacies reside in the fact that scientific knowledge presupposes a process of epistemic overcoming of knowings and concepts considered decontextualized for our present days and that they can be recontextualized in another historical moment. For instance, in the history of science, the laws of thermodynamics are still valid beyond the Modern Physics. In the case of Geography, the concept of city receives new cultural and social interpretations, but it maintains the same conceptual framework since its creation.

Regarding this aspect, we take as a reference the contributions of Gaston Bachelard, considered to be an influential contemporary philosopher who criticizes the traditional image of empiricist and inductive science. Many of his works demonstrate his epistemology, and it is mostly in his book The Philosophy of No: A Philosophy of the New Scientific Mind that the author argues for the need to create a new philosophy of science, more suited to scientific thought in continuous evolution. According to Bachelard (1978), one cannot conceive of a final

and absolute philosophy of science production[4]. Another essential work for the understanding of the Barchelardian philosophy is *The Formation of the Scientific Mind* (Bachelard, 1996). In this book, he presents the basic guidelines for building a new scientific thinking. Such guidelines derive from the idea of facing the epistemological obstacles as means to overcome them in order to ascend to the scientific spirit. Noteworthy is also the book's contributions Essays on the approximate knowledge (2004), in which Bachelard expands its philosophy on the production of knowledge. It is also noteworthy the contributions of the *Essay on the Approximate Knowledge* (2004), in which Bachelard extends its philosophy of the production of knowledge. In this work, one of the greatest inputs is about the necessity of rectifying the error as a process of knowing the reality. For Bachelard, the error is the starting point to ascend to the scientific spirit, opposing the process of seeking the truth, as proposed by the inductivist-empiricist philosophy. The issue about the role of error in the teacher's construction of knowledge is an essential reference to a didactic of geography, which is the dimension that we propose to approach in this part of the text.

Bachelard's works mentioned above do not deal with education or school education. However, they serve as a reference when we approach

[4] Here, it is worth to write a footnote so that we can establish a relation between scientific thought and the understanding of reality, further justifying the necessity to overcome epistemological obstacles to geographically comprehend the world: the essential role of scientific and technological advents in nations' political and economic advances. This issue becomes even more relevant when one of the main elements that sustained the development of these societies is highlighted: the thermal machines.

Steam-powered machines were technological devices that notably altered the industrial structures and, as a consequence, societies' organization. They function governed by various scientific principles associated with the field of thermodynamics, which together with the laws of mechanics, and later with the laws of electromagnetism, enabled the development of numerous new energy generation processes.

Nowadays, the mere observation of a pressure cooker filled with liquid, covered, and taken to boil allow making an association that in the past used to be of great ingenuity: heat and movement are directly related elements. Therefore, we can easily notice that the thermal machines transform heat into movement, i.e., more precisely, the perform work from the exchanges of heat. This basic idea was already know in the third century B.C. by Heron of Alexandria, who created a steam-powered machine called *eolípila* (from the Greek, *aeolipile*), that "produced winds" heating a hollow cylinder filled with water.

The use of controlled expansion of water-steam as a source of mechanical energy enables us to bring about several very interesting discussions about the relationship between the use of certain energy sources and the organization of societies.

The first aspect to be detected is from the answer to the following question: why was it in England of the late eighteenth century the steam engine gained effective boosting, becoming the leading mechanism of all production and transportation systems? (Castellar and Picazzio, 2014).

teaching and learning processes, particularly about the teaching of sciences (Garcia Perez; Rivero, 1995; Astolfi, 2003, 1994 and 1988). Indeed, several aspects of the thought of this philosopher can guide the learning processes and the construction of knowledge in various disciplines, particularly in the context of higher education. It is a contribution that forms a theoretical and conceptual system that is necessary for desirable academic and vocational education, in which Geography teachers can participate.

The Bachelardian perspective offers crucial elements for the construction of knowledge about School Geography. Both the categories of epistemological obstacles and error positivity are theoretical dimensions constituting an epistemic process capable of developing and dialectic thinking that may result in critical geographic thoughts. The remarks made in the footnote above exemplify the scale of importance as a scientific advent allows us to understand geographic concepts such as production, industry, and transport, i.e., the territory dynamics. This relation between the knowledge of Physics and the knowledge of Geography encourages an understanding of the world that positively contributes to overcoming obstacles and errors.

According to Bachelard, the epistemological obstacles derive from a set of factors related to the way that people perceive reality that prevents them from ascending to scientific knowledge. Therefore, to win the epistemological obstacles, one must constantly be in an epistemic monitoring process. Otherwise, the stiffening of knowledge may occur and, thus, he or she may not benefit from the epistemological progress.

When analyzing the construction process of geographic knowledge in the initial education of teachers, Souza (2009) points out to some aspects that Bachelard considers constitutive of such obstacles. One of the main elements that amount to epistemological obstacles in the education of Geography teachers would be what Bachelard named as primary observation of reality. The strong influence in traditional teaching of the discipline, the empiricist character of geography research tradition, and the importance given to observation as main-activity are considered obstacles to the extent that reality is conceived by the empirical characteristic of the phenomenon and by considering the obvious aspects of perception. According to the author:

> The primary experience or, to be more precise, the primary observation is always an initial obstacle for scientific culture. Indeed,

> this primary observation brings with it a profusion of images: it is picturesque, concrete, natural, and easy. You need only to describe it and marvel. And then it seems that you understand it. (Bachelard, 1998, p. 25)

The primary observation of reality is an important consideration in the construction of knowledge about Geography. However, it must have as a goal to be an activity that has an end in itself. In the words of Bachelard, the object is never what it shows of itself, therefore, there is a need to bring out all the explanations of the phenomenon after observing it carefully. Depending on the point of view, the primary observation can be an error and jeopardize knowledge. From a different point of view, though, the observation is crucial to interpret geographic facts and phenomena. It is worth saying that the epistemic thinking of this philosopher supports educational prospects to overcome these obstacles.

In turn, the rectification of error is a dimension able of promoting the construction of knowledge in Geography. The rectification of error and mediation are respectively categories appropriate to this process, which are associated with the action of thinking within in a social and cultural universe rich in information and techniques capable of upholding an epistemic action. Such action can generate qualitative relations with reality. The geographic episteme is related to the social, spatial, temporal and cultural realities in which the person is immersed, in view of the cognitive process carried out on them. Thus, it is possible to present much didactic support to ensure a more efficient process of knowledge building for the teaching of Geography.

From the errors present in daily teaching practice (in geographic texts, in statements prepared by teachers, and students' responses), a more proficient didactic mediation is possible, in which the concepts of the discipline and the professional know-how of Geography teachers are used to correct students' mistakes. In Bachelard's own words, "the problem of error seems to me to come before the problem of truth, or rather, I have found no possible solution to the problem of truth other than dispelling finer and finer errors". (Bachelard, 2004, p. 246)

Therefore, the author refers to the positivity of error as an element that is a generator of knowledge and a necessary alternative to individual cognitive development. Thus, it is plausible for the Bachelardian epistemology the existence of alternative conceptions, revealing the

"impurities and values" acquired by sensitive knowledge in the interaction of individuals with other individuals and of the individual with the surrounding world. The objectivity of an idea will be clearer and more distinct to the extent in which it emerges from a background of deeper and more diverse errors. It is necessary to make a mistake to reach a goal. There are no primary truths, only primary errors. The first and richer role of an individual is to make a mistake. The more complex is your error, the richer your experience will be. The experience is the reminiscence of rectified errors. In this perspective, "the error is a dialectic stage which needs to be transposed. It evokes a more accurate investigation. It is the motor of knowledge." (Bachelard, 2004, p. 251)

Thus, we understand that error has its positivity as long as it is rectified. It is to say: if we are not attentive to the errors present in our social and professional practice to then rectify them, we become like those professionals or intellectuals with traces very similar to arrogance. Under this perspective, errors can help us ascend to the scientific spirit. Astolfi (2003, p. 36) points out that: "obstacle is like a 'tissue of built errors', tenacious and cohering, which, therefore, resists to refutation"[5]. There are few experiences which make the evaluation as a mechanism capable of identifying errors to, based on them, reflect on didactic actions. First of all, obstacles are positive aspects that bring about great benefits to thinking and mental exercise, in short, to the process of knowledge construction for any educational level. In a metaphor proposed by the author, errors and obstacles allow a way of thinking with the mind set on a sofa (Astolfi, 2003).

The error has been studied at length in the educational field since this category entails an interesting didactic perspective in the process of knowledge building. Many scholars still corroborate the negative dimension to the didactics that make use of errors to punish and classify; discriminate the ones who learn from those who do not learn; differentiate the ones who deserve good scores from those who will not be able to pass. Contrary to this perspective, there is the error positivity in the teaching process and, based on it, we can consider real possibilities for the students to build their own concepts and, therefore, to become an autonomous

[5] Translated from the original in Spanish ("[...] el obstáculo es un 'tejido de errores construidos', tenaces y solidarios, que se resiste, por tanto, a la refutación.")

subject in their learning process. In the pedagogical practice, errors can represent a concrete possibility to evolve thinking.

Didactic Errors in the teaching of geography

What we call didactic errors in the teaching of Geography does not mean that they lack their own conceptual errors in the field of Geography didactics. Here, we understand this term as the one that is situated in the context of didactic procedures in the class-room by the teacher and that the occurrences are largely defined by theoretical inconsistencies related to the teaching and learning process in the discipline. Therefore, it can be related to the conceptual errors of Geography. We consider four didactic errors widely present in School Geography: the first one is related to teaching centered on the transmission of geographic contents; the second regards the notion of teaching planning; the third is on the centrality of the contents to teach Geography; and the fourth, the field work.

Regarding the first didactic error, Souza (2009) analyzed the role of content transmission by understanding it as an element of a unique teaching model of traditional teaching that is widely present in the education of Geography teachers. This model is grounded on the idea that academic-based Geography knowledge is essentially the true one. Therefore, the role of the school is to make of it its reference. The building process of this type of knowledge derives essentially from transmission. In our view, the content transmission constitutes itself as a didactic error for the following reason: if a teacher held the belief that the process of knowledge construction that he advocates is based on that model, and that the transmission of content is the most adequate procedure to this conception, thus, it does not represent a didactic error. What happens is that, in the discursive practices, there is a strong tendency of teachers to advocate another didactic model, the critical one. However, in the making of didactic procedures to teach Geography, the transmission of content, centered on the teacher, eventually becomes the main practice. For instance, in its distinct formulations, the constructivism comprises pedagogical orientation quite common in teachers' discourses. The same is recurrent in the initial education of Geography teachers. Frequently, our students write in their academic works explicit criticisms against the traditional models of teaching. This practice strengthens the idea

that the good class is transmitted. When we analyze their teaching plans and performances during their internship at schools, the transmission of content is characterized as the essence of their practices. At the same time, they feel frustrated with the outcomes for considering that the students have not learned Geography. The essence of this procedure reinforces a conduct that does not take into consideration what the students already know (previous knowledge). In the context of the pedagogical intentions, such practice represents a didactic error. Which teaching procedures overcome the content transmission? What do the didactic methods have to do with what we advocate as an alternative epistemic process?

Souza and Silva (2015, p. 169) present some elements that are capable of rectifying the notion of teaching centered on content transmission, emphasizing the following: the ability to question the thematic unit, by identifying the learning obstacles; to search for information and contents, having as a basic foundation the interpretation, comparison, and analyzes, among other cognitive processes; to underline the importance of these contents for the students' daily lives; in addition to synthesize, write, and produce narratives.

The transmission of contents as a didactic error in School Geography is often associated with the second didactic error, i.e., the notion of teaching planning. What is a teaching planning? What is the reason of planning? What is the role of planning in the advocated process of knowledge construction? It is a common idea that planning is a bureaucratic work at school; that what has been planned is never carried out in practice; that teacher's planning is a copy of previous plans; etc.

In our viewpoint, the teaching plan is an essential step for the geographic knowledge process that we support. The moment to think the goals of the discipline is also when the teacher defines what is vital to the teaching of Geography, including what Geography is about, what type of Geography he/she advocates, what kind of Geography the students should learn, and even the more specific contents. The teaching plan allows the overcoming of didactic error when the type of Geography that will be taught in the classroom, as well as the teaching strategies, are made objectively explicit.

Through the teaching plan it is also possible for the teachers to demonstrate their autonomy, knowledge, and capacity to deal with a variety of curriculum proposals adopted by schools. It is in the act of planning, having the goals as a reference, that the teacher will decide on the Geography's contents that best meet each objective, so that they can have meaning for students. When associated to the other dimensions of the teaching plan, the procedures cannot be incompatible with what is to be taught. There must be an articulated position for the implementation of goals, contents, and teaching methods (Libânio, 2010). The act of planning is important to overcome possible didactic errors that are often common in everyday actions. Planning the course and the lesson may contribute to the identification of didactic errors, since it reveals the conception about the meaning of planning.

The third didactic error has to do with the contents as an essential dimension to teach geography and it is very present in teaching practices, particularly, in planning and classes of the discipline. As already mentioned, it is common to begin planning by the selection of contents and the available didactic book is the main reference to select them. Likewise, in Geography classes, it is common for lectures to be the main didactic procedure, and the selected content to gravitate this type of class. In the lack of lectures, reading the text of the didactic book and/or copying the content written on the board form the backbone of Geography lessons. The frequent content derives essentially from the belief that if they are not presented and explained well and in advance, students will not be able to do the activities and exercises, hence, will not understand the subject matter.

We do consider that contents are an important dimension in the teaching activity. They, on the other hand, hold the responsibility to meet goals of what is to be taught. In this sense, which contents must be chosen? Do all available contents in a given didactic book, for example, meet the proposed objectives? It is in the objectives that teachers identify that geographical thought they want their students to develop. To reflect on teaching under this point of view is to establish a position of autonomy on the part of teachers. Plus, the contents must be selected as a dimension of the geographical thought that, at that particular moment, meets the intended goal.

Lastly, the fourth didactic error is the field work, based on the fact that this procedure, in many teaching situations, is characterized as an activity whose purpose is related to the traditional dimensions of Geography, where the field work does not question the preconceptions of students, does not explain the spatial complexity, nor yet is frequently used to show the spatial forms. The field word as a didactic error often reveals a legacy of the role that this procedure plays in geographical tradition, still strongly marked by the empiricist research tradition of science and the importance given to observation as a core activity.

Beyond these perspectives, the field work can contribute as a didactic procedure to encourage more complex interpretations and reflections on the spatial dynamics. It is an activity in which, beyond the appearances observed in space, one may understand its functionality, its historicity, the power relations in the production of this space, etc. The field work can become a moment to overcome didactic errors and epistemological obstacles when one understands that it is a procedure that can be investigative, i.e., used as a method to comprehend a phenomenon, an object, and based on it, to observe, describe, analyze, and interpret what is being studied. The field work surpasses obstacles when it takes into consideration the students' questions and hypothesis, their previous knowledge and the culture of the place in question.

An important aspect that needs to be incorporated into the didactic action is considering the field as a rich procedure to teach through the means of geographic cartographic concepts. For instance, we make use of Milton Santos' contributions from whom we learned that the space must be seen in its appearance and in its essence. The essence is understood through the manifestation of aspects that are not visible. It would be, e.g., the adoption of the notion of totality in the understanding of space. The specificity of this space analysis process for a didactic referral on field work would derive based on the use of the following categories: form, function, structure, and process (Santos, 1985).

The conception that we present about the importance of planning and teaching plan reveals the way in which we understand the process of teaching and learning. The field work, for example, is a procedure that can be meaningful if it is included in the class activities as an investigative process, making records of hypotheses, scenarios for analysis, and interpretation of Geography structural elements.

Conceptual errors in the Teaching of Geography

Conceptual errors derive from the internalization of a given concept of Geography in the teacher's mental structure (or in the student's, when that is the case). This ingrained conception is often the one that guides teaching practices. The concepts are frequently acquired be the experimental culture. Therefore, it is in the classroom that occurs the overcoming, i.e., the treatment given to contents must take into consideration what is known about it, but also the held representation of the studied concept. It implies the approaching the concept and the reality, establishing a relation based on questions that encourage students to expand the repertory on the readings, representations, and experiences they have of the world. Thus, the conceptual error is a manifestation that belongs to the process of teaching and learning. This pedagogical proposal that begins with daily situations encourages the interest and the meaning of scientific knowledge. It belongs to the active methodologies that step by step overcome the common sense, aggregating to it some other elements of the culture and science. The didactic activities in their varied versions, in this particular cognitive and socio-cognitive theoretical perspective, assist us in the conceptual changes.

The studies on conceptual errors in the educational field are more evident in investigations of Didactic of Science, among which we can bring to light Astolfi (2003) and Lopes (1993), and in the Didactic of Social Science, the highlight would be García Perez and Riveiro (1995). These research studies are references to reflect on conceptual errors in the teaching of Geography because the base of errors in these studies is related to the epistemology of knowledge building. In other words, is the epistemological position that one advocates is in practice contradictory, it generates the conceptual error. Conceptual errors are essentially errors of epistemic background. To modify and an epistemological conception / position is always more difficult.

> When the psychological conditions of the progress of science are searched, soon you can reach the conviction that it is in terms of obstacles that the problem of scientific knowledge must be raised. Though, it is not about considering external obstacles like the complexity and transience of phenomena, not even incriminating the weakness of the senses and the human spirit: it is in the own act of knowing, intimately, that surface, as a kind of functional

> necessity, delays and disruptions. It is here that resides the causes of inertia that we call epistemological obstacles. The knowledge of reality is a light that always projects a shadow elsewhere. It is never immediate and replete. The revelations of reality are constantly recurring. Reality is never << what you might believe >>, but it is always what you should have thought. The empirical thinking is clear, timeless, when the reasoning apparatus has been tuned. By unsaying the errors of yore, we find truth in an authentic intellectual regret. Indeed, we know against a previous knowledge, destroying botched knowledge, overcoming that which in the spirit itself constitutes an obstacle to spiritualization. (Bachelard, 2006, p. 165)

Therefore, we assert that part of the conceptual errors of Geography in the education and practice of the teacher are errors centered on the epistemic perspective of science that conceives it as the one that seeks the truth and emanates knowledge as an absolute truth, unchanged, without errors or possibilities of conceptual reformulations, that is not subjective. Also, that truth is the action of the objectivity of reality by the researcher.

Hence, conceptual error may be connected to distinct sources such as: errors derived from daily experiences and error originated from science itself in the teachers' education and practices and/or in didactic books. From our standpoint, these errors represent huge obstacles to the construction of School Geography we advocate. As stated before, the didactic errors can have a theoretical and epistemological background of the discipline in its expressions. Likewise, conceptual errors can guide didactic procedures with the Geography that we advocate.

Among the concepts that structure the School Geography, the notion of landscape can be the first to be understood essentially as a set of natural and/or static objects; the second conceptual error occurs with the notion of place, whose conception is referenced in the localization of objects in space and/or in the density of these objects; the third one regards the urban-rural relations; and, in its turn, the fourth error concerns the cartography that is present in the Teaching of Geography, in this case, in relation to the concepts.

When we mention the concepts, we underline the notion of landscape for being on the most learned in the classroom from the early years. The experience of daily life has in itself the contemplation of landscape, a look at what is experienced from a scenario and its social and physical elements. The landscape is what it is seen, but it is also dynamic

and subject to change. For this reason, concerning the overcoming of conceptual error, in this case, it should be avoided to regard it only as descriptive and static dimension of the observed space. These are conceptual errors to teach about landscape on the perspective that we believe, having as a reference Cavalcanti's definition:

> The concept of landscape, although it is not limited to Geography, is classic for the development of this science. It is traditionally associated to the features of an area of possible description; I do believe that even today we can stress the fact that the landscape is a domain of what is visible – the visible expression of a space – the domain of what is apparent, of everything that our vision reaches; the domain of what is experienced directly with our body, with our senses – sight, hearing, smell, taste; i.e., it is the dimension of forms which express the movement of society. The observation and comprehension of these forms serve to offer pathways for spatial analyses. In this sense, it takes place both the objective aspects captured in the landscape, as the subjective dimensions of the subjects that give meanings and senses to the elements of this landscape. Thus, the landscapes are technical, functional and aesthetic expressions of society. They are also dynamic and historical, as it concerns with expressions of society movements. It can be said therefore that, through the observation of landscape objects – observation that is subjective and selective –, the social actions, social contradictions, and witnesses of past actions, from different times, are perceived. (Cavalcanti, 2008, p. 51,52)

From this excerpt, it is worth highlighting some meaningful expressions to justify the conception of landscape as a conceptual error in the teaching of Geography: subjectivation; social movement of landscape forms; dynamic histories; meaning and function. These expressions which counteract the rationalist perspective that conceives landscape, mainly, as a dimension of a static, absolute, rational, little relational, non-historical space.

Another notion that is vital to Geography is the concept of place, which is present in several didactic activities. The more recurrent notions which derive from this concept are the following: place as a synonym of locality, from where it is possible to identify and locate objects in space; place of densification of particular objects; the place of living as space of daily experiences; and as any place on the earth's surface. To think the localities, densification and daily experiences is essential to reflect on the mentioned geographical concept. On the other hand, in a dialectical

perspective, this approach does not suffice. According to Cavalcanti (1998, p. 91), " the comprehension that the place can only be understood as an expression of totality, unfinished, open, and in movement, leads to the need to expand the understanding of the experienced for the conceived", of the lived space for the experienced space conceived for the representations, including the cartographic ones. To expand even further the concept of place, we can associate it to the notion of geographic scale. It being an attribute of spatial reasoning beyond the generalization, it is an important dimension to conceive the place in the perspective of different scales, as stated by Santos:

> The meeting point of logics that work in different scales, revealing of distinct levels, and sometimes contrasting, in the pursuit of efficiency and profit, in the use of capital and labor technologies. The place is the meeting point of remote and close interests, locally and globally. (Santos, 1994, p. 18-19)

Despite advocating a Critical Geography, in our dialogues established with Geography teachers and licentiate students, it has been common to find practical procedures with conceptions of place as a locality. It is this theoretical and methodological incoherence that eventually becomes epistemological obstacles for the students, due to teachers' conceptual fragility, which interfere in the teaching plan, jeopardizing a meaningful class, for instance, treating the notion of place with common sense. In our viewpoint, the undertaking of several geographic scales to think the concept of place is a central dimension that expands the notion related to daily practices, rectifying the geographical conceptual error.

Concerning the urban-rural relations as a conceptual error in teaching of Geography, we consider the fact that is quite common the idea that the city is a spatial dimension that prevails over the rural area, which in turn interfere little in the spatiality of urban space. Such conception strongly marks the teaching of Geography that places theses spaces in contraposition, with their own and isolated features. Although it is still possible to conceive this relationship between urban and rural spaces, in our point of view, they maintain relations of independency, complementarity, integration, and whole totality, much stronger than it seems at first glance. Despite being spaces with distinct landscapes, there is a sturdy economic, cultural, social, political, and symbolic intersection that dynamizes the relationship between urban and rural areas.

This concept is present in several contents of School Geography as well as in teachers' discourses or in classroom activities as dichotomous spaces. It is a common conceptual error when these spaces are opposed to one another like they appear in students' works about the theme at stake. On the one hand, students express (most of the times through pictures) the rural area as spatiality of backwardness, bucolic space, healthy environment, natural nature, and on the other hand, the urban area as a place of modernity, advanced technology, smart people, etc. The teacher, in turn, hardly questions such students' perceptions about the relationship between urban and rural areas. To rectify this concept, it is important to adopt an approach that conceives such spatialities under a perspective of the concept of totality and/or integrated spaces.

The conceptual error is also present when teaching cartography to the students. In this case, the concepts that structure cartography for the teaching of Geography are the following: legend, point, area and line, scale, vertical and oblique vision, bidimensional and tridimensional image, and spatial orientation. These concepts are relevant not only to read a thematic map, for example, but also to encourage spatial thinking through the notions of distance, direction, proximity, place, or topography. The mechanisms of spatially thinking and understanding the places are essential attributes of geography. Thus, when they are not learned in the classroom, they end up discouraging the students to read and elaborate maps, to perceive spatially, to understand the logic of relations among places. These problems could be obstacles to the understanding of geography and, consequently, the world.

In this context, the overcoming of epistemological obstacles is to make students possess an elevated reference system so that they can make use of different means of interpretation in their daily lives. When teachers do not teach and not even put in their teaching plans the foundations for the teaching of School Geography, they wind up contributing to students' inability to construct their hypotheses on localizations and distances, among other spatial connections. As stated by Germshel and Gersmehl (2013), "the process of linking the "where" facts of location with the "what" facts of conditions and connections is more complex and indirect than many people suspect." The teaching of cartography in schools is an essential foundation for students' socio-cognitive and spatial development.

Teaching through concepts: potentiality to overcome[6] errors

We believe we could adopt different approaches to developing the act of teaching Geography, which would be considered as teaching proposals capable of overcoming errors, and thus solidifying the process of rectifying them. The rectification of errors of epistemological background, according to Bachelard, reveals that the starting point for the development of knowledge that is advocated must begin with a problem. In this perspective, the problem is the response to the question. In other words, "It is precisely this that marks out the problem as being of the true scientific spirit." (Bachelard, 2006, p. 166) To overcome errors in the teaching of Geography, it is not productive to say only that the teacher is wrong, that the concepts of Geography that he holds are not updated. There must be created situations to question such conceptions, to encourage the learners to know other perspectives consistent to what is intend to be taught, acknowledging that the errors of epistemic nature are not solved rapidly.

The methodology of teaching through concepts (Souza, 2011; Souza and Silva, 2015; Cavalcanti, 1998; 2005) may constitute an empowering approach to error rectification in the teaching of Geography. We understand that teaching and learning, as socio-cognitive organizations, "are an integrating part of historically constructed social practice" (Castellar, 2010, p.42). Under this perspective, it is essential the role of the teacher to teach through concepts, creating didactic situations capable of dynamizing the relation between the subject and the object. For such dynamization that would approach the knowledge of Geography with the students' knowings, the teacher would use a set of educational tools that would allow students a constant movement in their learning process: the capacity to problematize, systematize, and synthesize. (Cavalcanti, 2014)

As mentioned above, to think the development of meaningful and investigative classes for the students, we advocate the notion that the formation of concepts becomes a fruitful methodology, capable of establishing a theoretical and methodological support to teach Geography. Further, for a successful enterprise of teaching through concepts, we understand that the identification and rectification of errors in the teaching of Geography are fundamentally important so that the student

[6] The term is used in this text for considering it as an approach (among many others) capable of rectifying error.

may really want to appropriate knowledge that can be useful in their daily lives and as citizenship education.

Final considerations

We consider that the construction of scientific knowledge is not an easy task due to the conceptual geographical and pedagogical problems. The understanding of the theoretical and methodological foundations can be a facilitator. It could also assist the teacher to overcome the traditional didactics that are often incompatible with the notion of knowledge that we advocate. Such a task is not simple, because the process of knowledge building of School Geography that we advocate is an epistemic process and, as argued above, the thinking changes of epistemic foundations are quite complex. Thus, it is not easy because in order to make epistemological progresses it is necessary to acknowledge the presence of errors in our daily social practice. Also, errors are fiercely punished in our society and severely criticized in our teaching practices at schools. It means to have a sound theoretical knowledge base about Geography, Education, Philosophy and Psychology, i.e., a solid initial education.

It is furnished with a solid theoretical and methodological basis that we will be able to overcome didactic and conceptual errors in the teaching of Geography, as stated previously. It is essential to: a) overcome the notion of knowledge as something ready and substitute it for the conception that knowledge is relative and processual; b) replace the idea of time of immediate and quantitative learning for the notion of students' cognitive time; and c) to overcome the notion of learning as a product to adopt a notion of learning as a process.

We intended to demonstrate that it is in the complexity of the theoretical and methodological foundations of the teaching of Geography that we feel motivated by the act of knowing and, in our case, identifying the didactic and conceptual errors – and to then rectify them. Consequently, to ensure that students value School Geography – a kind of Geography that is meaningful for the students to see, understand, and act in space at multiple scales. Lastly, to understand that identifying errors in our daily social practices and, specifically, in our practices of teaching is not an act shame, but rather a possibility of developing our scientific spirit.

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All authors effectively contributed in the production of this paper and collaboratively prepared the structure of the text. The first author wrote a part of the manuscript related to the theoretical-conceptual background on the notion of conceptual mistakes in Geography. The second author performed a critical review on the first version of the text and composed the concept of didactic mistakes in Geography teaching.

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