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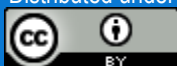
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The Trajectory of Social Agents in Higher Education in the State of Paraná

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ABSTRACT

The research is a study designed to characterize the cultural capital in the institutionalized state of the university professors in the area of Chemical Education in the state of Paraná, presenting the trajectory of academic training of agents, through their school indicators. The investigation was characterized as a qualitative research of documentary type, since it used documents, such as the Lattes curriculums available on the CNPQ (National Council for Scientific and Technological Development) platform, to measure the information in the constitution of data. With the documentary study, we sought to map the data extracted from the documents, in order to assess the school determinants, such as the level, area, place, and period of training of social agents working in the Teaching of Chemistry within the academic field. In this sense, we were able to understand how the school determinants influenced the cultural capital of the agents of the Chemical Education subfield in the academic field. For data analysis, we used Bardin's Content Analysis methodology (2010), based on the ideas of Bourdieu (2007, 2017b), referring to cultural capital. The results pointed to a subfield, constituted of masters and doctors, trained mainly in the state of Paraná, with formations not always linear to the scientific field. Thus, due to the struggles exercised to structure a scientific field and concerns about the object of investigation, they used their institutionalized cultural capital to incorporate constitutive dispositions, generated during academic training spaces.

KEYWORDS

Higher education. Degrees. Postgraduate courses. Science education.

A Trajetória dos Agentes Sociais no Ensino Superior do Estado do Paraná

RESUMO

A pesquisa trata-se de um estudo a fim de caracterizar o capital cultural no estado institucionalizado dos professores universitários da área de Educação Química do Paraná, evidenciando a trajetória de formação acadêmica dos agentes, por meio de seus indicadores escolares. A investigação caracterizou-se como uma pesquisa qualitativa do tipo documental, pois utilizou-se de documentos, como os currículos Lattes disponíveis na plataforma do Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), para mensurar informações na constituição de dados. Com o estudo documental, buscou-se mapear os dados extraídos dos documentos, com o intuito de aferir os determinantes escolares, como o nível, a área, o local e o período de formação dos agentes sociais atuantes no Ensino de Química dentro do campo acadêmico. Nesse sentido, podemos compreender como os determinantes escolares influenciaram no capital cultural dos agentes do subcampo da Educação Química no campo acadêmico. Para a análise dos dados, utilizou-se da metodologia de Análise de Conteúdo de Bardin (2010), baseadas nas ideias de Bourdieu (2007, 2017b), referente ao capital cultural. Os resultados apontaram para um subcampo, constituído por mestres e doutores, formados principalmente, no estado do Paraná, com formações nem sempre lineares ao campo científico. Desse modo, devido às lutas exercidas para estruturação de um campo científico e preocupações acerca do objeto de investigação, utilizaram-se de seu capital cultural institucionalizado para incorporarem-se de disposições constitutivas, geradas durante os espaços de formação acadêmica.

PALAVRAS-CHAVE

Educação Superior. Formação acadêmica. Pós-graduação. Ensino de Ciências.

La Trayectoria de los Agentes Sociales en la Educación Superior en el Estado de Paraná

RESUMEN

La investigación es un estudio diseñado para investigar la trayectoria de la formación académica de docentes pertenecientes al subcampo de Educación Química (EQ) de los cursos de Licenciatura en Química en instituciones públicas de educación superior en el estado de Paraná. La investigación se caracterizó como una investigación cualitativa, de tipo documental, ya que utilizaba documentos, como los currículos Lattes disponibles en la plataforma CNPq, para medir información en la construcción de datos. Con el estudio bibliométrico, buscamos mapear los datos extraídos de los documentos, a fin de evaluar el nivel, área, lugar y período de capacitación de los agentes sociales que trabajan en la Enseñanza de Química dentro del campo académico. Para el análisis de datos, se utilizó la metodología de análisis de contenido de Bardin (2010), con la elaboración de categorías establecidas *a priori* basadas en las ideas de Bourdieu (2004, 2017a), en referencia al capital cultural. Los resultados mostraron que el subcampo EQ consiste en maestros y doctores, entrenados principalmente en los estados de Paraná, Santa Catarina y São Paulo, con formaciones que no siempre son lineales al campo científico. Además, los resultados confirmaron la expansión del subcampo EQ en Paraná, lo que se indica por el crecimiento de agentes como formaciones específicas para trabajar en los cursos de Licenciatura en Química, lo cual es una indicación para la consolidación y constitución del área como campo de estudio.

PALABRAS CLAVE

Enseñanza superior. Título académico. Curso postuniversitario. Enseñanza de las ciencias.

Introduction

When talking about Higher Education, which is portrayed in this article as an academic field, it is necessary to think about which social agents are part of this universe. The academic field, in the perspective of Bourdieu (2017b), consists of professors, researchers, graduate students, undergraduate scholarship students, undergraduate academics, in short, all individuals willing to be part of a game of self and collective interests in the academy.

It is important to note that this field, already mentioned, includes its departments, collegiate bodies, coordinators, deans, directors, and other functions and places assigned to university capital, to exercise the function of representatives in positions. Within these departments¹, referring to specific areas of knowledge, university professors are arranged in different sub-areas, with the function of teaching classes within the curriculum of courses established by the joint construction of a field and researching within different thematic lines.

In a Chemistry department, for example, university professors are generally distributed between the areas of Inorganic, Analytical, Organic, Physical-Chemistry, and Teaching - these areas can be expanded according to their departmental organization – being these areas responsible for the training of graduates in the academic field. That way, it is emphasized that these university professors work in different courses, without being limited only to Chemistry courses, either in the qualification of a Licentiate or Bachelor's degree. In this work, the focus will be on the agents that are part of the Chemical Education (EQ) subfield responsible for Teaching Chemistry, one of the subareas responsible for the formation of future Chemistry teachers for Basic Education.

The professional in the area of Chemistry Teaching is part of a scientific field of Science Education, that is, it is an area² intitled Chemical Education. To be part of this subfield, the professional must be graduated in the Chemistry course and post-graduated in Science Teaching, Education, or similar areas. However, this trajectory is not always linear and continuous, since there are several strategies, including, entering and remaining in this subfield, and covering training.

Strategies or games are not always explicit, but built over long periods, with the purpose of protecting ideas, delimiting methodologies, increasing their capital volumes, adding recognition, etc. Also, not all social agents build their academic training trajectory based on the criteria established by the field, but they manage to be recognized by their peers as belonging individuals, due to their dedication and participation in the area.

¹ Department designation is one of the forms of organization in the academic field, as there are others. For example, in the state of Paraná we have universities that are organized around centers (e.g. UNICENTRO), others in departments (UEPG, UEL, UEM) and others by courses (UNIOESTE), and there are still those that are organized around colleges and sectors.

² The word subfield designed to speak of Education in Chemistry attempts to highlight this area as part of a larger field, such as the academic field. However, that in general this subfield brings together specificities of a field, to the point of naming it and differentiating it from other specific academic fields.

The social agents delimited to the discussions of this work are university professors, who work in the Chemistry Degree courses of public higher education institutions (HEIs) in the state of Paraná. They are also considered educators and chemists, responsible for constituting their kinds of capital and powers that govern the academic field. However, the discussions referring to the conditions of capital accumulation (economic, social, symbolic) will be the result of a broader work. At this moment, the discussions address the characterization of the subfield of university professors in the area of Chemical Education in the state of Paraná, through their cultural capital, showing the trajectory of academic training of agents, by their school indicators, presented in the Lattes curriculum³, in the form of degrees, institutions, training period, etc. (BOURDIEU, 2004, 2007, HEY, 2008).

O Campo Acadêmico para a Área de Educação Química

The academic field refers to the use of the institutional mechanism, guaranteed by the Brazilian State, in which it guarantees the production, reproduction, and circulation of academic products. In Brazil, this space involves universities and funding institutions - in particular the Coordination for the Improvement of Higher Education Personnel (CAPES) and the National Council for Scientific and Technological Development (CNPq) - which, with the support of these institutions, can, among other provisions, “Create post graduations and research associations in different areas of knowledge, to produce scientific periodicals and events in the country, for both national and foreign researchers, to form research centers and groups and to celebrate institutional agreements for scientific exchanges with international centers” (HEY, 2008, p. 16).

As seen, the academic space requires social agents, or better, communities capable of taking these possible actions. The term 'scientific community', borrowed from the ideas of Thomas Kuhn, had, according to Bourdieu (2017a, p. 29), the function of enunciating the formation of a closed community with defined problems, which uses methods designated for that field, serving as a disciplinary paradigm, that is, “a state of scientific achievement that is accepted by an important fraction of scientists and that tends to impose itself on all others”. However, according to Bourdieu (2017a), it is necessary to break with the presupposed ideas of the scientific community, which foresee a concept of pure science, totally autonomous and following internal logic, introducing the idea of the field. Thus, when expanding the views, it is understood that the groups are not unified or homogeneous, but formed by a locus of relationships between subjects with individual interests to play the game of a collective universe, that is, a legitimate social practice.

³ The Lattes curriculum is the responsibility of each researcher, displayed on the Lattes Platform, of the National Council for Scientific and Technological Development - CNPq. “The Lattes Curriculum has become a national standard in recording the past and current life of students and researchers in the country, and is now adopted by most of the country's development institutions, universities and research institutes. For its wealth of information and its growing reliability and comprehensiveness, has become an indispensable and compulsory element for the analysis of merit and competence of funding requests in the area of science and technology.” (see: <http://lattes.cnpq.br/>)

Consequently, the idea of the field is about “forces with a structure and also a space of conflicts for the maintenance or transformation of that field of forces” (BOURDIEU, 2017a, p. 52). Therefore, the force field occurs through the relationship between the different agents and the powers properly constituted from different capitals, determining a structure of positions within the scientific field. Such forces are also extended to other fields, such as the structure of the academic field which, due to its student population growth, required the increase of a body of professors within universities with specific training and conditioned the agents of this field a form of institutionalized cultural capital for “Ensuring them a bureaucratic career and regular income” (BOURDIEU, 2017b, p. 63). In this way, it occupies a dominant position, over other less institutionalized sectors.

Therefore, the academic space, according to Hey (2008, p. 102) "produces and is produced by real agents – of flesh and blood - endowed with specific capitals, evidenced in the properties raised from each one, which allow their performance in it". So, since this is a space for struggles, full of confrontations between researchers already endowed with different capitals, it aims also to conserve or transform the power relationships (HEY, 2008).

The intention is to think of the academic space as a territory made up of different components, among them are the social agents, who, in this work, are university professors in the Chemical Education subfield. In the academic field of Chemistry, educators are trained in smaller quantities compared to other masters and doctors in other areas of Chemistry (Analytical, Physical-Chemical, Organic, Inorganic) (SCHNETZLER, 2002). That said, despite the data from the CAPES report (2019) pointing to the growth of graduate programs in the area of Education (181), in the various modalities (academic master's, professional master's, academic doctorate and professional doctorate), we know it is known that the Teaching area serves not only chemical educators, but also extends to physicists, biologists and mathematicians, and all others that make up this scientific field (BRASIL, 2011).

The insertion of these social agents in postgraduate courses, not only promote specializations and the conceptual domain, but also allows individuals to circulate in social spaces intended for the appropriation of rural *habitus*. At this point, agents learn the strategies established to acquire different forms of capital and to benefit from them. For newcomers who can see the powers involved and take ownership of them, prestige and recognition are achieved in less time.

It is in this universe that agents create their space for academic production, also considered a space for struggles, an arena where this game of concurrence and competition seeks to reach different positions in the structure of the field, aiming to add even more capital and power. In this way, its structure is built on the basis of powers, with the intention of describing the logic of the struggles and defining the hierarchy in the field. Given this, it is emphasized that different fields tend to institute specific patterns, such as forms of relationship within the field, conditions of income, etc., functioning as a means of assisting the process of social reproduction.

The structure of the field still permits the granting of unequal positions, in which some researchers are highlighted, as there are dominant and dominate. The greater the amount of capital of a particular agent, the more he will stand out in relation to the other members and, consequently, there will be a classification system, responsible for making the 'name of the researcher' before the field.

The positions are built along their professional trajectory, by different capitals (symbolic, social, cultural), which determine, among so many things, the number of publications, participation and/or leadership in research groups, the different degrees, university administration positions, attendance at events and congresses, nomination for scientific commissions, collaboration in qualification and defense boards, etc.

According to Hey (2008, p.67), this classification system of the dominant group "establishes the classifications of works that must be considered relevant, serious, interesting, or better, that must be legitimized or not". Thus, the existing hierarchy, allows the comprehension of why the new members who enter the field, have the need to cite renowned researchers, since it is "their low hierarchical position that demands this" (HEY, 2008, p. 67).

According to Hey (2008, p. 67) "the absence of nominal citations is the most complete form of censorship". Not being mentioned by other researchers, it is the lack of recognition among peers, and this absence does not characterize the individual's work as 'good or bad, but rather accepted or not accepted' by the universe of belonging to those who occupy similar positions. This situation is characterized as a strategy by newcomers who seek the acceptance of dominants, and this admission is not expressed verbally, but rather by the nominal citation of other researchers in scientific texts.

When they understand the meaning of the game within the academic field, future researchers tend to start their trajectory since graduation, in research groups, facilitating their participation in the selective post-graduation processes. Entering this environment, already knowing its functioning and rules, can give conditions to preserve the ideas and interests of the existing dominant group and enable the new member of the field to approach this group. Some graduate selection processes emphasize more the skills to express knowledge produced in research through publications than to properly recognize the domain of specific content.

The new researchers enter a medium where there are already norms and rules to be followed, not being in their hands changing the game, but learning to play this game, requiring a dedication to acquire new knowledge. Therefore, expressing yourself in the form of academic products and being recognized for these results is a personal investment, that only the agent can make. Because of that, when entering the academic field, researchers end up adhering to "[...] academic tastes or preferences [...] involvement with different social environments that make up academic life, such as production institutions and the scientific circulation" (HEY, 2008, p. 103).

In this way, it is understood that the academic field has several disputes and powers involved and each scientific field has its own. Chemical Education is constituted as a subfield within an academic field, with the same characteristics as the field. They are groups of scientists, researchers, professors, postgraduate students, distributed in different thematic lines of studies, research groups, academic and political positions, magazine and event commissions, etc.

In the area of Chemical Education, research interests are attributed by the dominant and expressed groups - in the form of thematic lines for submitting works in events, sections and thematic axes in journals, research lines in graduate programs, etc. – under the condition that they retain their ideas and legitimize their actions. Some lines are recognized by peers - Teacher Education, Teaching and Learning, Language and Cognition, History, Philosophy and Sociology of Science, Information and Communication Technologies, Curriculum and Evaluation, Diversity and Inclusion etc. - others arise from their specificities and theorists selected by the groups. This article intends not to present all these lines, but to understand that there are still other developments in smaller parts and more specific interests within a subfield like Chemical Education.

These are the interests of increasingly specialized groups that move the game to legitimize their studies. Wherein, although some agents dedicate themselves to the same thematic lines, within them, there may be common interests and specific interests, such as the references and methodologies employed. Thereupon, when looking at these fields and/or subfields, their positions will be measured by the powers constructed by the volume of individual and collective capital. Being these capitals distributed by economic capital, social capital, cultural capital and symbolic capital.

Thus, this work seeks to look at one of these capitals, entitled according to Bourdieu (2007), as cultural capital, which presents itself in three ways - the incorporated state, the objectified state and the institutionalized state- indicated by the author in the article 'The three states of cultural capital' published in the work *Escritos da Educação*. The first, cultural capital in the incorporated state, is linked to the body, in which incorporation is assumed, where the individual needs to dedicate time and investment in himself, and cannot be transmitted or acquired by another person. Accumulation demands a long duration, in order to make this capital an integral part of the agent (*habitus*), this concept is used a lot by Bourdieu (1983, p. 65) to designate “system of durable and transposable dispositions that, integrating past experiences, works every moment as a matrix of perceptions, appraisals and actions”.

Cultural capital, in its objectified state, according to Bourdieu (2007), is configured as the possession of material goods, which represent the dominant culture in the form of scientific works (articles, books, etc.), libraries, laboratories, museums, which need incorporated cultural capital to appreciate, decipher or elaborate them. Thus, the objectified capital only exists (BOURDIEU, 2007, p.74) “as active capital, in a material and symbolic way, in the condition of being appropriated by the agents and used as a weapon and object of the struggles”, wherein an academic space, university professors obtain benefits proportional to the mastery of this targeted capital.

In its institutionalized state, Bourdieu (2007) states that capital manifests itself as a certificate of institutional recognition of acquired cultural competences, in the form of diplomas, degrees, certificates, etc. Certifications in the academic field guarantee institutional recognition to social agents, allowing for the establishment of forms of classification and criteria for entering the field. Besides that, the degrees ensure a financial return for the remunerations directed to each level of education (degrees) within the academic space. They are goods built since their first school lessons, which run throughout their academic training and continue to be built.

The tendency to acquire certifications starts from the need for educational accreditation to work in the academic field (Higher Education), since the field requires more and more specialists in certain areas, and in the area of Chemical Education, it is not different. Such search for specializations can be evidenced by tracing the trajectory of academic training of agents, through their school determinants, since their insertion in the academic field based on related degrees.

For the analysis of the trajectory, a map of the location of the intellectual field to be investigated must be drawn, in this case referring to the academic field belonging to the public HEIs of the State of Paraná, and to look at different marks in the trajectory of the formation of social agents. Therefore, it will be the result of a system of relevant and individual information of the analyzed subjects. In short, "pursuing a trajectory means following the historical development of concrete social groups in a social space defined by those same groups in their battles for the definition of limits and legitimacy within the field in which they operate" (MONTAGNER, 2007, p. 18).

Methodology

The research is characterized as qualitative research of the documentary type, as it is used as a data collection instrument, documents that have not yet been analyzed analytically or referenced bibliographically (OLIVEIRA, 2014). For the constitution of the research *corpus*, different techniques and instruments of data collection were used, among them: Lattes curriculum of agents belonging to IES in the state of Paraná, electronic form, and documentary survey of information on public websites.

The first step was to find the subjects belonging to the academic field (Higher Education) of Chemical Education in the State of Paraná, in the year 2018. It was decided to carry out a survey of Higher Education Institutions (HEIs), using the courses as a criterion in the Chemistry area in the National Register of Courses and Higher Education Institutions (e-MEC Register). The search on the e-MEC website only allows the selection of the Chemistry option, without delimiting the different qualifications, so it was decided to request, from the Regional Chemistry Council (CRQ IX⁴), the list of registered courses in their bases, in order

⁴ **Regional Chemistry Council - 9th region.** CRQ's are entities belonging to the state sphere and constitute the regional manifestation of the Federal Council of Chemistry (CFQ), being responsible for supervising the

to assess these differences and select the HEIs that offer the Chemistry courses, with the qualification in licentiate, in public institutions. To triangulate the information and due to the respective representativeness, an electronic form (Google forms) was sent to different agents belonging to this Chemical Education subfield.

The search also served to quantify the offer of licentiate courses at HEIs, since some institutions, such as the Federal Technological University of Paraná (UTFPR), the State University of Paraná (UNESPAR) and the Federal Institute of Paraná (IFPR) are distributed on campus in different cities. In this case, 11 public HEIs were identified, offering a total of 21 undergraduate courses, distributed as follows: IFPR - Campus Cascavel, Irati, Jacarezinho, Palmas, Paranavaí, Pitanga and Umuarama; UTFPR - Apucarana Campus, Campo Mourão, Curitiba, Londrina and Medianeira; Londrina State University (UEL); State University of Maringá (UEM); Ponta Grossa State University (UEPG); University of the Midwest (UNICENTRO) - Guarapuava; State University of Western Paraná (UNIOESTE) - Campus Toledo; UNESPAR – Campus União da Vitória; Federal University of Paraná (UFPR); Federal University Fronteira Sul (UFFS) - Campus Realeza and Federal University of Latin American Integration (UNILA). An e-mail was sent to the course coordinators of these public universities, requesting the indication of the professors of each course and IES who worked in the area of Chemistry Teaching.

The crossing of information due to contact via e-mail with the coordinators of undergraduate courses in Chemistry and the electronic form (sent to the professors indicated by the coordinators as being from the area of Chemistry Teaching), enabled the identification of 62 social agents from the subfield of Chemical Education working in public HEIs in the State of Paraná. Not all HEIs with Chemistry Degree courses have social agents in the area of Chemical Education. In possession of the list with the names of university professors, we proceeded to analyze the Lattes curricula, available on the CNPq platform, which consisted of a data source, due to the information available for public use.

The first analysis at Lattes made it possible to extract measurable criteria, with conditions to quantify them by qualitative analysis within pre-established indicators. Then, based on this, an alphanumeric data spreadsheet was created for each teacher analyzed, as shown in Chart 1.

exercise of technological professions at the regional level, such as the regulation of minimum content for Chemistry courses, and their professional duties. Available in the Normative Resolution No. 36, of April 25, 1974.

Table 1. Indicators in the Lattes curricula of EQ agents in the state of PR

Name of the agente	HEIs link	Level of education	Institution	Training period	Training location	Post-graduate program
P1		Graduation				
		Specialization				
		Master degree				
		Doctorate degree				

Source: the authors

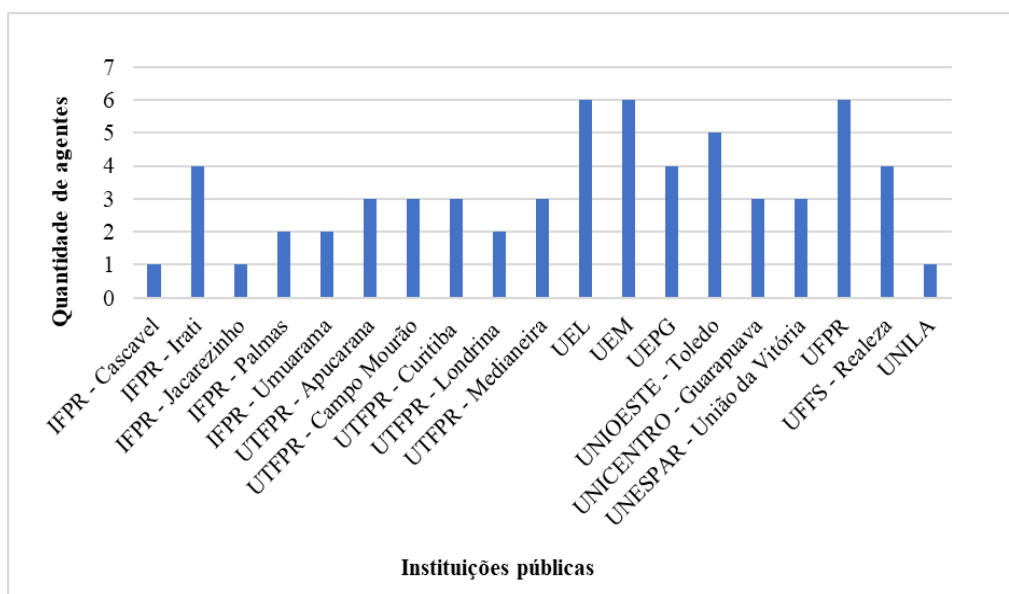
In this set, the Content Analysis methodology (BARODIN, 2010) was used, based on the information constructed by the indicators, allowing to group them into categories constructed *a priori*. The categories were generated with the purpose of knowing the training trajectory of university professors, through the certifications expressed by them in their Lattes curricula, which are: level of training, training area, training location and training period. The understanding of the constructed information is presented in conjunction with the discussions based on the ideas of Bourdieu (2017a) and Hey (2008), in the understanding of how the school determinants, responsible for the subject's academic formation, conduct their positions in the academic field.

Therefore, the work aimed to characterize cultural capital in the institutionalized state of university professors in the area of Chemical Education in the state of Paraná, showing the trajectory of academic training of agents through their school indicators. Therefore, it was possible to reflect on the following question: How did school determinants influence the cultural capital of agents in the Chemical Education subfield in the academic field?

Results and Discussion

The work within the academic field requires qualifications to exercise functions within this space. Social agents seek their training in different institutions and spaces throughout their academic trajectory until, in fact, they can complete their academic goals. The ways to enter this domain come from different conditions, such as selection processes, public tenders, research groups, graduate programs, among others. Regarding the exemplification previously mentioned, the selection processes are one of the most used for selecting new members for the field, both to exercise the teaching function at universities, and to enter university research or extension.

All in all, all agents belonging to the academic field followed their own paths, with different trajectories, but also with shared interests to be at the head of the area of Chemical Education in public HEIs. In the case of the state of Paraná, these agents are distributed in the Licentiate courses in Chemistry, totaling 62 social agents, distributed among 45 doctors, five masters and 12 doctoral students. The survey of university professors is shown in Graph 1, according to their employment relationship in the HEIs, and in two institutions located in the city of Paranavaí and Pitanga, teachers who work in EQ were not identified.

Graph 1. The social agents of EQ in public HEIs in the state of Paraná

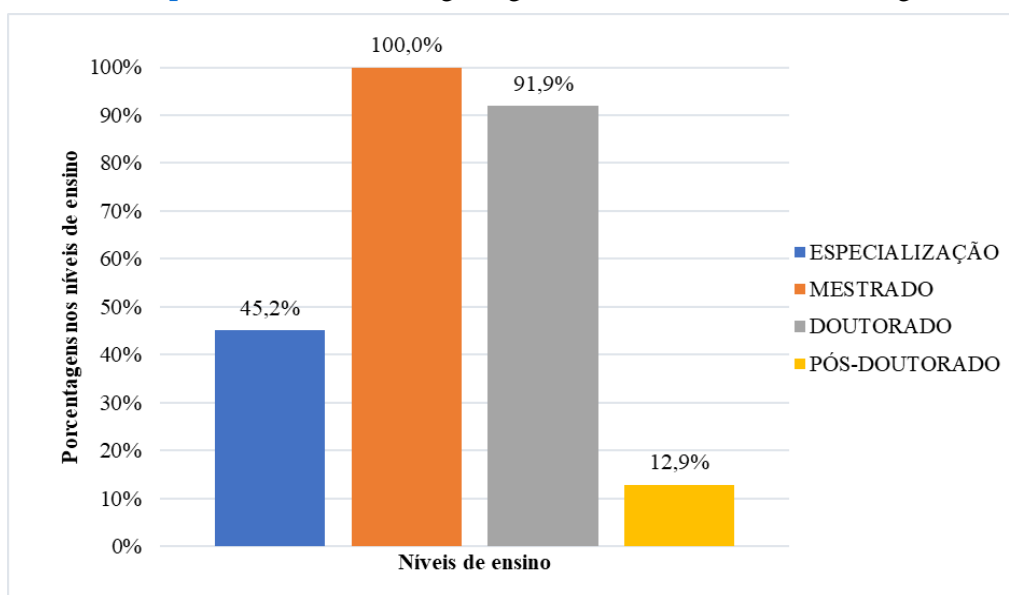
Source: the authors, based on data from EQ agents' Lattes curricula

It is observed a higher number of university professors dedicated to the area of Chemical Education at UEM, UEL, and UFPR. One of the justifications may be related to the emergence of Chemistry Licenciature Degree courses, these being the oldest in the state of Paraná, with this, the number of competitions held to hire teachers working in the field of EQ covered more these HEIs. In addition, as they are longer-lived courses, at some point, teachers with other academic backgrounds took up teaching before hiring teachers with specific training, and they continued to dedicate themselves to teaching in these institutions.

1. Level of Training

The undergraduate courses attended by the agents were diverse (Chemistry, Philosophy, Pedagogy, Mathematics, Physics, Philosophy, Biology). Thus, the focus on the trajectory of the teacher, after this initial training, may show other paths that allowed him to enter the academic field as teachers working in Chemistry Degree courses within the area of Chemical Education.

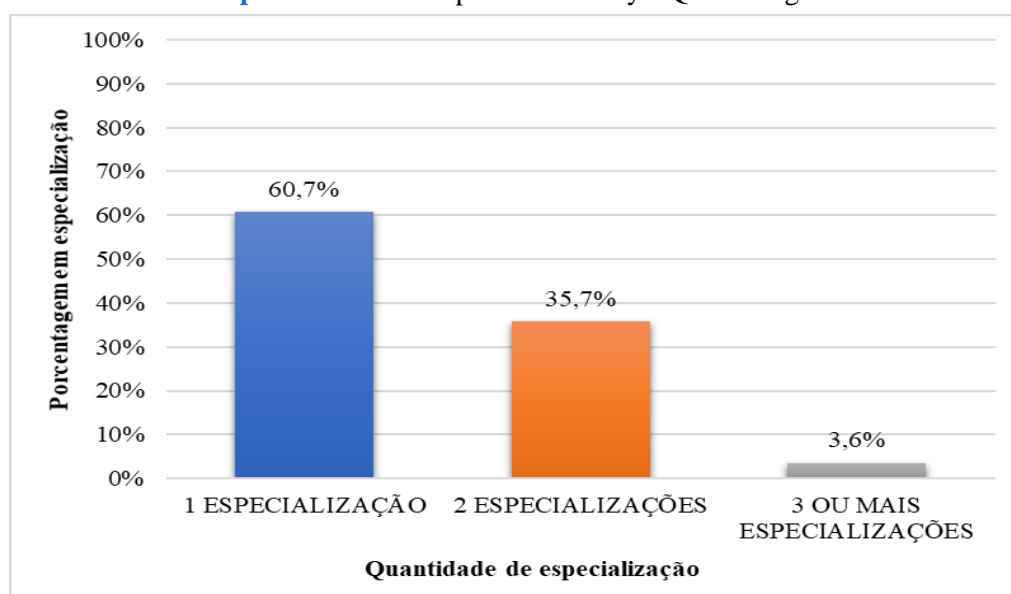
For training levels, according to Graph 2, it is identified that the social agents belonging to the Chemical Education subfield are all masters in their entirety (100%), and doctors in the vast majority (91.9%). These data reflect the possible criteria for the selection and tendering processes, which require a minimum master training as a prerequisite.

Graph 2. Academic training of agents at different levels of training

Source: the authors, based on data from EQ agents' Lattes curricula

Currently, there are 53 professors awarded and 9 collaborating professors with temporary contracts, working in the Chemical Education subfield. Based on the aforementioned data, it is emphasized that by analyzing the curriculum, it is not possible to infer whether all these professionals participated in specific selection processes for the area of Chemistry Teaching, since the area, being recent, had the dedication of others teachers, trained in the area of Chemistry, for its consolidation.

The post-doctorate presents the lowest quantity of agents trained in this modality (12.9%). One of the justifications may be attributed to the absence of economic retribution for agents belonging to the academic field. Another possibility for this low number is what will be presented in the analysis of the doctoral completion time (we have a considerable volume of recent doctors). However, there is a large number of teachers with specializations, as shown in Graph 3:

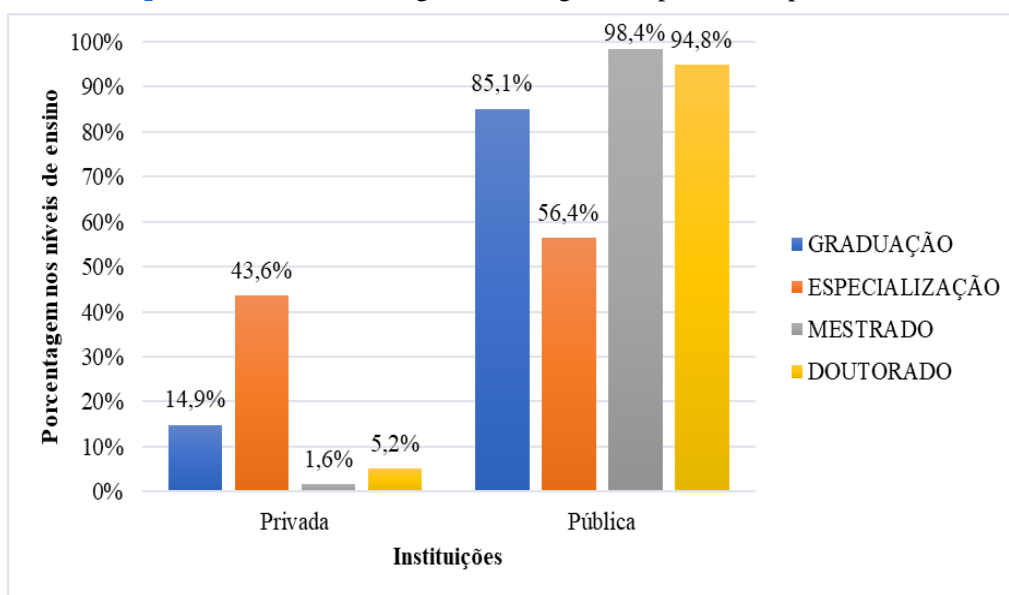
Graph 3. Amount of specialization by EQ social agents

Source: the authors, based on data from EQ agents' Lattes curricula

In the analysis of Graph 3, it is identified that of the 62 professionals, 60.7% have only one specialization, another 35.7% have at least two specializations, and 3.6% have three or more specializations. The first selection processes in the state of Paraná, did not establish the master as a prerequisite, being replaced by a specialization in the area of Education. This situation caused some agents to seek specialization to enter the university field. Another justification for the number of specializations (45.2%) is that many agents did not choose the academic field at first, and sought or traced their trajectory through basic education. Since the tenders for the Simplified Selection Process (PSS) of the State Secretariat of Education of Paraná (SEED) by the Regional Education Center (NRE)⁵ of the PR in their applications, it was used the *lato sensu* certifications (specializations) as requirements in the scores to achieve better positions in the selection process dispute.

The trajectory in the different public and private spaces in the HEIs can be seen in Graph 4. In the case of specializations, both in private institutions (43.6%) and in public institutions (56.4%) the data are shown to be close, and this may be associated with the search for these training courses, as pointed out earlier, through certifications in *lato sensu* courses due to lower costs and deadlines, in addition to greater flexibility in the schedules as they are mainly available in the form of Distance Learning (EAD).

⁵ They are macro (or micro) regions of the state with management of school actions, which are responsible for the coordination, guidance, control, adoption, application, monitoring and evaluation of the execution of measures aimed at maintaining and improving the functioning of the school. elementary and high school, regular education, youth and adult education and special education, in the school units of the state, municipal and private networks, in compliance with the policies of the Secretariat. Available at: <http://www.nre.seed.pr.gov.br/>

Graph 4. Academic training of social agents in public and private HEIs

Source: the authors, based on data from EQ agents' Lattes curricula

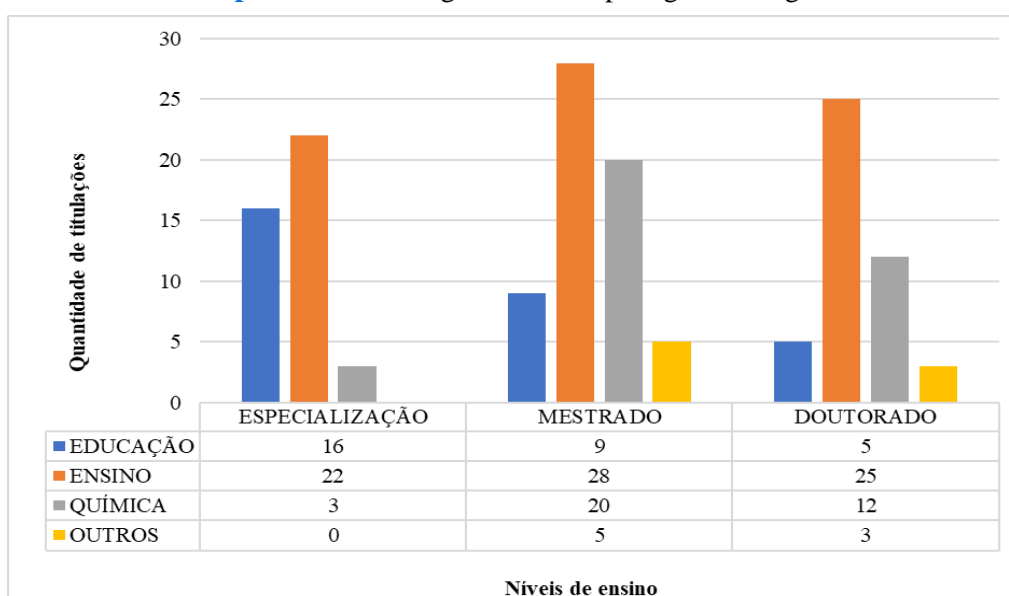
Another information perceptible by the analysis of Graph 4, is configured in the largest sample of agents with training trajectories in public HEIs, especially when looking at the graduation, master's and doctorate levels. Graduation graduates often create their relationship with research during their initial training (scientific initiation, teaching initiation, monitoring, etc.) and select the HEI programs in which their advisors are linked, due to the already existing work relationships built. In addition, this search extends to the selection of graduate programs and courses with the best CAPES evaluations, due to investments related to research and scholarships, in addition to the interest of beginning agents in starting to trace their trajectory research academic close to peers with representativeness already established in the field.

With this, the search for school determinants is part of the academic power “which is mainly founded on the control of the instruments of reproduction of the teaching body” (BOURDIEU, 2017b), which despite the volume of capital as a way of adding their recognition and position in the academic environment, the degrees become minimum requirements to enter the field. This way, according to Hey (2008, p.90), the search for certifications of agents in a simplistic way is a “manifest phenomenon, since all researchers go through this path to enter the academic career”. But in a broader way, it can ascertain the symbolic gains resulting, since inside, “the agent can use his position as an advantage and as a gain in other social spaces” Hey (2008, p. 102), as participation in bodies for public policy proposals, approval of course curricula, and even preparation of teaching materials legitimized for their recognition.

2. Training Area in Post-graduation

The social agents of the Chemical Education subfield, today trained within the Chemistry Degree courses and in postgraduate courses and/or programs in the area of Teaching/Education of Mathematical Sciences, have not always obeyed this linearity in training. Through the analysis carried out, the areas of training within the trajectory of university professors working in the academic field of Chemical Education in Paraná are perceived, which are different, as shown in Graph 5.

Graph 5. The training areas of the post-graduate agents



Source: the authors, based on data from EQ agents' Lattes curricula

In the analysis of *lato sensu* and *stricto sensu* post-graduation courses, the use of the terms - Education, Teaching, Chemistry, Others - served to distinguish the different areas found in Lattes. Words such as Teaching and Education, although some use them interchangeably, differ when it comes to research, especially when referring to graduate courses and programs which also belong to different areas of CAPES assessment. Currently, programs designed to train agents for the Chemical Education subfield are classified by the CAPES evaluation area (2017) as 'Teaching', within the 'Multidisciplinary' area. This teaching area (area 46) was created in 2011 by ordinance 83/2011, incorporating all programs in the former Science and Mathematics Teaching field, created in 2000 (CAPES, 2017).

Still in the analysis of Graph 5, it can be seen that university professors in the state of Paraná, have a higher number of academic degrees at the master's and doctoral levels in the 'Teaching' area, followed by the Chemistry and Education area, with some being graduated in other areas, such as engineering. In 'Teaching', the highlight is the search for specializations, since these certifications are carried out over a shorter period of time, in several public and private institutions, with greater reach to the subjects interested in this training.

From the analysis, it is noted that most agents have different levels of training (master's, doctorate) within the area of 'Teaching'. In the case of the master's degree, the number of degrees (28) in this area of graduate studies is not far from the area of Chemistry (20), and at the doctoral level this discrepancy is more evident. These data can indicate the changes of the agents by the training areas when they finish the master's degree and enter the doctorate. Since, there are agents who enter the master's degree in the field of Chemistry, and because they experience in university teaching and/or in other social spaces, relationships with the Chemical Education subfield, they change the focus of their education by continuing their studies in the doctorate.

Thus, the data indicate that the academic field of Chemical Education in the state of Paraná is made up of varied backgrounds, influenced by the increase in the number of Chemistry Licentiate Degree courses at universities and, consequently, in need of teachers with specific backgrounds. As for the aspect explained above, the absence of professionals with the appropriate training, at a given time, resulted in the hiring of professionals from other degrees. However, from the moment that there was an expansion of graduate programs and, consequently, specific training, the field began to structure itself, being called “study”, due to the materialization of the same object of investigation. With this, the Chemical Education subfield starts to be constituted and structured by the training of professionals within these objectives, by which it is understood that “the position of each agent in this structure, or rather, the weight of each one for forming this structure, and at the same time supporting it, depends on all other researchers, as well as on all points in space and on the relationships between all points ”(HEY, 2008, p.80). Evidencing that, the field does not exist for its individuality, but for the structuring of the small parts, portrayed here by the agents, to form the collection of forces and struggles.

In a recent research Massi, Carvalho and Giordan (2020) investigated the training of teachers, *stricto sensu* post-graduate advisors in the field of Education in the country and pointed out that graduate programs “unite the group around common objects, on the other hand, it masks strong distinctions ”(2020, p.10). In this way, the disparities themselves, due to the absence of common criteria, make it difficult to understand the area of Education as a field, since "it is almost impossible to identify a specific capital, an object of common dispute between agents and such different demands". These distinct characteristics of the large area of teaching do not all apply to Chemical Education, in which the object of the dispute is common, although there is a difference in the training trajectory at the graduate level, there is still a majority that has the same focus.

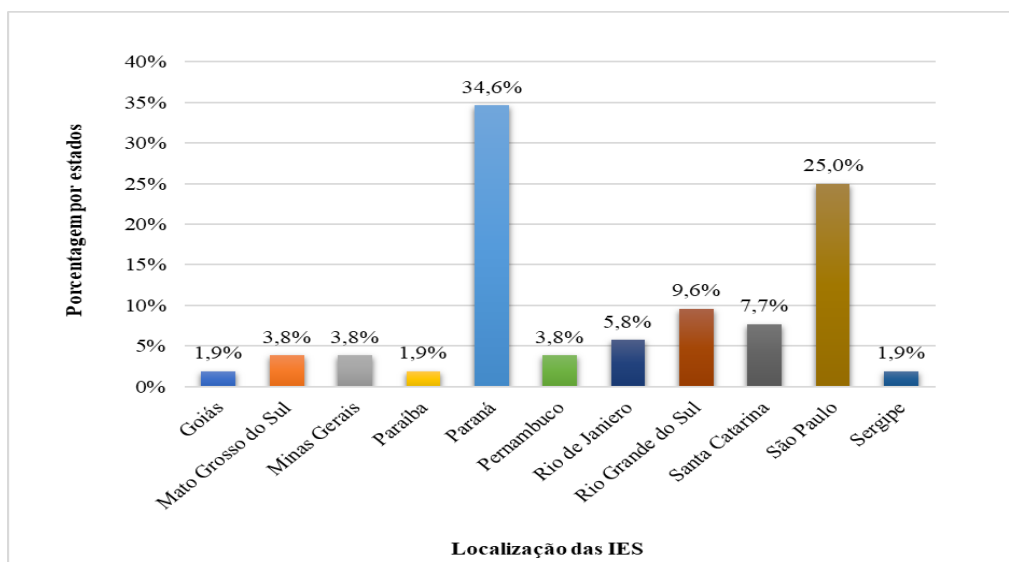
3. Training Location

In the analysis of the Lattes curricula, the different regions of Brazil chosen by agents for their training at the different levels of education were measured, shown in Graph 6. Most teachers are trained in the state of Paraná (35.3%), followed by São Paulo (25.5%), Rio Grande do Sul (9.8%) and Santa Catarina (7.8%), with a smaller amount in the Northeast and Midwest regions of the country. The choice of institutions in the appropriate states may

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involve different situations, such as proximity to family members, evaluations of courses and programs; however, this information is not explicit in Lattes, being subject to different interpretations.

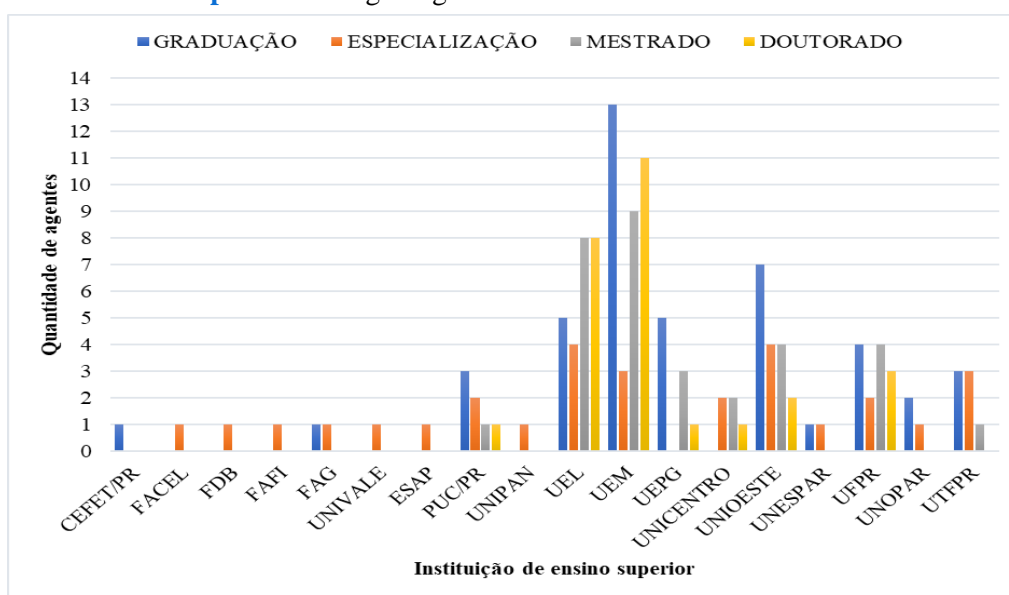
Graph 6. Training location of the EQ agents



Source: the authors, based on data from EQ agents' Lattes curricula

By looking specifically at the state of Paraná, in Graph 7, it is possible to identify public and private HEIs destined to the academic training trajectory of agents in the academic field. Some universities identified in the teachers' Lattes bring their old names, such as the Federal Center for Technological Education of Paraná (CEFET), which by law 11.184 / 2005, sanctioned by the government of ex-president Luiz Inácio Lula da Silva, transformed this institution in UTFPR.

Graph 7. Training of agents in institutions in the state of PR



Source: the authors, based on data from EQ agents' Lattes curricula

Still, through the analysis of Graph 7, it is identified that the agents have their degrees distributed between public and private HEIs, with their highest rate of trainees, in the state (UEM, UEL, UNIOESTE, UEPG) and federal (UFPR, UTFPR) universities. There is an emphasis on the Chemistry Licentiate Degree course at UEM, for being one of the oldest in relation to its creation, 1970⁶. Another justification can be attributed to the strong identity of the Licentiate course in the training of chemistry teachers, due to their involvement in research and extension groups and public policies (PIBID) with a focus on Chemistry Teaching.

In the case of doctoral-level training, most agents are trained in the post-graduate program in Education for Science and Mathematics (PCM) at UEM and the Teaching of Science and Mathematics Education (PECEM) program at UEL, in the area of Teaching, 11 and 8 graduates, respectively. The programs in the 'Teaching (Area 46)' area, aimed at training university professors for teaching chemistry, are allocated within the 'Greater Area - Multidisciplinary'. The area was created on June 6 by the CAPES 83/2011 ordinance, incorporating all graduate programs in the former Science and Mathematics Teaching area. Thus, in the last CAPES report (2017b), the increasing number of programs (157) and teachers (2,602) in the area, has emphasized the dimension of this field of study in the country, and emphasized this growth also by regions, as is the case of the South region that is behind (in number of programs) only from the Southeast region.

In the case of Paraná, the post-graduate programs presented in Chart 1, according to the information available on the Sucupira Platform (evaluated and recognized courses), are distributed between master's (M) and doctorate (D), in academic and professional modality. The evaluations of the graduate programs available for public examination carried out by other peers (commission of specialists in the field of Education) are organized by the evaluation directorate of the Coordination for the Improvement of Higher Education People (CAPES), based on the annual information recorded on the Sucupira Platform. A grade is given to the programs, such as "grades 3 (regular), 4 (good) and 5 (very good), and of the latter, excellent programs stand out, with grades 6 and 7, which constitute references for the Areas" (CAPES, 2017b, p.3).

⁶ The Full Degree **Course** in **Chemistry** at the State University of Maringá was created in 1970, authorized by Resolution No. 01/70-COU, of November 26 of this same year. With the creation of the Science **Course** (Resolution 30/74 - CFE), the **Chemistry Course** was interrupted between 1977 and 1979, being reactivated in 1979. Available at: <http://www.dqi.uem.br/graduacao>

Table 1. Post-graduate programs in the ‘Teaching’ area of the State of Paraná

Institution	Location	Post-graduate program	Level	Grade
ACADEMIC PROGRAMS				
UEL	Londrina	Science Teaching and Mathematical Education (PECEM)	(M/D)	7
UEM	Maringá	Science and Mathematics Education (PCM)	(M/D)	4
UFPR	Curitiba	Science and Mathematics Education (PPGECM)	(M/D)	4
UNIOESTE	Cascavel	Science Education and Mathematical Education (PPGECM)	(M/D)	4
UNIOESTE	Foz do Iguaçu	Teaching (PPGEN)	(M)	4
UTFPR	Ponta Grossa	Science and Technology Teaching (PPGECT)	(D)	4
UEPG	Ponta Grossa	Science Teaching and Mathematical Education (PPGECM)	(M)	3
UNESPAR	Paranavaí	Interdisciplinary Teacher Training (PPIFOR)	(M)	3
PROFESSIONAL PROGRAMS				
UTFPR	Ponta Grossa	Science and Technology Teaching (PPGECT)	(M)	5
UTFPR	Curitiba	Scientific, Educational and Technological Training (PPGFCET)	(M/D)	4
UTFPR	Londrina	Teaching of Human, Social and Nature Sciences (PPGEN)	(M)	4
UENP	Cornélio Procopio	Teaching (PPGEN)	(M)	3
UNICENTRO	Guarapuava	Teaching of Natural Sciences and Mathematics (PPGEN)	(M)	3

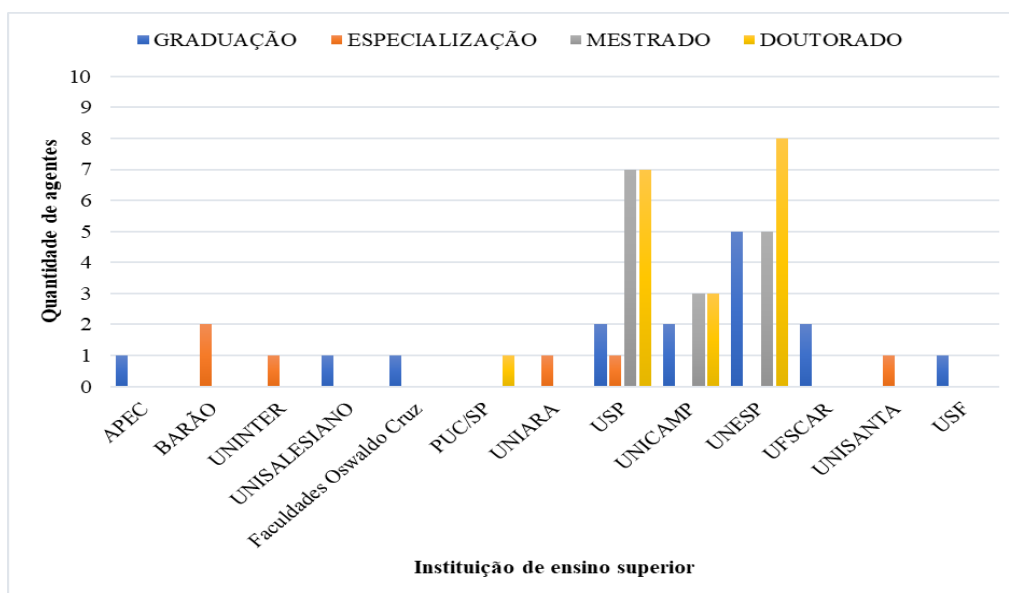
Source: the authors, with data extracted from the result of the Sucupira Platform.

Academic programs exist at the master's and doctoral levels, the same as in professional programs.⁷ The differences between the two modalities are in the objectives to prepare the agents and, in the case of the academic, it is configured in the training of the researcher and university professor, while in the professional modality it is mainly aimed at teachers in service in Basic Education, who are dedicated to building educational products available on the websites of the programs for use in their field of work and other schools in the country, as well as the academic products generated from the descriptive and analytical account of these experiences (CAPES, 2017a).

⁷ CAPES published Ordinance No. 60 of March 20, 2019 in the Official Gazette (DOU), which updates the regulations on professional master's and doctoral degrees. Previously, professional courses were regulated by Ordinance No. 131 of 28 June 2017, which, as of the new publication, ceased to be in force.

In addition to the state of Paraná, São Paulo has the second highest percentage in the academic education of Chemical Education agents in the state of Paraná (Graph 8), distributed among graduations (27.2%), specializations (10.9%), masters (27.2%) and doctorates (34.7%).

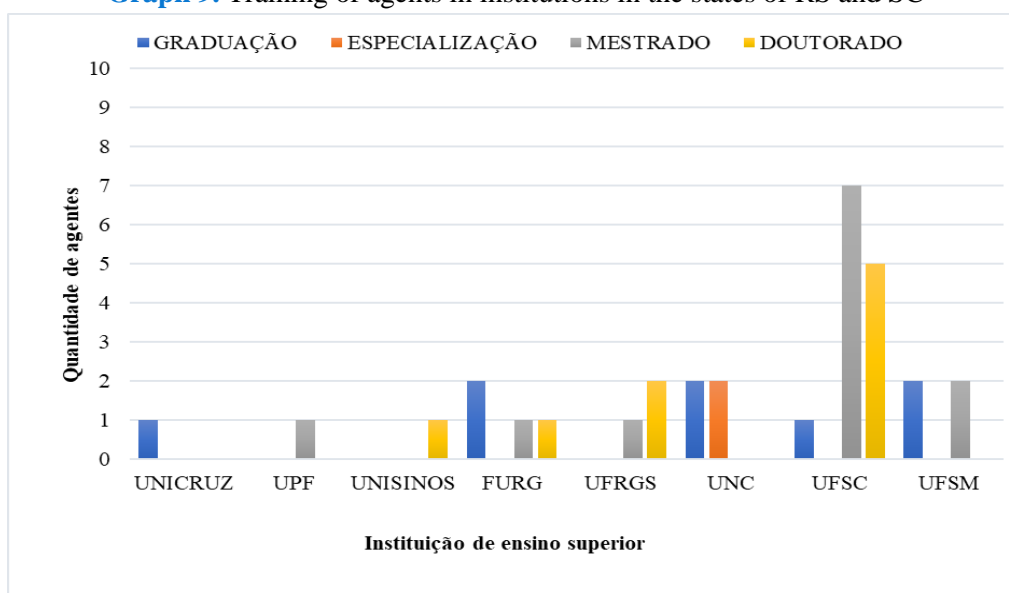
Graph 8. Training of agents in institutions in the state of SP



Source: the authors, based on data from EQ agents' Lattes curricula

Among the institutions featured in the training of agents at the master's and doctoral level are: São Paulo University (USP), Campinas State University (UNICAMP), and Paulista State University (UNESP). This is due to the fact that HEIs have graduate programs in the Teaching Area, responsible for the training of university professors for Science/Chemistry Teaching linked to their range of courses, such as 'Science Teaching (Physics, Chemistry, and Biology)' at USP and 'Education for Science' at UNESP in Bauru as a grade 5 for master's and doctorate. 'Multiunits in Science and Mathematics Teaching at UNICAMP are also examples of the mention to the formation of teachers in Chemistry, with a score of 4 for masters and doctoral degrees, all in the academic modality (CAPES, 2017).

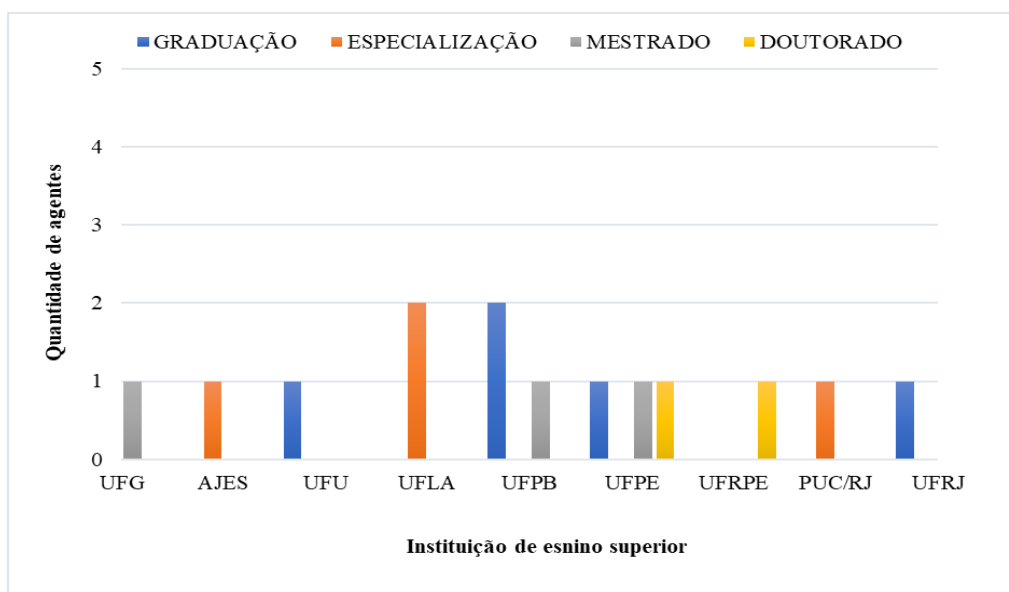
In the states of Santa Catarina and Rio Grande do Sul (Graph 9), the data indicate lower representativeness in the training of university teachers in Paraná. However, such institutions have programs with good evaluations by CAPES, such as the 'Scientific and Technological Education' program of the Federal University of Santa Catarina (UFSC) in Santa Catarina, with a score of 5, followed by the 'Education in Chemical Sciences of Life and Health program' (UFRGS) in Rio Grande do Sul, with grade 4, both for master's and academic doctoral degrees.

Graph 9. Training of agents in institutions in the states of RS and SC

Source: the authors, based on data from EQ agents' Lattes curricula

The justification for the lower representativeness of the agents trained in this state, should not be associated with the lack of programs with good evaluations, however the HEIs, possibly, in these states have managed to open selection processes to keep their agents trained in their own academic fields. This shows that, when agents enter the academic field during their masters and doctorates, they create professional bonds in that space, due to their dedication to research groups, regional events, selection boards and create their social capital, in the form of recognition of other pairs.

Finally, in Graph 10, other agents were identified who, in a smaller quantity, graduated from undergraduate courses in universities such as the Federal University of Goiás (UFG), the Federal University of Uberlândia (UFU), the Federal University of Paraíba (UFPB), the Federal University of Pernambuco (UFPE), the Federal University of Rio de Janeiro (UFRJ). For graduate programs, the training took place at the master's level at UFG, UFPB, Federal Rural University of Pernambuco (UFRPE) and at the doctorate at UFPE, UFRPE. The data indicate that the agents did not maintain a linear path to enter the field, as, for example, the agent trained at UFPE, who dedicated himself to academic training in the area of Chemistry.

Graph 10. Training of agents in institutions in other states.

Source: the authors, based on data from EQ agents' Lattes curricula

The data indicate that the agents did not maintain a linear trajectory to enter the field, such as, for example, the agent trained at UFPE, who dedicated himself to academic training in the area of Chemistry, and today works in the area of Chemical Education. Another university professor started his training in the state of Rio de Janeiro, going to do a master's degree in the area of Chemistry, in the state of São Paulo, until he became part of the academic field of the state of Paraná, and joined the subfield of Chemical Education at UEM. This agent is part of one of the many examples of routes to enter the field. Others started their trajectory in the state of SC, but the lack of post-graduate courses in the area at the HEI where they were doing their graduation at that time, conditioned them to seek training in the state of São Paulo.

These described situations indicate that the ways of entering the Chemical Education subfield do not always occur linearly after taking the undergraduate degree in Chemistry and pursuing graduate programs in Science Teaching. Especially since the emergence of post-graduate programs in the area of Science and Mathematics Education (Area 46) has expanded, since the presentation of reports in the area in 2010, with the growth of 7 programs in 2000 to 60 programs in 2010 (CAPES, 2010). This growth is increasing, since in 2013, after the relocation, now within the 'Teaching' area, there were 104 programs, reaching 157 in the last report in 2017, and 181 programs indicated in the area document (CAPES, 2019).

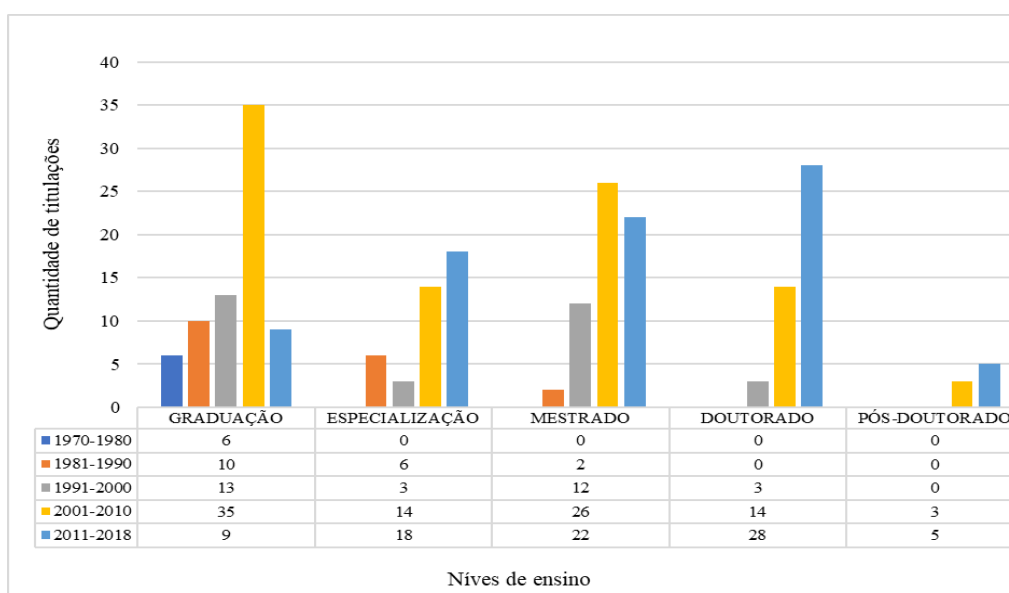
Given this, the study of the academic backgrounds of the agents, also allowed to highlight the different institutions for intellectual formation, since the environments of academic production and its circulation during their formation, contributed to gauge their academic dispositions, or rather, build their capital cultural, derived from conceptions about the attribution of academic activity (HEY, 2008). In this sense, the agents have the cultural capital incorporated, attributed by their own dedication for a long time, to appropriate the habitus, integrated by the diverse experiences, functioning "at every moment as a matrix of perceptions, appreciations, and actions" (BOURDIEU, 1983, p. 65).

Thus, the fact that the training of agents from other states, circles of researchers, proposals for differentiated works and conceptions of teaching and research, can add to that field provisions generated in the spaces in which they participated, serving, according to Hey (2008), as means of transformation, resulting from battles established by the entry of agents with different dispositions experienced in academic formation.

4. Training Period

In the analysis of Graph 11, it is possible to identify the number of training of agents in different periods. In the case of graduations, it is noted that the agents did more than one graduation, totaling 74 degrees, among them: Chemistry, Philosophy, Pedagogy, Mathematics, Physics and Biology, that is, of the 62 university professors, 19.35% of them did at least two graduations.

Graph 11. Training period of the agents of the EQ academic field



Source: the authors, based on data from EQ agents' Lattes curricula

There are only 4 agents in the field of EQ trained in degrees in the period 1970-1980, with no training in post-graduate programs *lato sensu* and *stricto sensu*. The six formations are distributed in: Licentiate and Bachelor degrees in Chemistry (1970-1973) at the Pontifical Catholic University (PUC) of Paraná; Licentiate degree in Chemistry (1971-1974) at PUC of Paraná; First Degree in Sciences (1970-1972) at UNESPAR; Graduation in Chemistry (1974-1977) at UEM; Licentiate degree in Sciences (1974-1976) at UEM and Graduation in Qualification in Chemistry (1976-1978) at the Prudentine Association of Education and Culture of Presidente Prudente (APEC). At this time, it is noted that the teachers trained in Science courses at that time later sought a Qualification in Chemistry.

The entry of the first two agents in the Master's degree took place in the period 1981-1990, with one agent in 1986 in the area of Physical Chemistry at the University of São Paulo (USP) and another in 1987 in the Master's Degree in Education at the Federal University of Santa Catarina (UFSC). Being, these professors, today acting in the courses of Licentiate degree in Chemistry in the academic field of the area of EQ in the state of Paraná, UEM, and UNESPAR, respectively, within the period of survey data of this research.

In the 1991-2000 period, however, there was modest growth in the number of graduates (13). However, there is a big jump in the index of social agents with Master's degrees (12), which is due to the search for improvement in the area. Since, the training of doctors (3) at that time is still incipient.

When looking at the 2001-2010-time frame, the number of graduates has a better representation compared to other periods. Since, some of these graduated social agents were in the Chemistry Licentiate degree courses after 2008 and 2009, after the Resolution of the CNE/CP n° 2/2002 that implemented the increase of the workload dedicated to the supervised internship and the training activities, configuring themselves as a way of identifying agents with Chemistry teaching. Another justification attributed to the increase in the master's degree may be associated with the emergence of public policies financed by CAPES, such as PIBID inaugurated by normative ordinance n° 38/2007, which contributed to the insertion of agents in investigations in the Teaching of Chemistry, and consequently, their search for graduate programs, for their identification as a research agent in this scientific field.

Concerning the period 2011-2018, it is noted that there is a reduction in the number of masters, which may be an indication that the field is beginning to stabilize in the number of agents participating in the Chemical Education subfield. The exponential increase in doctorates can indicate two things: 1) more judicious contests and selective tests, requiring completion of the course for contraction; 2) need for career specialization to remain in the field. The latter being directly linked to the field's own forces to maintain its ideas and criteria, thus being able to enter and remain in the field, and to acquire recognition and forms of belonging through the different volumes of constituted capital (BOURDIEU, 2004).

Due to this, the data show that the agents working in the subfield of Chemical Education in Paraná come from recent training, with most of their training between 2001-2010, and their postgraduate degrees in the same period extending until 2018. In the case of doctors, it is observed that the field consists of recent doctors in a range of 5 to 10 years, especially when looking at the 2011-2018 cutout. Such data are in accordance with the data published in the CAPES report (2017), which show the growing number of graduates in the area of 'Teaching' in the period from 2000 to 2016, pointing to the increased demand for postgraduate courses and the pace of growth in the Education area.

In addition, the possession of this school capital provides them with a dominant social position, among other fields, “as holders of an institutionalized form of cultural capital, which ensures a bureaucratic career and regular income” (BOURDIEU, 2017b, p.63), legitimized by the recognition that the position gives them.

Therefore, with specific reference to the training trajectory described by its school determinants, it is noted that differentiating aspects of training, such as attending university in public or private institutions, being trained in areas other than acting or always in a linear manner, participate in graduate programs with better or worse evaluations, alternate between other states during training or always keep within the same HEI, be in the field since the beginning of its constitution or arrive at it already consolidated, being able to assign itself different positions of these subjects in the structure of the academic field. However, the first results still fail to point to such positions specifically for the state of Paraná, since the discussions on symbolic capitals do not yet contemplate this work, although it is known that capitals do not act in isolation, but coexist and act in representativeness, or better, on the subject's position in that field.

Final Considerations

Considering the objective of this work, to characterize the cultural capital in the institutionalized state of university professors in the area of Chemical Education in the state of Paraná, evidencing the trajectory of academic training of agents through their school indicators, we made the analysis of the level of education of the agents, in relation to the post-graduate training area, place and period.

Through this trajectory, a field was identified, being structured, in its majority, by masters (100%) and doctors (91.9%), since the certifications of *lato sensu* (45.2%) and postdoctoral (12.9%) have not been minimum hiring requirements in tenders and selection processes. Their training took place, mainly, in HEIs in the state of Paraná (52.2%), with significant influences in *stricto sensu* post-graduate spaces, in the states of São Paulo (30%) and Santa Catarina (12%), due to representativeness and longevity of courses and programs. The search for certifications in these public HEIs, at the masters and doctoral levels, may indicate the attempt to organize agents to reach their prominent positions, with regard to their institutionalized cultural capital, by appropriating the representativeness of that academic field.

However, the trajectory at these levels (master's and doctoral degrees) of training is not always linear, due to changes in areas at some point in the course, such as, for example, leaving the master's degree in a certain area, and continuing in the doctorate at the area of Teaching. The change to the Teaching area may be conditioned to the agents' concern to seek a specific academic formation, as an object of common investigation, and symbolic powers are added for the attribution of the subjects' positions in the academic field not yet noticeable in the result of this work.

In addition, the trajectory in the training of agents shows us, a subfield of Chemical Education in HEIs in the state of Paraná, is still recent, being mostly formed by agents trained in the last two decades, with an increasing number of graduates from the area of Teaching, due to the curricular adaptations to the regulations of the area of teacher training (Resolution of the CNE / CP nº 2/2002) in the Chemistry Licenciature Degree courses. They contribute to the hiring of professionals with specific training in the area, prioritizing prerequisites for the selection and hiring of social agents in this academic field.

As it is a recent field, there is still a percentage of university professors with training in another area of knowledge and who are active in the EQ subfield. This diversity of formations may be associated with the need for these professionals, at some point, to have dedicated themselves and assumed the teaching area, when agents with specific training did not yet exist. On the other hand, this diversity is also related to the non-linear training of agents during their training trajectory, since the interest in the area may have arisen from professional experiences throughout university teaching, relationships with research and extension groups, participation in events, knowledge of public policies, among others.

The post-graduate programs have figured as important elements for the growth of the area, since, many of the agents trained in these spaces are inserted in the Chemistry Licenciature Degree courses, whether they are public tenders or collaborators/temporary. Besides, evaluations of post-graduate programs such as PECEM at UEL have contributed to the recognition and representativeness, at the national level, of the struggles and forces established within the field of Science and Mathematics Education in the State of Paraná.

Although the results of this work are not yet able to indicate the structuring of the academic field by the position of the missing agents, in this analysis looking at other symbolic capitals, we understand that tracing the trajectory of these agents makes it possible to understand that the school indicators are configured as influencing elements in the aggregation cultural capital, mainly in its institutionalized state, which gives, through certification, a way of objectifying the cultural capital of that subfield (Chemical Education), incorporated with provisions during its academic formation trajectory.

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