

Analysis of Dissertations Defended in the Postgraduate Program in Geography at the Federal University of Rondonópolis(Brazil): A Reflection on the Choice of the Scientific Method.

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ABSTRACT: *This study aims to demonstrate the validity of the scientific methods employed in master's dissertations, with an emphasis on the transparency and efficacy of the scientific method. The main purpose is to analyze researchers' approach in developing these dissertations, using the perspective of Lakatos and Marconi (2003) to investigate whether such works properly adhere to the scientific procedures established by these authors. To achieve this goal, four dissertations linked to the Postgraduate Program in Geography at the Federal University of Rondonópolis were analyzed. Furthermore, it emphasizes the importance of understanding the essential elements that constitute scientific research, including the fundamental characteristics and processes involved in this context.*

KEYWORDS -Lakatos and Marconi, scientific method, Geography, Federal University of Rondonópolis

I- INTRODUCTION

During the pandemic, there has been a wide discussion about the important role of science as an essential tool in seeking solutions to everyday challenges. This was driven by the need to find answers to the health crisis, highlighting the role of researchers as protagonists both nationally and internationally. However, the lack of understanding among the population regarding scientific procedures has led many to place their anxieties and hopes in science inappropriately, resulting in questioning of the scientific methods used by scientists.

Many of these questions are based on superficial and denialist discourses that fail to recognize the scientific process as transparent and effective. Thus, the aim of this article is to analyze and understand the paths taken by scientists in developing a master's dissertation from the perspective of Lakatos and Marconi (2003). It seeks to address the following provocation: do master's dissertations follow scientific procedures to achieve their objectives?

In this perspective, the analysis of four dissertations linked to the Postgraduate Program in Geography at the Federal University of Rondonópolis was proposed. Among them, the following stand out: "Rhythms and the Production of Agricultural Space in the Itiquira River Basin-MT," by Sued (2018); "Evaluation of the Influence of Land Use and Land Cover on Water Quality in the Red River in Southeastern Mato Grosso," by Souza (2015); "Production in Family Farming Areas and its Linkage with Agribusiness: Case Study of P.A.

Carimã in Rondonópolis-MT," by Silva (2015); and "Environmental Sanitation as an Indicator of Urban Environmental Quality in Rondonópolis – MT," by Araújo (2019).

To begin our conversation, it is essential to understand some elements that constitute science. Among them, essential questions stand out: what characterizes scientific research? What are the processes that permeate it? And above all, is there a scientific model that is more precise and/or true than another?

II- SCIENTIFIC RESEARCH

According to Marconi and Lakatos (2003, p.155), research is defined through a formal procedure, guided by a reflective activity; however, it also comprises procedures that allow testing information, which may or may not be falsified.

In a broad sense, scientific research consists of seeking knowledge, searching for information and data to obtain answers, as stated by Prodanov and Freitas (2013, p.43). Research, according to these authors, is synonymous with searches, inquiries, and questioning of reality.

In other words, scientific research, in a stricter sense, involves seeking knowledge supported by essential procedures to ensure that the obtained data are reliable. Thus, "research is a set of actions proposed to find a solution to a problem, based on rational and systematic procedures" (SILVA AND MENEZES, 2001, p.20).

There is a consensus among the cited authors regarding a methodology that qualifies the pursuit of knowledge. However, it is crucial to highlight that, to achieve the desired results, it is always necessary to follow paths that integrate a scientific model, referred to as procedures.

In this perspective, we will use Marconi and Lakatos' (2003, p.155) definition of scientific research procedures. These authors divided these procedures into six stages: 1) Selection of the topic or problem for investigation; 2) Definition and redefinition of the problem; 3) Survey and formulation of working hypotheses; 4) Data collection, systematization, and classification; 5) Data analysis and interpretation; and, finally, 6) Elaboration of the research results report.

In the initial phase of the research, it is indispensable to define the topic to be addressed in the investigation, which can take the form of a place, a process, or an individual. The choice of the topic is crucial because it delimits the subject to be explored in the research, which can address a social demand or be related to the researcher's proximity to a specific subject. In Postgraduate Programs, the topic is defined according to established research lines.

From the selection of the topic, we proceed to define the problem. According to Lakatos and Marconi (2003), defining the problem involves specifying it, requiring clarity and objectivity from the researcher to facilitate the construction of a hypothesis. The problem usually manifests itself as a question or provocation.

The third stage of research procedures involves formulating the hypothesis, which is closely related to the problem outlined in the previous stage. The hypothesis serves as a guide for conducting the research, guiding the variables and testing the results. Along with the theoretical framework, the creation of the hypothesis represents the most crucial element of the study, as, in the words of Marconi and Lakatos (2003, p.161),

"The hypothesis is a proposition made in an attempt to verify the validity of an existing answer to a problem", always subject to empirical verification, whether correct or incorrect, in agreement or opposition to common sense.

However, the fourth stage focuses on manipulating the selected data, clarifying how these data were processed and analyzed. As highlighted by Silva and Menezes (2001, p.34), it is decisive that the data reveal a cohesive integration among three fundamental elements of communication: the author, the reader, and the research. In this sense,

"The data collection will be related to the problem, the hypothesis, or the assumptions of the research and aims to obtain elements so that the objectives proposed in the research can be achieved. At this stage, you also choose the possible forms of tabulation and presentation of data and the means (statistical methods,

manual or computational instruments) that will be used to facilitate the interpretation and analysis of the data." (SILVA AND MENEZES, 2001, p.34)

In other words, the data go through three distinct processes: collection, aimed at choosing and applying variables; tabulation and presentation, using technological devices for index elaboration and statistical calculations; and the third stage, comprising the analysis and discussion of results according to the objectives established by the hypothesis.

In conclusion, we arrive at the conclusive report of the research, which, like all previous stages, must be intrinsically linked to the hypothesis. At this moment, it is necessary to expose the points that converge or diverge from the results obtained because [...] "the conclusion must include a synthesized recapitulation of the chapters and self-criticism regarding the development of the research, where you will make an assessment of the results obtained." (SILVA AND MENEZES, 2001, p.34).

III- METHODOLOGY

For the elaboration of this article, the research methodology proposed by Marconi and Lakatos (2003, p.44) was adopted, which involves reading and identifying the elements of the five stages that make up the referenced methodological procedures.

The work plan was structured according to the conventional article format, consisting of introduction, methodology, development, and conclusion.

Within the scope of the Postgraduate Program in Geography at the Federal University of Rondonópolis, four works were selected for analysis. The selection of material occurred randomly, choosing four master's dissertations; two linked to the research line of Applied Geotechnologies for Environmental Management and Analysis, and the remaining two representing the research line of Territorial Planning and Management.

These works were retrieved from the program's digital dissertation bank. The interpretation analyses followed the guidelines of Marconi and Lakatos (2003, p.48), which consist of formulating criticisms, preceded by classification and generalization of the main ideas from the bibliographic reference.

In the end, a text of analysis was constituted by the authors with the purpose of examining the organization of the scientific methodologies of the presented dissertations.

3.1- The scientific approach

Initially, the geographical analysis categories adopted by the authors were identified, organized as follows:

Table 1. Categories of analysis in the dissertations

Author	Category
Silva (2015)	Territory, Region, and Place
Souza (2015)	Region and Territory
Sued (2018)	Region, Territory, and Place
Araújo (2019)	Region and Territory

Source: Prepared by the authors

Silva (2015) addresses the categories of Territory, Region, and Place; Souza (2015) employs the categories of Region and Territory; Sued (2018) encompasses Region, Territory, and Place; and finally, Araújo (2019) employs the categories of Region and Territory.

Regarding the problem, we identify it as the guiding starting point of scientific research, where the researcher engages to find a solution. According to La Ville and Dionne (1999, p. 85-86), the problem is divided into two research categories, which help to define and delimit the problematic. One of these categories consists of filling a gap in science, that is, the main objective of the research, established in this modality, can add new knowledge to existing knowledge. According to La Ville and Dionne, this type of research is called fundamental research.

The second category proposed by La Ville and Dionne (1999) consists of the need to solve an existing or pre-existing problem, such as an environmental, social, and/or political problem. In this category, the research aims to contribute to understanding the problem, suggesting new approaches, and is called applied research.

Thus, applied research aims to generate new knowledge to contribute to the development or improvement in problem-solving. Additionally, a qualitative approach is adopted, as highlighted by Marconi and Lakatos (2003), characterized by analyzing and interpreting deeper aspects, describing the complexity of human behavior, and providing more detailed analyses of investigations, attitudes, and behavior trends. Finally, it is descriptive, as it records and analyzes facts or variables collected from reality itself, seeking to classify, explain, and interpret phenomena that occur.

We understand that both categories of problems, both fundamental and applied, are present in the dissertations mentioned here. These works assume an applied character, distinguished by the qualitative and descriptive approach, characteristics that permeate the entire development of these research projects.

In this context, it is evident that all the dissertations presented in this study share this qualitative characteristic, as they seek not only an in-depth understanding of fundamental issues but also the practical application of this knowledge to solve concrete problems. By adopting qualitative approaches, these research projects seek to analyze and interpret deeper aspects, providing detailed information about human behaviors, while the descriptive nature of the work allows for meticulous recording and analysis of facts and variables collected in reality. This convergence of applied, qualitative, and descriptive characteristics reinforces the methodological consistency present in the dissertations under analysis.

3.2-Definition and Redefinition of the Research Problem

Upon analyzing the dissertations in question, a cohesive and clear delimitation of the problem was observed. In most cases, the addressed issues were intrinsically related to the process of spatial transformation, especially in the context of capital advancement, with a predominant focus on agribusiness. Specifically, Silva (2015) investigated the advances of the capitalist production model in rural areas and the resulting impacts on rural settlements. Souza (2015) focused on analyzing land use and occupation by various crops, exploring their effects on water quality. Meanwhile, Sued (2018) explored the rhythms of life in rural areas of Itiquira - MT, examining the changes resulting from the adoption of the agribusiness production model.

It is noteworthy that Araújo's dissertation (2019) presents a unique perspective by addressing environmental quality through sanitary indicators. This research proposes a brief discussion on the lack of adequate urban planning and its impacts on environmental fragility, expanding the scope of analysis to issues related to quality of life and urban sustainability. Thus, the dissertations critically and comprehensively explore the challenges faced in different geographical contexts, contributing to a more complete understanding of the interactions between spatial, economic, and environmental quality transformations.

3.3-Survey and Work Hypothesis

In conjunction with defining the problem, it is essential to establish a potential explanation that guides the investigation. In this perspective, Köche (2018, p.108) emphasizes that understanding the studied phenomena arises through hypothesis formulation. The author highlights that hypotheses represent the researcher's fundamental tools, being crucial as primary means to achieve desired conclusions.

In summary, "the hypothesis is the explanation, condition, or principle, presented in the form of a declarative proposition, which establishes relationships between relevant variables for a given phenomenon or problem" (KÖCHE, 2018, p.108). Thus, the careful formulation of hypotheses not only guides but also constitutes an essential tool for the researcher to achieve the desired understanding throughout the investigation.

In Sued's dissertation (2018), the hypothesis is based on the analysis of the organization of physical elements in the area, directly influencing the occupation process and social relationship dynamics. The central theme suggests that the studied watershed has its own physical, chemical, biological, and social rhythms. A thorough understanding of this totality is essential to understand the impacts of capitalist production relations,

especially due to rhythm fragmentation. In other words, Sued's (2018) research's general objective is based on understanding the rhythms, shaped by the contradictory processes occurring in the specific context of this place.

However, in Silva's dissertation (2015), the hypothesis is grounded in the analysis of the influence of agribusiness power relations on rural settlements. Through his hypothesis, the author seeks to validate the interaction between family agriculture and the agribusiness production model. One of the main objectives of his work is to thoroughly understand how this integration process unfolds.

Similarly, Souza's (2015) assumption is based on changes in space production.

"The use of land has been significantly altered with population growth, factors such as domestic and industrial pollution, high consumption rates, surface runoff from areas exploited by agriculture, and disrespect in urbanized areas of Permanent Preservation Areas (PPAs) threaten water availability and quality."

With the purpose of reaching this conclusion, the author directed the study towards identifying land uses in the Red River basin during the period between 2004 and 2014. The main focus was to understand if the various practices adopted during this period influenced changes in water quality.

Subsequently, Araújo (2019), in a context that follows the methodology related to the necessary response time for the adoption of efficient public policies, effectively worked with methodologies and objectives to clarify her doubts. She constructed the hypothesis that environmental sanitation indicators would be efficient in analyzing environmental quality. According to the methodology used, she managed to confirm her hypothesis.

IV-THE USE OF METHODOLOGY

Methodology is characterized as the path that the researcher will use to achieve their specific objective, aiming for understanding and the pursuit of knowledge (PRODANOV AND FREITAS 2013, p.24). Thus, we can assert that, without methodology, there is no science.

"The method consists of a set of systematic and rational activities which, with greater security and economy, allows achieving the objective - valid and true knowledge -, tracing the path to be followed" (MARCONI AND LAKATOS, 2003, p. 83).

The choice of method for research approach is essential for understanding the investigator's intentionality, as it will guide the procedures for conducting the research.

The city of Rondonópolis - where the Postgraduate Program in Geography, to which the dissertations belong, is located - is inserted, according to IBGE (2017), in the Intermediate Geographical Region of Rondonópolis, one of the five intermediate regions of Mato Grosso, being one of the 134 intermediate regions of Brazil - mainly focused on the dissemination and reproduction of agribusiness. Most of the analyzed works consist of the study and systematization of dialectical ideas between agribusiness and the population, as well as their means of resistance - family farming.

The predominant use of the hypothetico-deductive method became evident, as the research follows the schemes proposed by Gil (2008, p.12), corresponding to a formulation of the problem to be studied; nevertheless, there is the observation of this object, emphasizing a characteristic, followed by the formulation of hypotheses, which can be verified or refuted. Finally, we have the corroboration of these results.

In the context of this methodological approach, it is notable that Sued (2018), Silva (2015), and Souza (2015) chose to incorporate the precepts of dialectics as central foundations to develop their discussions. These reflections were structured based on the economic contradictions faced by communities regarding the capitalist system.

The focus on dialectics provided a deeper and contextualized analysis, allowing a more comprehensive understanding of the underlying dynamics and tensions present in the interactions between communities and the capitalist economic context.

Because according to Prodanov and Freitas (2013, p.35),

In Dialectical Change, transformation occurs through contradictions. At a certain moment, there is a qualitative change because changes in things cannot always be quantitative. On the other hand, as everything is in motion, everything has "two faces" (quantitative and qualitative, positive and negative, old and new), one transforming into the other; the struggle of these contradictions is the content of the development process.

However, Araújo (2019) opts for the use of an inductive model when constructing her sanitary quality map. In this context, the author uses predefined variables as a basis, aiming for a deeper understanding of environmental quality in her study object.

V- DATA COLLECTION, SYSTEMATIZATION, AND DATA CLASSIFICATION

Very rarely does someone produce something entirely alone. Theories, for example, arise from multiple interpretations, even if created individually. According to Fonseca (2002), one of the primary phases of research, regardless of its nature, is data/information collection, as it aims to capture the important content generated by tools, fieldwork, websites, and public interaction activities, which are in turn produced by various perspectives.

According to Lakatos and Marconi (2003), it is through data analysis, whether in-depth or not, that the development of research takes its course, as this phase can bring new significance or even a change in the proposed objectives, since data are responsible for representing reality. They can be obtained through documentary research, bibliographic research, and direct contacts, the latter being related to field or laboratory research conducted with individuals who can provide data or suggest possible sources of information, such as sources from the internet.

Thus, "the sum of the collected material, usable and adequate, will vary according to the investigator's skill, experience, and ability to discover clues or important subsidies for their work" (LAKATOS AND MARCONI, 2003, p.158).

Analyzing the dissertations from PPGeo (UFR), one can see the use of very relevant data for scientific production. Each one made sure to meet its objectives and thus, necessarily emphasized its results through data collection, systematization, and classification.

In this sense, the use of qualitative and quantitative data obtained via the internet from sites such as IBGE, INCRA, and also from fieldwork, with interviews, among other sources, was essential for the production of cartographic material as well as documents that allowed the representation of phenomena.

Lakatos and Marconi (2003, p.166) point out that before analysis and interpretation, data must go through the following steps: selection, coding, tabulation. It is important to know how to analyze and interpret this data to make decisions that improve the results and the systematization of the entire research.

For example, Souza's dissertation (2015) brought a discussion on the influence of land use and occupation on the water quality of the Red River in southeastern Mato Grosso, working through the analysis of data collected in the field; after collection, components found in the water were identified.

Similarly, Araújo (2019), for each environmental sanitation indicator used, produced cartographic material pinpointing the locations and levels of environmental quality in the urban area, subsequently using the collected data for the production of indicator maps.

Silva (2015) used satellite images to locate the study areas, and Sued (2018) to establish a more detailed analysis of the physical characteristics of the Itiquira river basin and its socioeconomic relations.

VI-DATA ANALYSIS AND INTERPRETATION

Maps have the function of representing a particular locality on a flat surface, presenting one or several of its aspects. According to Castro (1995), they are, above all, a form of language and therefore communication. Thus, the cartographic material used and produced by the authors mentioned above fulfills this function.

Cartographic representation needs to contain some elements in the creation process such as the title, the legend, the scale, the orientation, and the cartographic projection used in order to facilitate the interpretation of this resource by anyone. Martinelli (2005) addresses one of these elements, the legend, where he concludes that:

"The legend, in turn, constitutes, after the title has been assimilated, the gateway to entering the core of the map's content in all its fullness. At first contact, it has the role of cataloging all the signs on the map by decoding them." (MARTINELLI, 2005, p. 14).

Knowing its importance on the map, when it is about the location of a space cutout, it is very pertinent that it is present so that readers can identify territorial boundaries and thus locate them spatially more accurately. One weakness found in the analyzed dissertations is precisely the absence of the legend in the location maps of the study area.

However, among the maps elaborated in the results of the research, the outcome was satisfactory, that is, they managed to bring the representation/information of the phenomenon using the appropriate scale for its analysis. Thus, they all achieved the objective, composing [...] "a strategy of approximation to reality, which includes both the inseparability between size and phenomenon, which is defined as a dimensional problem, as well as the complexity of phenomena and the impossibility of apprehending them directly" (CASTRO, 1995, p.118).

It is observed that the methods and techniques used by the authors were suitable for the problem and hypotheses raised and the space-time characteristics according to the phenomenon, so the methodologies presented correlation with the specific objectives, thus achieving the general/specific objective of each of them.

VII- CONCLUSION

Considering the methodology applied and the established framework, we conclude that the Master's dissertations follow the rites of scientific research proposed by Marconi and Lakatos (2003). This work not only validated these procedures but also provided a renewed insight into the rites of scientific research of the dissertations from the graduate program in Geography at PPGeo-UFR.

Practice has revealed that scientific production can occur through various paths and approaches, emphasizing, however, the interdependence and the need for a suitable structure to facilitate both the development and interpretation of processes. Thus, we reinforce the importance of adherence to solid and effective methodological principles, contributing to the quality of knowledge generated in scientific research, regardless of the area/field of knowledge.

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