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The constitution of research groups in Mathematics Education in Brazil

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Abstract: We analyze the constitution of the research groups in Mathematics Education in Brazil, registered in the Directory of Research Groups in Brazil of CNPq. The theoretical and methodological contributions are linked to Education and Mathematics Education, the norms/resolutions of CNPq and the descriptive survey research in a quanti-qualitative approach. The results showed a total of 569 groups, with significant growth since 2002, a predominance with up to 12 years of activity, concentrated in the Southeast and Northeast regions, but predominant in the states of São Paulo, Paraná, Minas Gerais, Bahia, Rio de Janeiro and Pará and in the Public Institutions, especially UTFPR and UNESP. The groups concentrate 15,085 people among researchers, students, technicians, and collaborators. We argue about the emergence of a research agenda that can privilege future studies around our investigative region.

Keywords: Mathematics Education. Research Groups. Directory of Research Groups of CNPq.

La constitución de grupos de investigación en Educación Matemática en Brasil

Resumen: Analizamos la constitución de los grupos de/con investigación en Educación Matemática en Brasil, registrados en el Directorio de Grupos de Investigación en Brasil del CNPq. Los aportes teóricos y metodológicos están vinculados a la Educación y a la Educación Matemática, a las normas/resoluciones del CNPq y a la investigación descriptiva por encuesta en un enfoque cuanti-cualitativo. Los resultados mostraron un total de 569 grupos, con un crecimiento significativo a partir del año 2002, un predominio con hasta 12 años de actividad, concentrado en las regiones Sudeste y Nordeste, pero predominante en los estados de São Paulo, Paraná, Minas Gerais, Bahía, Río de Janeiro y Pará y en las Instituciones Públicas, especialmente la UTFPR y la UNESP. Los grupos concentran a 15.085 personas entre investigadores, estudiantes, técnicos y colaboradores. Argumentamos sobre el surgimiento de una agenda de investigación que puede privilegiar futuros estudios en torno a nuestra región de investigación.

Palabras clave: Educación Matemática. Grupos de Investigación. Directorio de Grupos de Investigación del CNPq.

A constituição de grupos de/com pesquisa em Educação Matemática no Brasil

Resumo: Analisamos a constituição dos grupos de/com pesquisa em Educação Matemática no Brasil, cadastrados no Diretório dos Grupos de Pesquisa no Brasil do CNPq. Os aportes teórico-metodológicos vinculam-se a Educação e Educação Matemática, as normas/resoluções do

CNPq e a pesquisa descritiva de levantamento numa abordagem quanti-qualitativa. Os resultados evidenciaram um total de 569 grupos, com um crescimento significativo a partir do ano de 2002, um predomínio com até 12 anos de atuação, concentrados nas regiões Sudeste e Nordeste, mas predominantes nos estados de São Paulo, Paraná, Minas Gerais, Bahia, Rio de Janeiro e Pará e nas Instituições Públicas, com destaque para a UTFPR e a UNESP. Os grupos concentram 15.085 pessoas entre pesquisadores, estudantes, técnicos e colaboradores. Argumentamos sobre a emergência de uma agenda de investigação que possa privilegiar estudos vindouros em torno da nossa região investigativa.

Palavras-chave: Educação Matemática. Grupos de Pesquisa. Diretório de Grupos de Pesquisa do CNPq.

1 Introduction

The object of study of this article is the groups of/with research in Mathematics Education (EDM) in Brazil, consisting of research groups strictly focused on EDM and groups with research in EDM, as they have other predominant areas of knowledge in their research activities.

These groups are registered in the Diretório dos Grupos de Pesquisa no Brasil (DGPB) [Directory of Research Groups in Brazil] and are authorized to develop their scientific research activities in their institutions and graduate programs.

We can problematize, justify, and recognize the importance of our study through several paths, windows, ways, and roads intrinsic or external to EDM, but not necessarily isolated from it. In a simple but legitimate statement, glimpsed from the past to the present, few researchers focused on analyzing, discussing, understanding and/or systematizing the Brazilian EDM research from the inside. Outstanding work in this direction involves the doctoral research developed by Silva (2017).

On the other hand, the results indicated in the research developed by Bicudo and Paulo (2011) show possibilities of investigations around research groups articulated with scientific production in EDM in Brazil.

> [...] more investigations are needed on the subject that can subsidize the discussion of Research Groups and characterize the production in Mathematics Education in Brazil. It is important to understand and explain the trends that mark the research in Mathematics Education in Brazil, focusing on the questions that support them and the scientific, philosophical and methodological rigour they pursue. We understand that we need these subsidies to think about research in Mathematics Education in Brazil, especially at the institutional level, understood as the national instance that brings together the researchers of the country, the SIPEM, for constituting the locus where, on behalf of SBEM, this research should be debated. (Bicudo & Paulo, 2011, p. 254)

This peculiar marking was also configured in our research as a fertile ground to plant our second justification, assuming its relevance and accrediting its potential to contribute to advancing the research produced in EDM in Brazil, in the investigative region of the research groups present in the DGPB.

In the EDM outside sphere but not isolated or less critical, Mainardes' (2022) recent work on research groups in the area of Education also highlights the scarcity of studies on research groups as an object of study in different investigation possibilities and methodological approaches (macro, micro and meso).

In turn, Nardi's (2005) research and his subsequent and/or branched productions end up crossing our investigative path by containing historical memories and/or traces of historicity not only concerning Sciences Teaching, but also of Mathematics, which implies knowledge and understanding of the History of Mathematics Education in Brazil. In this sense, research such as Feres' doctoral thesis (2010) advanced in seeking to intensify and systematize the constituent institutional elements of the Science and Mathematics Teaching area in Brazil.

In the thesis above, for example, we observed data from graduate programs, lines of research and research groups in science and mathematics teaching. In quantitative data, the researcher presented a list of 60 graduate programs in area 46 of the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes) [Coordination for the Improvement of Higher Education Personnel] — Teaching of Sciences and Mathematics (ECM) — and a total of 134 research groups located in these programs. There are registers of programs in "Teaching of Sciences", "Teaching of Sciences and Mathematics", "Education for Science", "Mathematics and Technological Education", and "Mathematics Education", among others. There are also registers of more than 40 research groups with nomenclatures focused on EDM and a comprehensive spectrum of research lines focused on EDM research.

Therefore, the leading question of our investigation, now contextualized and problematized, is: How are the groups of/with research in Mathematics Education in Brazil constituted? This question involves seeking understandings and/or answers to the following guiding questions: a) What is the registration status of these groups in the DGPB (certified, certified-not updated, in completion, excluded, certification denied, group awaiting certification)? b) What is their creation/performance time? c) What is their distribution by geographic region, federation unit, and educational institution? d) Who are the stakeholders and what is the frequency of human resources of these groups? We point out that these questions unfold in the quantitative and qualitative variables or categories of analysis of our investigation.

Thus, the main objective of this article is to understand how the groups of/with research in Mathematics Education in Brazil registered in the DGPB are constituted. To this end, we try to organize it into four sections in which the Diretório dos Grupos de Pesquisa no Brasil (DGPB), the research in Mathematics Education and the results found in the data collection are presented.

2 DGPB and EDM research

Created in 1992 by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) [National Council for Scientific and Technological Development], the DGPB is the main source of data for Brazilian scientific and technological research, storing and disseminating a valuable inventory of information from research groups allocated in higher education institutions, scientific research institutes, and technological institutes.

The information gathers data on the human resources of the research groups (researchers, students, technicians, collaborators, and institutions, among others), lines of research in progress, the areas of knowledge, sectors of activities involved, number of research groups in activity, number of researchers, scientific production, technological production, artistic production, among many others. This inventory allows outlining a biennial scientific-technological profile of Brazilian research, when data are updated in the database by the Brazilian scientific and technological community, processed and disseminated to society through the official CNPq website.

The DGPB's official website highlights three main objectives for its importance and use. The first involves the scientific and technological community, which can use this to exchange

information quickly, accurately and clearly, revealing the actors, their location, what they are doing and what they have produced recently. Its objective is to enable communication between the Brazilian scientific and technological communities.

The second objective, linked to institutions, scientific societies, and/or governmental and non-governmental bodies in general, highlights a broad source of information about research groups in the current base, but also emphasizes that "its census character invites the deepening of knowledge through the numerous possibilities of survey studies" (CNPq, 2022 s.n.). Thus, its objective is to stimulate the analysis of data stored for the development of management and planning activities in science and technology, or research that the processed data itself cannot cover, dialogue with, and answer and/or understand some questions, such as those that we pose and pursue in our investigation.

The third objective highlights the quality of the DGPB as a fundamental instrument in preserving the memory of scientific and technological activities carried out in the country, periodically recorded with the updates of data made almost always in a biennial frequency.

The DGPB also presents in its content conceptions that it assumes regarding to research, researcher, research group, line of research, scientific, technological, and artistic productions (S, T & A) of the research group, participating institutions, and the type of situation in which research groups can be found in the current database. These and other definitions that constitute the DGPB can be accessed on its official website in the glossary section.

Such contents and conceptions are intertwined in our investigation also to the extent that we question what research, researcher, research group, and line of research are and which institutions have allocated these groups currently in the EDM research region. Obviously, the answers, explanations and/or interpretations already posted in the specific EDM literature have presented a plural, complex, heterogeneous, historical, temporal, convergent and divergent epistemological, philosophical, sociological, psychological, ontological, theoretical, and methodological and pedagogical framework (Bicudo & Paulo, 2011; Fernandes, 2017).

This scenario reaffirms the multi and interdisciplinary character of EDM as a professional and scientific field in its historical process of constitution, crystallization, and expansion (Kilpatrick; 1994, 1996; D'Ambrosio, 1993). It also reveals the importance of continuing to build the history of research in EDM by placing in *Epoché* the very research of research in EDM in a continuous process of investigating, seeking, interpreting, explaining, answering, and interrogating its investigative regions, but never in a defined, ready, and finished performance.

By way of example, the work of Vianna (2000) clearly points out an EDM that brings together mathematical educators in their free work space-time and attached at the same time to their circumstances, to their colleagues from other knowledge areas, their craft assignments etc., which implies conceiving and transiting in an area of knowledge in which this area and the being of this area becomes, makes itself, breaks up, remakes itself, acts, refuses to act, denies itself, sees itself and sees its surroundings in the subjective freedom and restriction of its circumstances.

Regarding the research groups, it is necessary to highlight the different situations in which they can be found in the current DGPB database. In summary, it can be a certified group, a certified group – not updated, a filling group, a deleted group, a group with denied certification or a group awaiting certification.

From the label concerning the type of situation that a research group may be disposed of in the DGPB, it is possible to understand what each situation represents and thus executes

interpretations, understandings, and choices of groups that have their scientific research activities in operation with the postgraduate institutions/programs that house them.

3 Deepening the theme and related researches

Our investigation is based on the constitution of groups registered with the DGPB that carry out research in EDM in Brazil. The word "constitution" is critical in our investigation, as it denotes the quality of what composes, integrates, forms, organizes, establishes, consists, represents, means, and establishes the EDM area in Brazil and, specifically, the groups registered in the DGPB that carry out research in EDM.

It is important to mention that this quality carries at the same time its past, present and future history (in perspective, projecting future developments). Thus, our research is also situated in the history of EDM as a professional and scientific field in its crystallization process, which, in Brazil, begins to germinate from the 1960s, intertwined with concerns about the teaching of mathematics in the history of mathematics. With its curricular modernization and with the Movimento da Matemática Moderna [Modern Mathematics Movement — MMM], it is institutionalized as a Brazilian scientific community with the foundation of the Sociedade Brasileira de Educação Matemática [Brazilian Society of Mathematics Education — SBEM], in 1988, during the II Encontro Nacional de Educação Matemática [National Meeting of Mathematics Education]— II ENEM (Fernandes & Menezes, 2002; Silva, 2004).

Since then, EDM has been expanding, celebrating achievements, fighting for places of speech and opening spaces, overcoming prejudices, and suffering institutional resistance regarding its legitimate capacity to be and act in Brazilian education, in the education of teachers who teach mathematics and in the teaching of mathematics for Basic Education (Fernandes & Valente, 2019).

Therefore, our investigation advances in the research produced in EDM in Brazil, in the investigative region of the groups registered in the DGPB, based on previous research with traces of historicity, surveys and meta-research-understanding about the research carried out in EDM in Brazil that encompass stories of subjective positions of EM in the Brazilian scientific-academic scenario and/or that consider its constitutive elements, elucidating systematizations, perspectives, research trends, theoretical-methodological approaches, graduate programs with EDM research, groups that carry out research in EDM and lines of research (Lopes, 1994; Grossi, 1994; Carneiro, 2000; Fernandes & Menezes, 2002; Miguel *et al*, 2004; Silva, 2004; Silva, 2013; Fernandes, 2017).

Among these, we highlight Fernandes' (2017) work for presenting five categories of research (C1, C2, C3, C4, C5) that focus their interests on stories and/or that present traces of historicity of the constitution and consolidation of EDM as a research area in the Brazilian scientific-academic scenario.

Specifically, these studies deal with the "organization of societies, **research groups,** and scientific events or those that present a periodization for the Brazilian scientific-academic production in Mathematics Education" (Fernandes, 2017, p. 123, emphasis added). In this perspective, we mainly situated our investigation in the vicinity of categories C1 and C3, as they emphasize studies on the constitution of EDM in its founding/pragmatic bases and the foundation, performance and constituent elements of study and research groups in Brazil.

From another perspective, when discussing research groups as an object of study in the area of Education, Mainardes (2022) presents theoretical-methodological possibilities for investigating research groups by delineating areas of investigation and methodological

approaches considered in the research processes. In the scope of our investigation, we privileged the magnitude of research groups in the EDM survey region in a macro methodological approach. According to this author, studies in this direction are relevant since:

> As indicated, investigations on research groups in Brazil have emphasized the approach of individual groups and investigation on groups in specific areas of knowledge or academic fields or some region of the country. Thus, there is a lack of more comprehensive studies on the quantitative and qualitative dimensions of research groups in Brazil. The DGPB/CNPq provides researchers with access to research groups registered with CNPq and, from there, several aspects can be explored, such as the quantity and characteristics of research groups in large areas and in specific fields, growth rates, comparative studies (inter and intra-groups) etc. Studies of this nature are particularly important when there is no data on the research groups of an area or of a specific field and may constitute the first stage of the investigation to later investigate aspects of the meso and micro levels. (Mainardes, 2022, p. 11)

In a literature review, we identified two studies in the national literature that deal with research groups in EDM as an object of study in a macro methodological approach. This is the work of Amorim (2017) and Oliveira (2017).

Amorim's work (2017) investigated EDM research groups registered with the CNPq's DGPB articulated with Field Education (and vice versa). In the path of the Field Education for EDM, he identified 251 groups, which were distributed by regions and Higher Education Institutions (HED). At the EDM for Field Education, the author identified 363 groups distributed throughout the country. The conclusive data indicated 14 groups that articulated Field Education and EDM, with emphasis on the Northeast Region, responsible for allocating 6 of them.

Similarly, Oliveira's (2017) work investigated and described characteristics of groups registered with the DGPB that research EDM in conjunction with Educação à Distância (EaD) [Distance Education]. After completing the survey, the author validated the number of 21 groups distributed in 16 HEIs.

In this sense, these groups were characterized based on some quantitative and qualitative variables. The main results pointed to a predominance of groups founded in the first decade of the 2000s and operating for over ten years; the repercussions of the groups favoured the themes "Mathematics Teaching/Learning", "Use of digital technologies in mathematics classes", "Mathematics Teacher Education" and "Distance Education"; the scientific productions of the groups focused mainly on the initial and continuous education of mathematics teachers in multiple virtual contexts and diverse bases of didactic, cognitive, epistemological, philosophical, and methodological references. Finally, the observed areas of training of the researchers in the groups were mainly Humanities (112) and Exact Sciences (35), obeying the order of a master's degree or PhD in EDM, Education, and Mathematics.

Therefore, we seek to know the present constitution and expand and clarify an overview of the current research groups registered with the DGPB that carry out research in EDM in Brazil. In this macro methodological approach, we seek to advance and contribute to the scientific production in EDM in Brazil.

4 Study Development

Recognizing the nature of the objective, the technical procedures adopted, and the type

of data approach, our investigation presents its methodological bases linked to the descriptive survey in a quantitative and qualitative approach (Bogdan & Biklen, 1994; Babbie, 1999; Cervo, Bervian & Silva, 2006).

We situate descriptive research as a type of research that seeks to study and describe characteristics, properties and/or relationships in a given community or group. Thus, "this modality includes studies aimed at identifying social representations and *the profile of individuals and groups*" (Cervo, Bervian & Silva, 2006, p. 62, emphasis added). As pointed out in our objective, the group we analyzed and described is constituted of the research groups registered in the DGPB, and we seek to elucidate characteristics of its constitution according to some quantitative and qualitative variables.

This type of research has been important in EDM, as it allows us to understand and elucidate a panoramic view of the research produced in different margins of time, space, theoretical-methodological frameworks, actors, institutions, study and research groups, lines of research, trends, thematic axes, and databases (Fiorentini & Lorenzato, 2012). In this way, we highlight studies such as those by Carvalho (1994), Fiorentini (1994) and Cargnin et al. (2022).

Obviously, a survey work requires a redoubled, meticulous effort and covers a systematic, hermeneutical, and plausible look around the analysis of the content sought in the different databases. In our study, the data production source was the DGPB. The survey of the research groups took place from March 4 to 18, 2022 and followed the parameters elucidated in Table 1.

Table 1: Survey of Research Groups in the DGPB

Search Term	Applied Filters (exact search)	Number of groups presented	Number of validated groups
"Mathematics Education"	Consulted by: group Group name Line of research Search line keyword	534	458
"Mathematics Teaching"	Consulted by: group Group name Line of research	185	93
"Teaching of Mathematics"	Consulted by: group Group name Line of research	53	18
TOTAL		**772**	**569**

Source: Research Data (2022)

The terms used in the research groups' search were "Mathematics Education" and "Teaching of/of the Mathematics". The processed results pointed out all the groups that had them in their nomenclature in some line of research. For a deeper search, we also marked the "keyword" option for the first command, increasing the chances of identifying the research groups in the EDM survey region.

The "Mathematics Education" command does not require comments, as it characterizes our area of inquiry. The other commands were adopted due to their historical nuclear position as an object of study of EDM as a professional and scientific field. The specific literature of EDM records that the first study groups carried the intrinsic nature of improving and modernizing mathematics teaching. In addition, the EDM area itself has been emerging,

consolidating, and institutionalizing at the heart of this prerogative. In this sense, it is common that, in its nomenclature, these commands were and still are in evidence.

The search resulted in an exact number of 772 groups, of which 569 were validated for our investigation[1]. This reduction was due to repetitions of groups and the type of situation of some of them, such as excluded, awaiting certification and groups that had no connection with the commands adopted and, therefore, with EDM. In this curious case, we do not know why this happened.

These identifications were perceived during the initial tabulation of the data, carried out from March 19 to 31, 2022. For this purpose, we used a data systematization form constructed by the authors of this article. In it, we recorded all data related to the constituent elements of the groups, such as the name of the group, name(s) of the leader(s), type of situation, geographic location, linked institution, lines of research, quantity of human resources, and year of foundation, among others. Subsequently, we synthesized these data in graphs, tables and charts for better organization, analysis and interpretations.

The data approach was quantitative and qualitative. Its importance is qualified by the need to understand aspects such as how many and which the research groups are. Thus, by way of example, we asked: How many and which are the research groups? How many and which research groups are sheltered in the southeast region? And so on.

In this sense, to understand how the research groups that carry out research in EDM in Brazil are constituted in the present time, we demarcate the following variables or categories of analysis: type of their situation in the DGPB; time of creation/performance of the research groups; distribution of them by geographic region, Federation Unit (FU) and Higher Education Institution (HEI); the actors and the frequency of human resources in terms of Researchers (R), Students (S), Technicians (T) and Employees (E).

5 Answering Study Questions

Applying the methodological procedures described in the previous topic, we validated a total of 569 groups registered in the DGPB that carry out EDM research in Brazil, among research groups that strictly present lines of research in EDM and groups with research in EDM whose main focus lies in other fields of knowledge.

Considering the type of situation of the groups, 443 of them were duly certified, 86 were certified – not updated and 39 were in completion (in the sense that they also already exist and are being updated by their leaders). In the following topic, we present the results and the discussions.

5.1 About the Time of Creation/Performance of the Research Groups

Regarding the time of the creation of the groups, the results showed that the first three date back to 1980, 1981 and 1989. These are, respectively, the following groups: Núcleo de Educação em Ciência, Matemática e Tecnologia [Nucleus of Education in Science, Mathematics and Technology] (Universidade Federal de Juiz de Fora — UFJF), PSIEM-GEPEMAI: Psicologia da Educação Matemática e Formação de Professores [PSIEM-GEPEMAI: Psychology of Mathematics Education and Teacher Education] (Universidade Estadual de Campinas — UNICAMP) and Laboratório de Psicologia Genética [Laboratory of Genetic Psychology] (Universidade Estadual de Campinas — UNICAMP). In summary, the repercussions registered by these groups reveal a particular interest in the themes of “Teacher

[1] The list of groups from/with research in Mathematics Education in Brazil is available at: https://doi.org/10.29327/782146.

Education", "Curriculum", and "Piagetian Genetic Psychology" under the aegis of the education of new researchers and applications of knowledge produced in Basic Education.

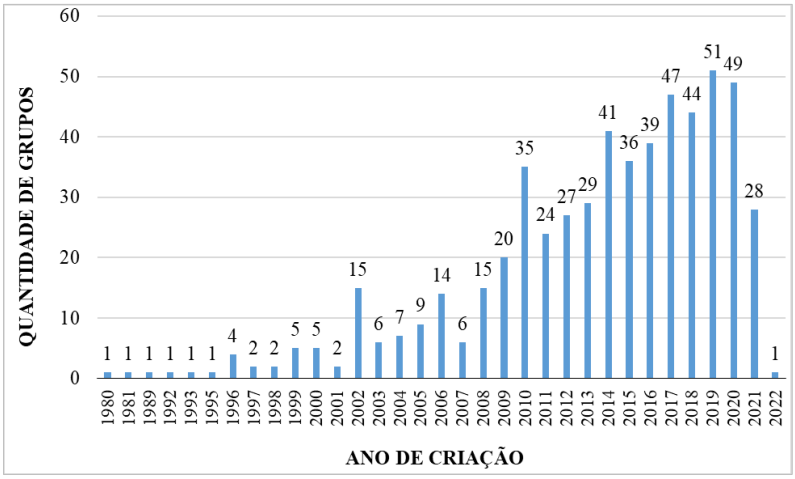
We interpret that these themes say a lot about the period of the foundation of these groups, since in the appearance and institutionalization of EDM in the 1980s in Brazil, the prerogative of overcoming the failure of MMM added other paths and new perspectives for the Education of Mathematics Teachers, for the Teaching and Learning Processes of Mathematics, for the Curricular Modernization of School Mathematics, and school practices based on Fundamentals of Educational Psychology.

In this sense, the specific literature on EDM registers a significant predominance of research on these themes in the 1980s and 1990s. As an example, we indicate the mapping research developed by Fiorentini (1994), the state-of-the-art research developed by Melo (2006) and the bibliographic review developed by Santos (2008).

From the 2000s, there has been a predominant focus on the Education of Teachers that Teach Mathematics and Curriculum Modernization to the detriment of research focused on the theme of Psychology in EDM, as pointed out by Bicudo and Paulo (2011).

Another possibility of data interpretation related to the time of the foundation of the relevant research groups to our investigation concerns temporal evolution. From 1980 to 2001, the number of EDM groups was still incipient. From 2002 onwards, there has been a significant increase in the number of groups emerging in the area, mainly as of 2010. For better visualization, Figure 1 shows the entirety of these results.

Figure 1: Temporal evolution of the groups' creation



Source: Research Data (2022)

According to data from the last DGPB census on the years of existence of the research groups of all the Great Knowledge Areas adopted by CNPq, we observed that 58.2% of the groups have between 1 and 9 years of existence, 17% between 10 and 14 years, 7.8% between 15 and 19 years and, finally, only 8.7% have 20 or more years of existence. We observed that the vast majority register up to 12 years of experience (reference from 2010 onwards).

Within the scope of our investigation, the research groups with the longest experience in EDM research are between 22 and 42 years old (reference from 1980 to 2000). Thus, according to this parameter, we can infer that the EDM area in Brazil is already consolidated within some longer-lived research groups and in the process of consolidation in scientific practice by younger ones.

These data can reveal quantitative and qualitative aspects that can be investigated from

the consolidation processes of these EDM research groups, such as the accumulated symbolic, economic, and scientific capital; the operating practices, study strategies and research development; and how the processes of knowledge production, distribution of tasks, cooperation networks, organization of publications and authorship occur; among other aspects. This investigative practice can be forwarded in a micro and/or meso methodological bias (Mainardes, 2022).

5.2 About the Time of Creation/Performance of the Research Groups

We consider it equally important to map the geographic location and UF of the 569 groups that carry out EDM research in Brazil. This study allowed us, for example, to glimpse how and in what proportions the EDM area has been expanding and consolidating itself throughout the country, demarcating the regions and states with the greatest polarization and those in potential development around our investigative region.

In generic lines, the last census recorded in the DGPB shows a quantitative predominance of research groups in the Southeast region, followed by the South, Northeast, Midwest and North regions. These data consider all the Great Areas of Knowledge adopted by CNPq.

Our results indicated a concentration of 179 groups (32%) allocated in the Southeast region, followed by the Northeast region (152 groups, 27%), the South region (122 groups, 21%), the North region (70 groups, 12%) and the Midwest region (46 groups, 8%).

From the data above, we can infer that the predominance of research groups in the Southeast reaffirms the emergence, expansion and consolidation of the EDM area in the country, especially through this region. In it, we observe the emergence of one of the first mathematical educators, Professor Euclides de Medeiros Guimarães Roxo, working at Colégio Pedro II, who was responsible for the curricular modernization proposal of school mathematics in the Francisco Campos Reform in 1934 (Valente, 2005).

We can also highlight the creation, in 1984, of the first Graduate Program in Mathematics Education of the Universidade Estadual Paulista de Rio Claro — Unesp/RC [Paulista State University of Rio Claro — Unesp/RC] (Bicudo, 2014), having started with the Master's degree and later, implementing the Doctorate in 1993; the emergence of the first specific course of Mathematics Teacher Training at the Faculdade de Filosofia, Ciência e Letras da Universidade de São Paulo — FFCL/USP [Faculty of Philosophy, Sciences and Letters of the University of São Paulo — FFCL/USP] (Silva, 2000); the first Encontro Nacional de Educação Matemática (I ENEM) [National Meeting of Mathematics Education — I ENEM] held in São Paulo, in 1987 (Fernandes & Menezes, 2002), the Programa Experimental de Mestrado em Ensino de Ciências e Matemática — UNICAMP [Experimental Master's Degree Program in Science and Mathematics Teaching — UNICAMP] from 1975 to 1984 (D'Ambrosio, 2014) and the Faculdade de Educação — UNICAMP [College of Education — UNICAMP] itself.

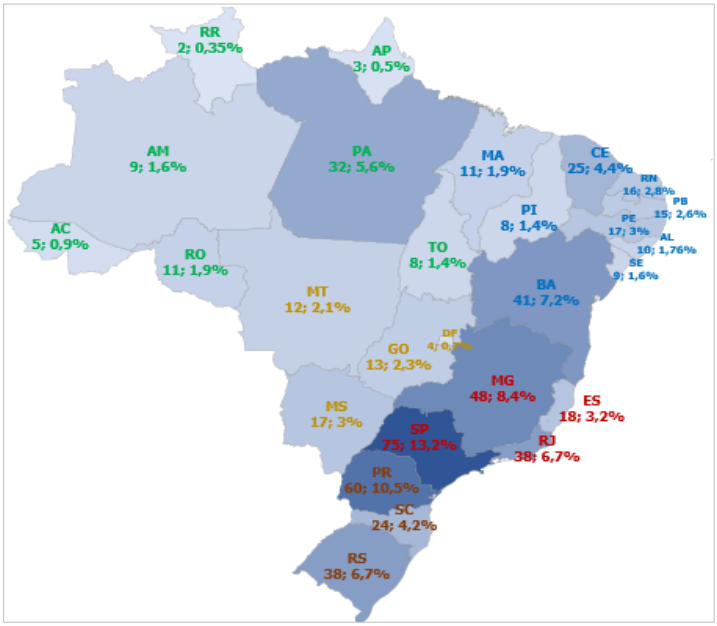
Within the Northeast region, we highlight the first Congress of Mathematics Teachers held in Brazil, in 1955, in the city of Salvador, and coordinated by Professor Oswaldo Sangiorgi under the initiative of Professor Martha de Souza Dantas and the active participation of Professor Omar Catunda, a graduate and professor at the Faculdade da Bahia [Faculty of Bahia], respectively, at the time of the event (Fernandes & Menezes, 2002). In short, the discussions present in this first event and other events that followed it (the last one took place in 1964 in the city of São José dos Campos-SP) were based on coping with the MMM failure and the collective construction of new horizons for the education of mathematics teachers and the

mathematics teaching.

Glimpsing the distribution of research groups by UF, we also observed a more specific overview of the groups that carry out research in EDM in Brazil, as shown in figure 2. Data from the last DGPB census reveal that the eight states with the highest concentration of research groups are: Rio de Janeiro, São Paulo, Rio Grande do Sul, Minas Gerais, Paraná, Santa Catarina, Bahia and Pernambuco. These data consider all the Great Areas of Knowledge adopted by CNPq.

Our results registered a predominance of groups that carry out research in EDM distributed in São Paulo, Paraná, Minas Gerais, Bahia, Rio de Janeiro and Pará. On the other hand, we have other states in a potential situation of expanding new groups, especially in the North and Midwest regions.

Figure 2: Distribution of Research Groups by State of Brazil



Source: Research Data (2022)

We understand that this expansion may also owe to the creation of new graduate programs and the significant frequency of new researchers. Thus, the socioeconomic development of these states and investments by national and local government development agencies also constitute fundamental prerogatives in this movement of growth of the EDM area by the forums of the research groups.

Nevertheless, the data presented and discussed in this topic do not allow us to print evidence, in comparative data, on the growth of groups in these regions around the EDM area, in the present time. In general terms, the data presented on the DGPB website record a continuous growth of registered research groups from their first census (year 1993, 4,402 groups) to the last (year 2016, 37,640 groups). They also point to an increase in groups as of the 2000s, data similar to ours, as presented in the previous item.

Regarding the distribution of research groups across the regions of the country, the last census recorded that "The percentage growth in the number of registered groups in 2016 compared to 2014 by state was: North: 15%, Northeast: 7%, Midwest: 9%, South: 9% and Southeast: 3%". Therefore, considering these generic data, we conjecture a development potential in the regions with fewer groups of/with research in EDM.

5.3 About the HEIs of the Research Groups

For harmonious and intentional projection of the growth of research groups in the regions of the country, we consider it essential to outline the HEIs linked to the 569 groups considered in our investigative process, elucidating the number of institutions and the number of groups of each institution. The construction of this panorama allowed us to understand, for example, which institutions are highlighted and which are in the process of consolidation around our investigative region. The results of this survey can be observed in its entirety in Table 2.

The last DGPB census registered a total of 531 HEIs containing 37,640 research groups, considering all the Large Knowledge Areas adopted by CNPq. Regarding the distribution of groups by HEIs, the data observed in the same database highlight that the five predominant institutions in the number of research groups are Universidade de São Paulo — USP [University of São Paulo — USP], Universidade Estadual Paulista — UNESP [Paulista State University — UNESP], Universidade Federal do Rio de Janeiro (UFRJ) [Federal University of Rio de Janeiro — UFRJ], Universidade Federal do Rio Grande do Sul — UFRGS [Federal University of Rio Grande do Sul — UFRGS] and Universidade Estadual de Campinas — UNICAMP [State University of Campinas — UNICAMP].

Table 2: Distribution of Research Groups by Hei

Order Nº	Institution – Acronym	Number of Institutions	Number of Groups of each HEI	Number of groups
01	UTFPR	1	19	19
02	UNESP	1	18	18
03	IFES	1	15	15
04	IFSP	1	14	14
05	UERJ, UFMS, UEPA	3	11	33
06	UFSCAR, UNITE	2	10	20
07	IFRS, UFPE	2	9	18
08	UFT, IFCE	2	8	16
09	IFBA, UFPR, UFS, UFPA, UEFS, UFJF, IFPA	7	7	49
10	IFRN, UFMT, USP, UFTM, UESB, UFSC, UNIFESP, UESC, UNEB	9	6	54
11	UFMG, UFV, UFAL, UFFS, UFF, UNIOESTE, UEM, UNESPAR, UFRB, IFPB, IFPR, UFAM, UNIFESSPA, UEMG, UFRN, PUC/SP	16	5	80
12	UNIRIO, IFPI, UnB, IFG, UNEMAT, IF Goiano, UPE, UFRGS, UFAC, UEL, UFU, UFGD, UEPB, UFRRJ, UENP, URCA, UEPG, UFC, IF-Farroupilha, UFERSA, UFOP, UFRJ, UEMA, UNICAMP	24	4	96
13	UNICSUL, UFPB, UFCG, IF-Catarinense, UFES, UFSM, ULBRA, IFRJ, UFABC, UFPEL, UFG, IFMA, URI, UVA-CE, IFAL, UFCA, UNIFEI, UDESC, UEA	19	3	57
14	CP II, UFOPA, UNICAP, UECE, UESPI, UFPI, IFSC, UFOB, UFJ, UFMA, UFVJM, USF, IFS,	22	2	44

	IFMG, UNEAL, IFMT, UNIFAP, UNILAB, FAETEC, FURG, UNISUL, UEMS,			
15	UNILA, UNIP, UNICEUMA, UNESC, IFSUL, UERN, UNIJUI, UNIG, UEAP, UNIUBE, FEI, IFSULDEMINAS, UEMASUL, PUCRS, FURB, UNINOVE, IFRR, UNIMONTES, UERGS, IFRO, UFRPE, CEFET/MG, FEBAVE, UNICENTRO, IFAC, IFNMG, IFAM, IFPE, UCSAL, IFBAIANO, UNIVATES, UNIGRANRIO, UERR, UPF, UNIFAL/MG, UNIARARAS	36	1	36
Total		**146**	**---**	**569**

Source: Research Data (2022)

In our case, the results indicated 146 HEIs linked to the 569 groups that carry out research in EDM. Among them, we highlight the Universidade Tecnológica Federal do Paraná — UTFPR [Federal Technological University of Paraná — UTFPR] and UNESP, with 19 and 18 research groups, respectively.

Analyzing the research groups of the first institution, we observed that the group with the longest experience is 17 years old, and most groups have been created as of 2015. In this sense, we interpret that it may be an institution in a potential consolidation process of its EDM research groups.

Therefore, UNESP presents four research groups founded in the 1990s and two in the early 2000s. In addition, most of the groups were created between 1992 and 2012. Thus, they are groups of greater longevity and consolidated in the scientific tradition of EDM research produced in Brazil.

Nevertheless, the data also indicate growth potentials in the vast majority of institutions that allocate EDM research groups, as is the case of the 36 HEIs with only one group. In short, only 13 HEIs have between eight and 19 groups, while the rest have between one and seven groups.

We sought to outline the types of HEI that allocate the 569 groups considered in our investigation. In this sense, the 146 HEIs observed are represented by institutions of a different nature, as shown in Table 3.

Table 3: Distribution of Research Groups by HEI

Institutions			**Number of groups**
Public	Federal	Federal Universities	257
		Federal Institutes	121
		Colégio Pedro II	2
	State	State Universities	158
	Municipal	Municipal Universities	1
Private			23
Community			7
Total			**569**

Source: Research Data (2022)

In short, the federal public institutions aggregate most of the groups that conduct

research in EDM in the country, followed by the state ones. Regarding private and community institutions, we observed an incipient number of groups since the sum of the UFTPR and UNESP groups, for example, already exceeds the number of groups registered in these institutions.

In our view, one way to interpret these data involves alluding to the immeasurable importance of Brazilian public universities in the process of developing the scientific and technological sovereignty of the country, including in the area of EDM. Since the foundation of the first Brazilian public university (USP, year 1934), the education of human resources and the social, economic, and cultural impacts that these institutions have favoured on Brazilian society have stood out. Studies such as Casaril (2019), for example, show the impacts and importance of public universities for society, for the regional and local economy.

Meanwhile, we emphasize that in the current political, social, and economic conjunctures these institutions have been aggressively attacked ideologically and politically, besides financially suppressed, which has vented threats on their bases of operation and progress. Regarding the financing of research activities and advances in Higher Education, the same happens with the dismantling we witness by the cuts in CNPq and Capes. Undoubtedly, the areas of Education, Science and Technology are among the most impaired in "Brazil of the Now" (Oliveira & Pereira, 2022).

This scenario has also impacted and sometimes stopped the work of several research groups and the emergence of many others because of the lack of minimum financial funds to guarantee cutting-edge research, better positions in international rankings, and be consolidated in internationalization processes so demanded by the competent government agencies (Kadamani & Greve, 2019; Tumenas, 2021).

Regarding private and community institutions, the data we present may lead us to a false impression that there are no quality groups working on research in EDM because, within the scope of the institutionalization of EDM in Brazil, historical milestones and the observance of the academic training of numerous mathematical educators can rule out this pseudo-impression. As an example, we mention the work of Lopes (1994), about the pioneering implementation in Brazil of a Lato Sensu Graduate Course in Mathematics Education, with the partnership of the Grupo de Estudos e Pesquisas em Educação Matemática — GEPEM [Group of Studies and Research in Mathematics Education — GEPEM], created on February 24, 1976, in Rio de Janeiro, and the Universidade Santa Úrsula — USU [Santa Ursula University — USU].

5.4 On the Human Resources of Research Groups

The DGPB database presents the human resources distribution of the research groups under different nuances. These resources are composed of Researchers (P), Students (E), Technicians (T) and Collaborators (C). Each actor assumes a peculiar role in the research group and has its relevance in research activities, whether linked to the production of scientific knowledge applied to Basic Education, Teacher Training, Scientific Dissemination, Science, Innovation, and Business Technology, and/or to master's/doctoral/postdoctoral research of their respective postgraduate programs.

In the area of Education, the last census registered 3,595 (9.6%) research groups and 26,011 (10.2%) researchers, data that shows this area has the most groups and researchers in the country.

As a speciality of the Great Area of Human Sciences and the Education Area, we seek to investigate the human resources of the 569 groups that carry out research in EDM in the

country. This study was counted by Region and by state and allowed us, for example, to measure the distribution of those who do research in EDM in the country in the institutional pathways of their groups. The complete data can be seen in Table 4.

Initially, it is important to highlight that there was no double counting of researchers in each state, but there was a double counting in the total of 5,726 researchers. This scenario was because one researcher participates in different groups in different states. Thus, the actual numbers of researchers linked to the 569 groups are lower than those obtained, but not so much since this episode was not so often registered.

Another important point is that some groups have an interdisciplinary nature in their lines of research. In these cases, we identified 254 groups that present lines of research pertinent to EDM but also lines that are not EDM themes, being groups from other Large Areas/Areas of Knowledge than Human Sciences/Education and Exact Sciences and Earth/Mathematics.

We understand that this scenario is historically rooted in the interdisciplinary configuration of EDM (Steiner, 1993) and the institutional organization of graduate programs, as we have pointed out previously, from the specific legislations, including the foundation of area 46 of Capes, which caused institutional, research and professional performance articulations in the ECM scope (Moreira, 2002).

We also conjecture this scenario as a territory of struggles and disputes for spaces of legitimacy involving mathematical educators. Hypothetically, several of them may be minorities in the institutions that allocate these research groups and thus may not have a partnership and/or peer support for the development of a research group essentially focused on the EDM survey region.

Table 4: Human Resources of Research Groups by Region and State

Geographical Region	State	Frequency of human resources				Total
		R	S	T	E	
South	Rio Grande do Sul	310	332	10	3	655
	Santa Catarina	223	225	15	5	468
	Paraná	570	811	10	4	1,395
	Subtotal	**1,103**	**1,368**	**35**	**12**	**2,518**
Southeast	São Paulo	825	792	25	17	1,659
	Rio de Janeiro	393	305	6	13	717
	Espírito Santo	247	184	2	-	433
	Minas Gerais	443	489	31	4	967
	Subtotal	**1,908**	**1,770**	**64**	**34**	**3,776**
Midwest	Mato Grosso do Sul	103	135	11	1	250
	Goiás	157	162	6	3	328
	Distrito Federal	83	27	4	3	117
	Mato Grosso	117	47	2	1	167
	Subtotal	**460**	**371**	**23**	**8**	**862**
Northeast	Bahia	369	382	24	3	778
	Sergipe	116	137	-	-	253

	Alagoas	76	179	2	1	258
	Pernambuco	159	225	72	8	464
	Paraíba	162	198	13	5	378
	Rio Grande do Norte	230	186	21	2	439
	Piauí	60	40	1	-	101
	Ceará	299	203	18	3	523
	Maranhão	80	120	6	-	206
	Subtotal	**1,551**	**1,670**	**157**	**22**	**3,400**
North	Amazonas	97	87	2	-	186
	Acre	75	53	4	-	132
	Pará	294	300	20	10	624
	Amapá	31	39	2	-	72
	Tocantins	58	80	5	2	145
	Roraima	11	9	2	-	22
	Rondônia	138	207	3	-	348
	Subtotal	**704**	**775**	**38**	**12**	**1,529**
Total		**5,726**	**5,954**	**317**	**88**	**12,085**

Source: Research Data (2022)

Although these stories about EDM's scientific-academic position in Brazil are already in reality status, as we pointed out in the previous topics, for the case raised here, an investigation agenda seems to be emerging as a need around this institutional research forum.

In addition, it leads us to revisit several other questions, such as: What is an EDM research group? What is an EDM researcher? Where are these researchers allocated? Should EDM have institutional limits? If so, why and which ones? Otherwise, why not? What are the (dis)advantages envisioned in this (im)posed configuration? We understand that these and so many other issues involving the complexity of this area also rest on what Sriraman and English (2010) argue:

> Any theory of thought, teaching or learning rests on an underlying philosophy of knowledge. Mathematics education lies at the nexus of two fields of research, namely mathematics and education. However, numerous other disciplines interact with these two fields, aggravating the complexity of developing theories that define mathematics education. (Sriraman & English, 2010, p. 7)

For now, as our objective in this study was to quantify all researchers located in the groups that research in EDM in Brazil, we regard it is appropriate to consider the total number of researchers presented by each group.

In any case, in complementary and extensive ways to the data indicated in the study by Bicudo and Paulo (2011) about the 216 researches presented by 356 researchers at the III Seminário Internacional de Pesquisa em Educação Matemática — III SIPEM [III International Seminar on Research in Mathematics Education — III SIPEM], and analyzed in the attempt to phenomenologically give meaning to what research in Mathematics Education in Brazil is, we consider that under the aegis of the institutional forum of the research groups observed in our

study, these data can also equate and represent the number of researchers involved with research in EDM in the country.

In addition, in a consultation carried out on the SBEM website (06/26/2022 at 00:14), we observed in the list of partners with the 2022 annuity paid off, the number of 3,329 active members of the maximum institutional entity of the community in EDM in Brazil. In short, these members are professors linked to HEIs, professors working in Basic Education and undergraduate and graduate students.

Thus, in our view, these data from the research groups and the SBEM itself are institutional forums that can also represent and characterize quantitatively and qualitatively those involved in research in EDM in the country. Quantitatively, mainly because it results from legitimate and recognized macro instances. Qualitatively, mainly because it considers the diversity of stakeholders involved in the research carried out in the EDM inquiry region.

The data in Table 4 still reaffirm the predominance of researchers located in the Southeast region, followed by the Northeast, South, North and Midwest regions, highlighting the potential spaces for the qualified training of more human resources committed to research in EDM in the country. The same scenario appeared for the number of students and collaborators. Regarding the technicians, the northeast region presented the highest quantity.

Together with the research agenda previously mentioned, we highlight the importance of characterizing the academic training of researchers, students, technicians, and collaborators, clarifying, for example, the positions these collaborators assume in the research groups, the influences they bring to the modes of visibility and scientific production of these groups, how these relationships are established, and how they are closed and/or extended and from which institutions/countries they come.

Regarding students, we point out the importance of research groups for the production of scientific knowledge, for the consolidation of researchers and the education of new researchers, functioning as spaces for the renewal and oxygenation of human resources. In these spaces, students can understand the scientific pedagogy of their knowledge area and thus acquire their scientific habitus.

6 Final Considerations

The data collected in our investigation and analyzed under descriptive research with a quantitative and qualitative approach answered the proposed guiding questions. Our research achieved its objective, understanding how the groups of/with research in EDM in Brazil and registered in the DGPB are constituted.

Our hermeneutic exercise was done based on the analytical corpus of 569 research groups. Most groups had up to 12 years of experience, but there are also longer-lived and consolidated groups that have between 22 and 42 years of existence/experience. The creation of those groups has boosted mainly as of the early 2000s.

In our view, this scenario revealed an area under consolidation within some groups, regions, states and institutions to the detriment of others. In their turn, these others can be seen as potential institutional spaces for developing and expanding EDM in the country. To this end, we call on the community in EDM to reflect on collaboration processes and networks that can be thought, planned and executed to solidify Brazilian EDM area abroad.

At various times in the text, issues already present in the EDM's inquiry region came to light, and others emerged from our investigative inquiry. In this sense, we argue about the

emergence of an investigation agenda that can privilege future studies around our inquiry – the groups that carry out research in EDM in Brazil and are registered with the DGPB.

In this sense, our database, for example, still evokes the continuation of future investigations in the core of the research groups considered in our study. We ask: What are the Large Areas and Areas that allocate these research groups and what can this communicate to the research produced in EDM in the country? What are the lines of research that these groups develop their studies and research in the EDM survey region? What is the distribution of lines of research, and what is the average of lines per group? What is the scientific profile of researchers, students, technicians and collaborators in these research groups?

To this end, we reaffirm our investigative path and hope that other researchers will show interest in this research agenda.

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