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Situation of the offer Doctorate in Education Programs in Chile*

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Abstract

The quality training demand has increased due to the complexity of modern society. As education is the fundamental foundation for people's progress, this research is interested in analyzing the offer of doctoral programs in education in Chile (quality and quantity), aiming to generate information for the decision-making process of the various interest groups. This research was a descriptive study involving primary and secondary sources of information (scientific articles, enrollment database, and web pages); a relevant source is the Higher Education Information System of the Chilean Ministry of Education, whose version is updated until July 2022. A growth of 2,680.5% was detected in the enrollment of postgraduate students in Chile between 1984 and 2022, which exceeds the higher education system, which has multiplied its enrollment by 6.8 times in the same period, which in the specific case of doctorates is 46 times. The relevance of accreditation systems underscores the need for a more substantial commitment to ensure quality education at all levels, especially in doctoral programs in this area.

Keywords: Higher education; universities; university governance; research; education policy.

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Situación de la oferta de Programas de Doctorados en Educación en Chile

Resumen

La demanda de formación de calidad ha aumentado debido a la complejidad de la sociedad actual. Como la educación es el pilar fundamental en el progreso de los pueblos, interesa en esta investigación analizar la oferta de programas de doctorado en educación existentes en Chile (cantidad y calidad), con la finalidad de generar información para el proceso de toma de decisiones de los diversos grupos de interés. Se realiza una investigación de tipo descriptivo, que utiliza fuentes primarias y secundarias de información (artículos científicos, base de datos de matrículas y páginas web); una fuente relevante, es el Sistema de Información de Educación Superior del Ministerio de Educación de Chile, cuya versión se encuentra actualizada hasta julio de 2022. Se detectó un crecimiento de la matrícula de los postgrados en Chile, de un 2.680,5% entre los años 1984 al 2022; el que supera al sistema de educación superior, el que ha multiplicado su matrícula en 6,8 veces en el mismo período, que en el caso específico de los doctorados es de 46 veces. Considerando la relevancia de los sistemas de acreditación, se subraya la necesidad de un mayor esfuerzo para asegurar calidad en la educación en todos los niveles, especialmente en los programas de doctorado del área.

Palabras clave: Educación superior; universidades; gobernanza universitaria; investigación; Política educativa

Introduction

Higher education has a fundamental role in the progress of individuals, nations, and society as a unit, an imperative that is becoming increasingly relevant because of the increasing organizational complexity (Zapata & Caldera, 2008; Stensaker, 2018; Bitencourt et al., 2021). On the basis described above, the following assertions can be made initially:

First, it should be mentioned that the undergraduate and graduate formative processes influence the development of individuals at the cognitive, psychological, social, and moral levels, improving their opportunities and their abilities to respond to the requirements of a complex society, enabling the configuration of a more active, participatory and concerned citizen of the future of their countries (Vossensteyn et al., 2018; Pirela, Novoa & Hernandez, 2021); promoting, in turn, essential values such as justice, solidarity and respect for human rights (Skrbinjek, 2020).

Second, higher education generates advanced knowledge that contributes to state-of-the-art, generating effects on the communities' innovation, social development, growth, and economic development, along with the sustainability of the territories (Makhanya, 2020; Menon & Suresh, 2020).

Third, higher education institutions build a connection with the market that can be highly positive for local development (David, 2019), especially when there is a strong tendency to achieve a connection between the demands of the market and the changes and demands that emerge from society.

Thus, undergraduate and postgraduate teaching, research, and market relations contribute to the well-being of a country, which is why it is relevant to understand how some of these dimensions are developed in an educational system such as the Chilean one, both for the empirical evidence that can be provided and for the characteristics of the high degree of academic capitalism that it offers.

Considering this issue, the main objective of this research is to analyze the

situation of the offer of doctoral programs in education in Chile to generate information for the decision-making process of the various interested parties.

The research was carried out using primary and secondary sources of information (scientific articles, enrollment database, admission requirements from the programs' web pages, and reports of the doctoral programs accredited in education). Information on enrollment, offerings, and graduates was obtained from the Higher Education Information System. A retrospective analysis of studies compiled in the literature on higher education and graduate programs in Chile was carried out to provide the theoretical context for the inquiry; then, the focus was placed on the study object, which is the doctorate programs in education in Chile.

The research detected the existence of a significant growth in graduate enrollment in Chile between 1984 and 2022. It also highlights that over 30% of the universities do not offer doctoral programs and that three universities concentrate practically half of them. All the information presented can serve as relevant inputs to support the decision-making processes of the various groups interested in the respective graduate programs and, in particular, the doctoral programs in the field of education.

1. Theoretical foundations

1.1. Background of higher education in Chile

A turning point in the current higher education system in Chile dates back to the 1980 reform, which transformed the existing institutions at all levels (internal organization, financing structure, regulatory system, among others), allowing the consolidation of a system based on private initiative to the detriment of the system based on public institutions (Salazar & Leihy, 2013).

One of the first effects was reflected in the forced division of the Universidad de Chile and the Universidad Técnica del Estado, entities that had to dispose of their headquarters and campuses outside the capital, transforming themselves into new universities. A similar process was experienced by the Pontificia Universidad Católica de Chile, which had to divest itself of its regional campuses in the south of the country. In total, the system went from having 8 universities (2 public and 6 private) to 25, allowing, additionally, the creation of new universities, Professional Institutes (PI), and Technical Training Centers (TTC) in a simple manner (until 1980, to create a new university -public or private- a law was required).

Regarding financing, all Chilean universities, up to the time of the reform, were financed by the State. In 1980, this source was eliminated, and they became self-financing through tuition and student fees. This change increased private provision, particularly in institutions such as technical training centers and professional institutes.

Concerning the number of students, the figure in all higher education institutions in 1980 was 118,978, while by 1990, the amount increased to 249,482; however, if only university enrollment is considered, it had only increased to 131,702 in 1990 (Sistema de Información de Educación Superior [SIES], 2022a; 2022b; 2022c).

Another significant milestone occurred in 2005 with Law 20.007, which created the State-Guaranteed Loan (SGC), a new loan system for students of higher education institutions who did not have the resources to pay for university and were not beneficiaries of the scholarship system (in this case, the State would provide the guarantee to private banks, but the students were responsible for the debt). This system was added to other existing loans, such as the solidarity fund and the CORFO loan.

These actions caused an explosive increase in the system, from 619,002 students in 2005 to 1,069,099 in 2011 (Servicio de Información de Educación Superior [SIES],

2021); a phenomenon that responds to the context within which contemporary higher education unfolds, a context that is distinctly characterized by processes of massification and universalization in access (Brunner & Ganga, 2016; Brunner & Ganga-Contreras, 2018).

Although the credits were granted to students, they were only valid in educational entities with institutional accreditation (regardless of whether it was a public or private institution), established through the Higher Education Quality Assurance Law No. 20,129 of 2006.

The loan system led to severe financial debt for students and their families; nevertheless, it was expected that with their income as professionals, they would be able to pay without any problems. This expectation was not fulfilled in all cases, especially in those who never finished their studies, who had to bear the social impact of being indebted individuals who could not always cover the costs associated with the debt (Olavarría & Allende, 2013; Perez-Roa, 2014).

In the public provision of higher education in 1985, institutions in this sector

had 89,536 students, corresponding to 44.51% of the total enrollment in the country; by 2010, it had increased to 178,541 students, but their participation was reduced to 18.11% considering the total system, which shows that the growth of the system was made through private institutions and encouraged by public policies (Rodríguez, 2012).

In Chile, there are currently 213,403 higher education students in public institutions (204,950 in universities 2022), representing 16.38% of the total enrollment in higher education, a percentage that again shows a decrease, despite the creation of two new state universities during 2015 (Law 20,842) and 15 state technical training centers since 2016 (Law 20,910).

As shown in Table 1, Chile's higher education system comprises 149 institutions, of which 53 are technical training centers, 37 professional institutes, and 56 are universities. Together, they have an enrollment of 1,301,925 students, of which 54,579 correspond to postgraduate studies, and of these, only 6,875 are doctoral students (Sistema de Información de Educación Superior [SIES], 2022a; 2022b; 2022d).

Table 1
2022 Chilean Higher Education Enrollment Report

Type of institution	2014	2015	2016	2017	2018	2019	2020	2021	2022
CFTs	148,012	146,546	141,720	136,789	136,741	137,949	130,345	134,510	131,758
Women	77,535	75,947	73,940	71,879	72,653	73,801	71,493	77,793	75,875
Men	70,477	70,599	67,780	64,910	64,088	64,148	58,852	56,717	55,883
IPs	357,395	378,802	384,667	377,353	374,897	381,412	361,387	379,838	397,705
Women	181,710	190,735	193,346	190,181	188,880	191,946	181,999	193,712	201,023
Men	175,685	188,067	191,321	187,172	186,017	189,466	179,388	186,126	196,682
Ues	709,723	707,695	720,791	734,151	750,639	749,149	659,995	780,391	772,462
Women	372,625	373,663	384,305	395,051	407,538	407,112	361,291	429,685	423,634

Cont... Table 1

Men	337,098	334,032	336,486	339,100	343,101	342,037	298,704	350,706	348,828
Overall Total	1,215,130	1,233,043	1,247,178	1,248,293	1,262,277	1,268,510	1,151,727	1,294,739	1,301,925
Women	531,870	640,345	651,591	657,111	669,071	672,859	614,783	701,190	700,532
Men	583,260	592,698	595,587	591,182	593,206	595,651	536,944	593,549	601,393

Source: Sistema de Información de Educación Superior (SIES, 2022a).

Most enrollment in higher education is represented by women, something that has not changed over the last decade but is more evident in technical training centers and universities. In contrast, this phenomenon has only occurred in professional institutes since 2011, and the difference between men and women is minimal in these areas.

1.2. Preliminary information on postgraduate studies in Chile

The postgraduate programs are divided into two types of courses: On the one hand, there are master's degrees; their name may vary depending on the program's emphasis; these are classified in the ISCED 7 category according to Unesco's International Standard Classification of Education (Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura [UNESCO], 2011). These are programs that a person can access once they have achieved a bachelor's degree. In Chile, these programs are offered exclusively by universities (Art. 6 clause e Law 21.091 of 2018) and include master's degrees, master's degrees, and specializations such as medical specializations.

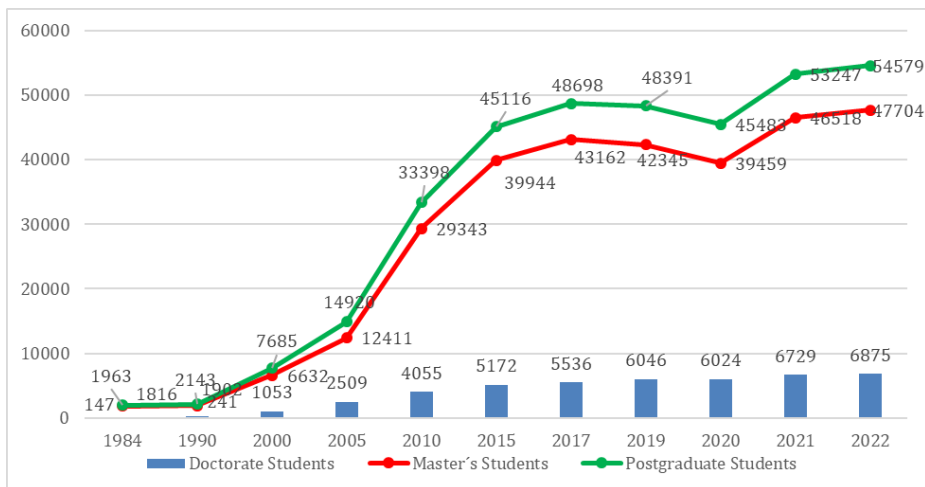
The second type of postgraduate program includes doctorates, classified at

ISCED level 8, which establishes that the minimum duration of these programs is 3 years (UNESCO, 2011). In Chile, these programs can only be offered by universities, as in the previous case.

According to the quality assurance system that accredits programs in Chile, there are two types of master's degree programs. Those with an emphasis on professional development are called "professionalizing", and programs whose purpose is "academic" development. No difference was made for doctoral degrees, considering that all programs were for academic or research training (Espinoza & Gonzalez, 2009; Pulido & Espinoza, 2018). From the new accreditation criteria, this was proposed, differentiating programs that have a "scientific/academic" or "technological/professional" purpose (Comisión Nacional de Acreditación [CNA], 2019).

The length of master's programs is 1 to 2 years, while doctoral programs range from 4 to 5 years, although exceptionally, there are programs with a formal extension of 7 semesters.

The enrollment of graduate students has increased substantially in recent years, from 1,963 students in 1984 to 54,579 in 2022; this represents an increase of 27.8 times, a figure that rises to 46 times in the case of doctoral programs (see Graph I).



Source: Sistema de Información de la Educación Superior (SIES, 2022a).

Graph I: Students in Master's and Doctoral Programs in Chile

Regarding what type of universities represent the majority of graduate enrollment, Table 2 shows that in the last year, only 22.75% of it corresponds to public institutions, which shows a significant change compared to 2007, when it represented 41.75% (SIES, 2022a).

Public institutions have increased the number of graduate students in this period by 43.7%; however, their increase has been low compared to private institutions, which went from having 12,053 students in 2007 to 42,161 in 2022 (all which represents an increase of 249.8%).

Table 2
Graduate enrollment growth by university ownership.

Type of Universities	Postgraduate Enrollment 2007	Postgraduate Enrollment 2022
Public Universities	8,640	12,418
Private Universities	12,053	42,161

Source: Sistema de Información de Educación Superior (SIES, 2022a).

A total of 41 of the 58 universities have doctoral programs with enrollment (Servicio de Información de Educación Superior [SIES], 2022c; 2022d), with 47.71% of doctoral enrollment clustered in three universities: Pontificia Católica de Chile (20.15%),

Universidad de Chile (17.73%), and Universidad de Concepción (9.83%). Coincidentally, the institutions with the highest enrollment in doctoral programs have a high level of scientific production measured by articles in Scopus (De-Moya-Anegón et al., 2021).

2. Results and discussion

2.1. Available openings in Doctoral Programs in Education

For simplification purposes and to understand part of their history and main geographic location, Table 3 shows the

universities involved in the study with their corresponding acronyms and dates of foundation. Among the universities presented, it is possible to see institutions that are in the process of closing or that no longer exist, such as the Universidad de Arte y Ciencias Sociales (ARCIS), del Mar and Bolívar: ARCIS, del Mar, and Bolivariana.

Table 3
Universities with doctoral programs in areas of education and their acronyms

University name	Acronym	Foundation date	Headquarter city
Universidad de Chile	UCH	1842	Santiago
Pontificia universidad católica de Chile	PUC	1888	Santiago
Universidad de Concepción	UDEC	1919	Concepción
Pontificia universidad católica de Valparaíso	PUCV	1928	Valparaíso
Universidad de Santiago de Chile	USACH	1952	Santiago
Universidad de la Frontera	UFRO	1981	Temuco
Universidad de Tarapacá	UTA	1981	Arica
Universidad de la Serena	ULS	1981	La Serena
Universidad Diego Portales	UDP	1982	Santiago
Universidad Central de Chile	UCEN	1982	Santiago
Universidad de Arte y Ciencias Sociales	UARCIS	1982	Santiago
Universidad Arturo Prat	UNAP	1984	Iquique
Universidad de Playa Ancha de Ciencias de la Educación	UPLA	1985	Valparaíso
Universidad Metropolitana de Ciencias de la Educación	UMCE	1985	Santiago
Universidad Bolivariana	UB	1987	Santiago
Universidad Andres Bello	UNAB	1988	Santiago
Universidad del Bío-Bío	UBB	1988	Concepción
Universidad Academia de Humanismo Cristiano	UAHC	1988	Santiago
Universidad de Aconcagua	UAC	1989	San Felipe
Universidad del Mar	UMAR	1989	Viña del mar
Universidad Bernardo O'Higgins	UBO	1990	Santiago
Universidad SEK	USEK	1990	Santiago
Universidad Católica de la Santísima Concepción	UCSC	1991	Concepción
Universidad Católica de Temuco	UCT	1991	Temuco
Universidad Católica del Maule	UCM	1991	Talca
Universidad de Los Lagos	ULAGOS	1993	Osorno
Universidad Tecnológica Metropolitana	UTEM	1993	Santiago
Universidad Alberto Hurtado	UAH	1997	Santiago
Universidad Los Leones	ULL	2010	Santiago

Source: Own elaboration, 2022 based on data from SIES (2021).

In Chile, there are 12 doctoral programs in the field of education offered by 15 universities, institutions that offer 71 places for the year 2022. In this case, three doctoral programs account for over half of the offer (see Table 4).

Table 4
Academic offerings in doctoral programs in education in Chile

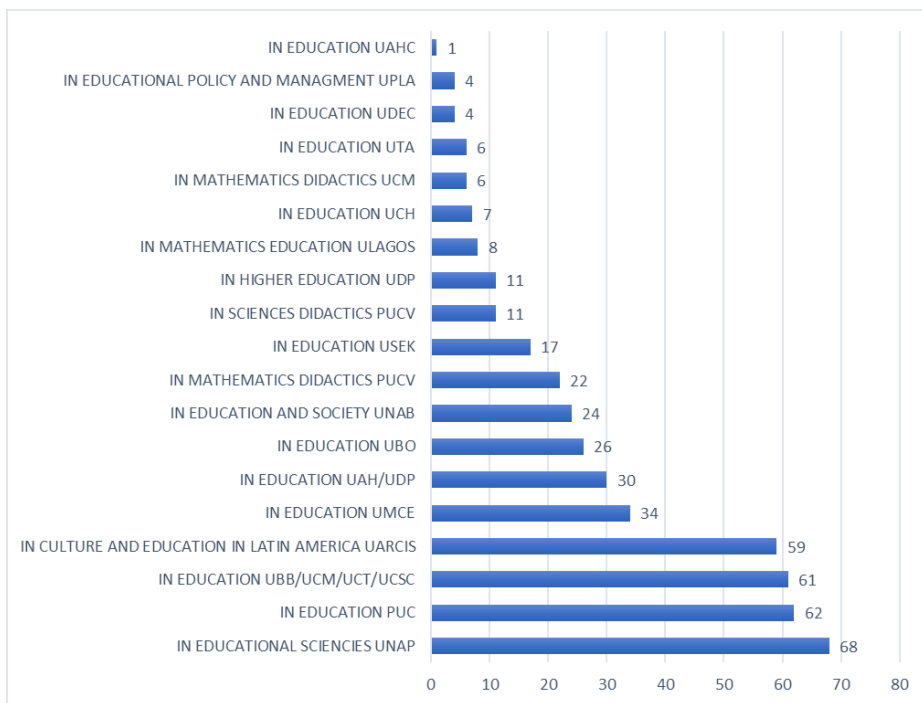
Name of Doctoral Program	Universities	Number of openings
Doctorate in Education in Consortium	UCSC/UCM /UCT/UBB	21(6/6/5/4)
Doctorate in Education	UMCE	8
Doctorate in Education	UBO	7
Doctorate in Mathematics Didactics	UCM	6
Doctorate in Education	UTA	6
Doctorate in Education	UDP/UAH	6(2/4)
Doctorate in Education and Society	UNAB	5
Doctorate in Didactics of Science	PUCV	5
Doctorate in Mathematics Didactics	PUCV	4
Doctorate in Higher Education	UDP	2
Doctorate in Education	PUC	1
Doctorate in Education	UCH	does not provide information

Source: Own elaboration, 2022 based on data from SIES (2022d).

An observed phenomenon relates to the academic offerings that some universities promote on their websites, which do not match the vacancies declared by them for the 2022 process before the relevant public agencies. An example of this is the doctorate in education at the Pontificia Universidad Católica de Chile (while on its website, it reports 10 vacancies for the 2022 process, in the SIES, only one vacancy appears).

2.2. Number of enrolled students by 2022

Grup II incorporates all doctoral programs reporting current enrollment in the area of education as of July 12, 2022, including those that are in the process of closure. Overall, doctoral education programs have an enrollment of 461 students, with 54.23% distributed in four entities: UNAP (14.75%), PUC (13.45%), Consortium of universities (13.23%), and UARCIS (10%) (SIES, 2022a).



Source: Own elaboration, 2022 based on data from SIES (2022d).
Graph II: Education Doctorate Enrollees in the year 2022

Additionally, there is a doctoral program in culture and education in Latin America offered by the Universidad de Arte y Ciencias Sociales (ARCIS), an institution that is in the process of being closed, so those students who wish to complete their studies are encouraged to do so through special programs with third party institutions. The doctoral program has an enrollment of 59 students and is being offered through an agreement with the Universidad Católica del Maule. The modality of this program is online.

The other program worth mentioning is that of the UNAP, which concentrates 14.8% of the students enrolled. This doctorate is also taught online, and unlike the others that

occupy the majority of the enrollment, it does not yet have any graduates.

2.3. Accredited doctoral programs

a. General information

As shown in Table 5, nine accredited doctoral programs in education comply with this standard, and one of them (with the exception of the re-accreditation process resulting from COVID) is in the process of re-accreditation. Only five resolutions of their accreditation reports were found.

Table 5
Accredited doctoral programs in Chile

Doctorate Name	Universities	Duration of doctorate	Years of accreditation
In Education*	UAH/UDP	4	2017-2021
In Mathematics Didactics	PUCV	4	2019-2023
In Education	UCM/UCSC/UCT/UBB	4	2019-2023
In Education	PUC	6	2022-2028
In Education	UMCE	2	2021-2023
In Education	UBO	2	2022-2024
In Education	UTA	3	2022-2025
In Mathematics Education	ULAGOS	3	2022-2025
In Mathematics Didactics	UCM	4	2022-2026

Note: *An extension has been granted due to COVID and is in the process of re-accreditation.

Source: Own elaboration, 2022 based on data from SIES (2021); and CNA (2022a).

The number of students enrolled in these programs is 249, equivalent to 54% of the total number of students enrolled in the doctoral programs this research covers. Additionally, it was detected that during the year 2022, the doctoral program in mathematics education at ULAGOS, and the doctorate in education at UBO, despite being accredited, did not enroll new students.

b. Doctoral academic staff

Table 6 shows the number of faculty members that report doctoral programs on their websites. No information was found for the doctoral programs of the Universidad de Concepción and the Academia de Humanismo Cristiano (all these programs are closing). A similar situation occurs with a recently created doctoral program at the Universidad de Chile.

Table 6
Number of faculty members by doctoral program

Number of informed faculty members	Universities	Program
36	TOTAL CONSORCIO	Doctorate in Education Consortium
30	PUC	Doctorate in Education
28	UMCE	Doctorate in Education
20	UDP/UAH	Doctorate in Education
17	UNAB	Doctorate in Education and Society

Cont... Table 6

11	UTA	Doctorate in Education
10	PUCV	Doctorate in Mathematics Didactics
10	UDP	Doctorate in Higher Education
9	UBO	Doctorate in Education
9	PUCV	Doctorate in Science Didactics
8	USEK	Doctorate in Education
8	ULAGOS	Doctorate in Mathematics Education
8	UCM	Doctorate in Physical Activity Sciences
7	UCM	Doctorate in Mathematics Didactics

Source: Own elaboration, 2022 based on the revision of the programs' websites.

c. Admission criteria

The requirements for admission into doctoral programs differ significantly according

to their nature, but they have common elements based on the legislation and the graduate profile of the doctoral student. Table 7 shows the application requirements for accredited doctoral programs.

Table 7
Requirements for applying to accredited doctorate programs

Doctorate	University	Requirements
In Education	UCSC/UCM/ UCT/UBB	-A pre-research project consisting of the lines of research of the program. -Letter of interest -Concentration of bachelor's and/or master's degree transcripts -Research and professional experience in related areas -2 letters of recommendation from researchers with experience in education.
In Education	PUC	-A pre-research project consistent with the lines of the program. -Letter of interest -Concentration of bachelor's or master's degree grades including ranking of graduation position in their promotion -2 letters of recommendation -English proficiency -Experience consistent with the profile of the program
In Education	UMCE	-A pre-research project consistent with the lines of the program. -Letter of interest -2 letters of recommendation from academics -English proficiency -Two years of experience in the educational field -Hold a university degree or master's degree in the educational field.

Cont... Table 7

In Education	UAH/UDP	A pre-research project consistent with the lines of the program. Letter of interest Undergraduate or Master's degree transcript including the ranking of the graduation position in his/her promotion. 2 letters of recommendation English proficiency through English certification Experience associated with the profile of the program
In Education	UBO	A pre-research project consistent with the lines of the program. Letter of interest 2 letters of recommendation where at least one is from a researcher in the field of education Experience associated with the program profile Possession of a graduate or master's degree in the field of education. Submit a work experience survey/Rendir cuestionario sobre experiencia laboral
Doctorate in Mathematics Didactics	PUCV	Admission Examination Hold a graduate or master's degree in mathematics, didactics of mathematics, education or similar. 2 letters of recommendation from academics Work or research experience in education or similar fields Letter of interest
Doctorate in Mathematics Education	ULAGOS	A pre-research project compatible with the program's lines of research. Cover letter Concentration of bachelor's or master's degree transcripts 3 letters of recommendation Proficiency in English through certification Possession of a master's degree in didactics, mathematics or similar areas. Admission test
Doctorate in Mathematics Didactics	UCM	A pre-research project consistent with the lines of the program. 2 letters of recommendation from researchers of national or international trajectory. Evidence of technical proficiency in English for the reading of documents. Experience linked to the publication of scientific articles Hold a master's degree or equivalent that has been nationally or internationally accredited in the areas of mathematics, didactics or similar. Admission test to measure knowledge of didactics.

Source: Own elaboration, 2022 based on the review of the programs' websites.

Table 8 contains the application requirements for non-accredited doctoral programs that have been in operation for at least 3 years.

Table 8
Requirements for applicants to non-accredited doctoral programs

Doctorate	University	Requirements
Doctorate in Education and Society	UNAB	A pre-project of research consistent with the lines of the program. Letter of interest Concentration of bachelor's or master's degree grades, including the ranking of graduation position in their promotion. 2 letters of recommendation English proficiency through certification Experience associated with the program profile

Cont... Table 8

Doctorate in Science Didactics	PUCV	<p>A pre-research project aligned with the program's lines of research. Application cover letter A transcript of bachelor's or master's degree grades. 2 letters of recommendation from academics one of which must be foreign and the other national Proficiency in English through certification Work or research experience in education Admission exam Bachelor's or Master's degree in science didactics or equivalent.Examen de admisión Grado de licenciado o de magister en didáctica de las ciencias o similares.</p>
In Education	USEK	<p>A pre-project of research consistent with the lines of the program. Cover letter Hold a bachelor's or master's degree in the field of education.</p>
Doctorate in Physical Activity Sciences	UCM	<p>A pre-research project consisting with the lines of the program. 2 letters of recommendation one of which must be associated with the undergraduate training and the other with the master's degree. Experience in publishing at least 2 scientific articles indexed in either Scielo or Scopus.</p>
In Higher Education	UDP	<p>A pre-research project consistent with the lines of the program. Application Letter Concentration of bachelor's or master's degree transcripts 2 recommendation letters, at least one from an academic with a doctorate degree. Previous experience in publishing scientific articles. Hold a master's degree or equivalent.</p>

Source: Own elaboration, 2022 based on the review of the programs' websites.

Recently created programs are shown in Table 9. In the case of the Ph.D. program at the Universidad de Tarapacá, this program has been accredited for three years (the maximum for new programs). The program at the Universidad de Chile started its first admission process in 2022.

Table 9
Application requirements for new doctoral programs

Doctorate	University	Requirements
In Education	UTA	<p>A pre-research project compatible with the program's lines of research. Cover letter Concentration of bachelor's or master's degree grades including the ranking of the graduation position in their promotion. 2 letters of recommendation from academics with doctorate degree (external to the university). English proficiency through certification Research or work experience in education</p>
In Education	UCH	<p>A preliminary research project consistent with the lines of the program. Academic training associated with education programs either at the undergraduate, master's or doctorate level. Concentration of grades of the last highest academic degree previously obtained. Academic experience associated with the publication of scientific articles and research projects. Certificate of intermediate-advanced level in English for Spanish-speaking students and Spanish for non-Spanish-speaking students. Full dedication to the program.</p>

Source: Own elaboration, 2022 based on the review of the programs' websites.

d. Research areas of the doctoral programs

Table 10 shows multiple research areas of the doctorates, with two being the

minimum number (doctorate from UCM, UMCE, UTA, and Consortium) and seven the maximum declared (doctorate from PUC).

Table 10
Research areas of PhD programs

Doctorate	University	Research areas
Didactics of Mathematics	UCM	Problem Solving and Mathematical Modeling Teacher Training Development of Mathematical Thinking
Physical Activity Sciences	UCM	Physical Activity and Health: Sports Performance
Mathematics Education	ULAGOS	History, epistemology and sociocultural aspects of mathematics. Didactics of the various mathematical frameworks. Mathematics teacher training
Didactics of Mathematics	PUCV	Teacher training Modeling and Technology Specific mathematical thinking.
Science Didactics	PUCV	Teacher professional development in science Science Teaching and Learning Philosophy, Epistemology, Nature and History of Science
Education	USEK	Does not report
Education	UBO	Social processes and education Curriculum and teaching innovation and quality. Research on professional knowledge and pedagogical and didactic actions.
Education	UTA	School learning, diversity and culture Higher education
Education	UAH/UDP	Educational policy and social justice Leadership, teachers and learning Higher education, work and youth trajectories.
Education	UCM/UCSC/UCT/UBB	Teacher education and learning Education and interculturality
Education	UCH	The Teaching Profession and its Practice. School Education Historical, Philosophical, Economic and Sociological Bases of Education. Neurosciences, Education and Learning

Cont... Table 10

Education	PUC	Teacher education and teacher professional development. Policy, equity and difference in education, leadership and school improvement. Higher education. Foundations and meanings of education. School teaching and learning. Early childhood teaching and learning. Educational measurement and evaluation.
Education	UMCE	Diversity and Education. Educational System and its Contexts. Interdisciplinarity and Education
Education and Society	UNAB	Well-being and Socioemotional Education Language, Education and Society Public Policies in Education
Higher Education	UDP	Political Economy of Higher Education Systems Academic Institutions and Organizations Academic and University Management Profession Higher Education and Social Change

Source: Own elaboration, 2022 based on the review of the programs' websites.

The research areas are fundamental when guiding students to determine which program is the closest to their interests. However, they are also important when approaching the accreditation process since the National Accreditation Commission requests that, for each declared research line in the doctoral program, there must be a faculty that can support it. The minimum number of academics per line is seven, and they must have the qualifications to carry out the required lectures.

The productivity required for accreditation of doctoral programs in the area of education is divided into, on the one hand, individual requirements for each academic and, on the other hand, requirements that must be met as a percentage of the faculty. Individually, each academic in education must have published 5 scientific articles in the last 5 years, where at least 3 publications are indexed in Web of Science (Wos) or Scopus. In one, they must be the main author. The remaining two publications must be published in peer-reviewed journals indexed in Scielo, Latindex catalog 2.0, and Redalyc, among others (CNA,

2016; 2018). Publications in journals indexed in Emerging Sources Citation Index are not considered.

The group orientation of the faculty requires that at least 60% of the academics must have been awarded in the last 5 years as principal investigator, a research project of external competitive funds such as Fondecyt (Fondo Nacional de Desarrollo Científico y Tecnológico), FONIS (Fondo Nacional de Investigación y Desarrollo en Salud), FONIDE (Fondo de Investigación y Desarrollo en Educación), FONDEF (Fondo de Fomento al Desarrollo Científico y Tecnológico), FONADIS (Fondo Nacional de la Discapacidad), MILENIO (Iniciativa Científica Milenio), CNED (Consejo Nacional de Educación), CNA (Comisión Nacional de Acreditación), and Research Centers.

Those members of the faculty who do not meet the above criteria must have internal research projects as responsible researcher or co-investigator. These projects must be contestable and contemplate the following conditions in their bases: (1) Evaluation by peers external to the unit that grants funding

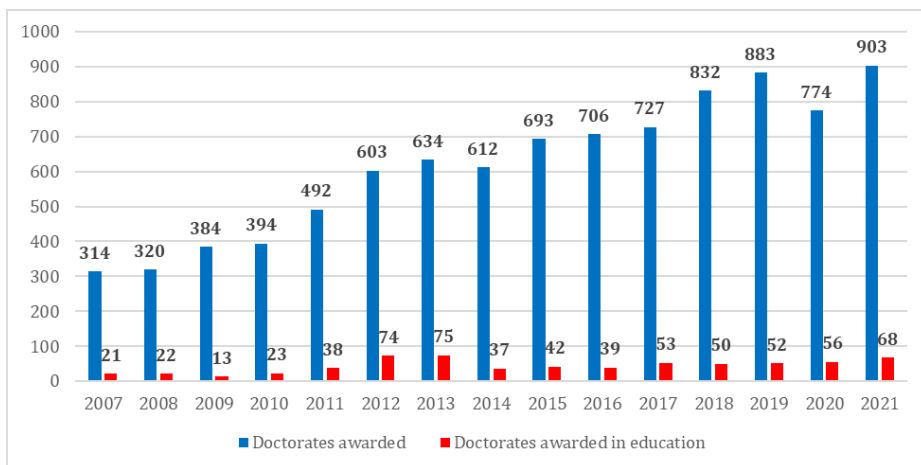
to the project, and, in addition, the review must contemplate using a blind methodology; (2) Minimum duration of 1 year; (3) As a requirement for closure, have demonstrated indexed publications associated with the project (CNA, 2018).

e. Program graduates

From 2007 to 2021, 9,271 people obtained a doctoral degree in Chilean

universities (SIES, 2021). In the case of education programs, during the period, a total of 663 graduates were awarded doctoral degrees, which represents 7.15% of the total.

Graph III shows how the number of new PhDs tends to rise, but in education, the number of new PhDs increased significantly during 2012 and 2013 and then fell sharply. This figure can be explained by the closure of several doctoral programs in the area, which probably accelerated the process of those students who were close to or in a position to complete their studies.



Source: Sistema de Información de Educación Superior (SIES, 2021).

Graph III: Total awarded doctorates and doctorates in education Chile 2007-2020

Table 11 shows all graduates of current and non-current doctoral programs associated with education from 2007 to 2021. The number of graduates from current programs is 112, representing 20.66% of the total number

of graduates during the period. Meanwhile, in the case of graduates from programs that are no longer in effect (those that are no longer offering classes or have closed their admission of new students), the total number of graduates is 542.

Table 11
Number of graduates by current and non-current Ph.D. programs for the 2007-2020 period

Graduates of current Doctorate Programs in education areas		
Name	University	No. of Graduates
Doctorate in education consortium	UBB/UCM/UCT/UCSC	29
Doctorate in mathematics didactics	PUCV	27
Doctorate in education	UMCE	23
Doctorate in education	UDP/UAH	16
Doctorate in education	PUC	8
Doctorate in higher education	UDP	8
Doctorate in education and society	UNAB	1
Graduates of Doctoral Programs in education NOT in effect		
Doctorate in Educational Policy and Management	UPLA	77
Doctorate in Education	UAHC	48
Doctorate in Education	UMAR	35
Doctorate in Educational Sciences	UFRO	31
Doctorate Educational Administration and Management	UAC	28
Doctorate Educational Sciences, with specialization in Intercultural Education	USACH	27
Doctorate in Education	USEK	26
Doctorate in Curriculum and Didactics	UAC	26
Doctorate in Evaluation and Accreditation	UAC	23
Doctorate in Educational Sciences	ULS	22
Doctorate in Culture and Education in Latin America	UARCIS	21
Doctorate in Education with specialization in Transformational Learning	UB	18
Doctorate in Education	UDEC	17
Doctorate in Education with a Specialization in Pedagogical Mediation	ULS	11
Doctorate in Mathematics Education	ULAGOS	6
Doctorate in Education	UBO	4
Doctorate in Education and Development	ULARE	3
Doctorate in Educational Sciences, with Specialization in curriculum and didactics	ULL	2
Doctorate in Psychology and Education	UCEN	1
Doctorate in Educational Sciences	UPLA	1
Doctorate in Education	ULARE	1
Doctorate in Educational Sciences, with specialization in Educational Governance and Management	ULL	1
Doctorate in Educational Sciences with specialization in Evaluation and Accreditation	ULL	1

Source: Sistema de Información de Educación Superior (SIES, 2021).

f. Analysis of program accreditation documents.

The following are the resolutions published by the National Accreditation Commission, outlining the reasons for the accreditation of each doctoral program in the area of education.

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f.1. Doctorate in Education Universidad Metropolitana de Ciencias de la Educación (UMCE)

The first corresponds to the doctoral program in education at the Universidad Metropolitana de Ciencias de la Educación, which was accredited for two years, from

September 2021 to September 2023. The institutional context of the university allows development according to the program's needs and is supported by the postgraduate objectives of the university.

Among the highlights of the admissions process, it highlights the high rate of applicants and a low acceptance rate, which should be mentioned in numerical terms in the resolution. The existence of a comprehensive offering of 17 elective courses in the program, of which at least 4 must be taken, stands out. Overall, they consider that the assessment mechanisms and organization of the courses are adequate for this level of training.

The program's graduation rate is considered low in the analyzed period, it has a high attrition rate, and the current graduation time is more than two years over the 4 formal years of the program. The program has 65 permanent academics, 28 of whom make up the faculty, and 37 are collaborators. The doctorate also declares the participation of 17 visiting scholars. The program's faculty has an average of 1.4 publications per academic year in Wos/Scopus journals.

Among the criticisms of the program, the existence of an asymmetry in the number of publications among the different lines of research is highlighted. Additionally, it is argued that some of its publications are not directly related to the educational field and that there needs to be more interdisciplinary justification to explain them. The bibliography is also criticized for being primarily based on references in Spanish and needs to be updated. Finally, it is mentioned that it needs better outreach and international relations activities.

f.2. Doctorate in Education Universidad Alberto Hurtado (UAH) and Universidad Diego Portales (UDP)

The doctoral program taught jointly by the Alberto Hurtado and Diego Portales universities, meanwhile, is currently in the

process of re-accreditation, therefore, the information provided below corresponds to its previous process approved on December 11, 2017 (CNA, 2022b).

There is a declared high demand for the PhD, thus between 2012 and 2017, 152 people applied, of which 18 were accepted (12% acceptance rate). It is reported that for the 2013 cohort, the graduation rate of the program corresponds to 25%, while the dropout rate for the period 2013-2017 is 11% (2 out of 18 students).

The program is composed of 34 permanent academics, of which 17 are part of the faculty, and all of them have full-time dedication in the respective universities (33 to 44 hours per week); it is also reported the participation of 24 visiting professors. The productivity of the program is reflected in an average of 2.5 publications in Web of Science per faculty member between 2012-2016. Also, it is stated that faculty members average 0.9 Fondecyt projects awarded as responsible researchers.

Regarding the academics who direct theses (18 in total), all of them have at least one publication in Wos, Scopus, or Scielo and have been awarded a tenderable research project as a responsible researcher in the last 5 years.

The doctoral program declares 4 lines of research: (1) Educational policies and equity; (2) the school and the classroom; (3) teachers; and (4) education and work. Each of the lines is supported by at least 2 members of the faculty. However, in the accreditation, it was found that the education and work line was only integrated by one member of the faculty and a graduate student who supported this line, with no other academic collaborator.

Finally, in the conclusions, the accreditation commission highlights the coordination of the universities to manage the program and the strengths in terms of links that this inter-institutional union has allowed, and the exchange of academics and students.

f.3. Doctorate in Education from the Pontificia Universidad Católica de Chile

The doctoral program in education at the Pontificia Universidad Católica de Chile is accredited for 6 years (2022-2028), and given the context of the pandemic, it was extended for one year. The information below comes from the resolution approving the accreditation (CNA, 2022b).

The doctorate has 7 lines of research: (1) School learning; (2) early childhood teaching and learning; (3) higher education; (4) teacher training and teacher professional development; (5) educational measurement and evaluation; (6) foundations and meanings of education; and (7) policy, equity and difference in education, leadership and school improvement. Each of these is supported by at least two faculty members.

The demand for the doctoral program in 2012-2016 was declared high, given that 178 people applied, of which 45 were accepted (it has an acceptance rate of 25%). Only two applicants did not formalize their enrollment.

The graduation rate for 2007-2012 is 44% (24 graduates out of 54 students); however, of the 39 possible graduates, only 2 students in the period 2012-2016 managed to graduate in the planned time of the program (4 years). The dropout rate for 2007-2016 is 13.6% (12 students).

For their graduation process, students must comply with one of two alternatives: a traditional thesis or compendium of 3 published scientific articles (one must be published in journals indexed in WoS or Scopus of quartiles 1 or 2, according to Scimago). Those students who follow the traditional thesis path must also present an article published in WoS or Scopus journals. Productivity associated with graduate students in 2012-2016 is 99 indexed articles and 22 non-indexed articles.

The program's academic staff is composed of 56 permanent professors, of which 33 belong to the faculty and 23 are collaborators; in addition, the participation of 31 visiting scholars is declared. All faculty

members have a full-time dedication at the university (between 33 to 45 hours per week). The productivity of the faculty, as reported from 2012 to 2016, averages 1.9 WoS publications per academic. Regarding Fondecyt projects with faculty academics as responsible researchers, the average is 1.06 in the same years.

The accreditation report questions that 51% of the theses are concentrated in 5 academics from the faculty, although it is mentioned that there is progress since the previous accreditation process.

f.4. Doctorate in Consortium UBB/UCT/UCSC/UCM

In the case of the doctorate in education taught jointly by the universities of Bio-Bio, Católica de la Santísima Concepción, Católica del Maule, and Católica de Temuco, it has been accredited for 4 years between November 2019 and November 2023. Given the difficulty of organizing a doctoral program between 4 institutions in different cities, a Consortium Steering Committee was created, composed of the postgraduate directors of each university. At the headquarters level, there is an inter-university academic committee composed of the program directors of each university. With these arrangements, the program resolves some of the criticisms made of the organization in the first instance.

Regarding the admission process, it is considered adequate for the objectives pursued by the program. During the 2015-2019 period, there were 208 applicants, of which 83 were admitted (40% acceptance rate); of these, 70 formalized their enrollment. Notably, 37% of its students are from other universities, and 6% are international students. Regarding the students' background, 81.4% come from education programs, and the remaining percentage comes from health, social sciences, engineering, and biology careers.

The program consists of 4 years, and to obtain the degree, the candidate must submit a WoS/Scopus publication as the first author

associated with the university of the doctoral program. The actual time spent in the program is 4.4 years for the 2015-2019 cohort. At the time of accreditation, the six existing graduates had 19 publications in Wos/Scopus journals and 14 book chapters.

The graduation rate for 2014-2015 is 27.3%; this represents a total of 6 students out of a possible 22. Students must choose between the 4 universities, given that the doctoral degree is associated with one of them; of these 6 graduate students, 2 are from Católica del Maule, 1 from Católica de la Santísima Concepción and 3 from Católica de Temuco. The Universidad del Bio-Bio had no graduates for this period.

The academic staff comprises 48 tenured professors, of which 27 are faculty members and 21 are collaborators. The program does not declare visiting professors, and the proportion of academics per university is homogeneous, which was well valued by the accreditation.

The productivity of the faculty is 3.7 Wos publications per academic (2014-2018); in projects, it is 1.1 Fondecyt per academic as a responsible researcher. The academics adequately support the declared lines of research, but in different ways in each site of the doctoral program.

The program's efforts compared to the previous accreditation process are appreciated. However, it still reveals problems such as a bibliography based on literature mainly in Spanish and the need for mechanisms to resolve academic and administrative problems among the different universities. The low graduation rate up to this process is a matter of concern. Therefore, they are requested to reinforce the thesis elaboration process to be homogeneous among the different institutions.

f.5. Doctorate in mathematics didactics Pontificia Universidad Católica de Valparaíso (PUCV)

Likewise, the doctoral program in Didactics of Mathematics offered by the

Pontificia Católica de Valparaíso is accredited for 4 years between November 2019 and November 2023. It stands out as the only accredited program in didactics out of the four currently existing.

Students' selection and admission process is criticized since, at the time of being accredited, the applicant had two modalities (3 and 4 years of duration, respectively). In the first one, there is an exam on general knowledge of mathematics didactics, but there is no mention of the procedure for the second one.

In 2015-2019, 68 people applied, of which 30 were accepted; this implies a rate of 44.11%. Regarding their disciplinary origin, it is highlighted that 74% are graduates in mathematics and similar programs; the remaining percentage comes from education, civil engineering, or mathematical engineering programs. Concerning institutional origin, 26% of the students come from the PUCV, 59% are from other national institutions, and only 15% are international students.

The doctorate has two modalities: 3 years and 4 years. The difference resides in training in the discipline of didactics of mathematics. Both are full-time, face-to-face, daytime programs. Compared to other accredited doctoral programs, the updating of the bibliography is not questioned, but the low amount of literature in other languages, particularly in English, is questioned. The completion of a traditional doctoral thesis is established to obtain the degree, and there is no request to present scientific articles; only the credits and activities associated with the program must be accomplished. Regarding scientific productivity, the graduates of the period (2015-2019) have published 76 articles, but only 13% are from Wos/Scopus/Scielo journals.

The graduation rate of the 3-year mode is 65% (11 out of 17 possible), while the 4-year mode has a graduation rate of 80% (8 out of 10 possible). The actual time to complete the program is 4 years for those in the short modality (3 years) and 4.5 years for those in the extended modality (4 years). In its

8 years of operation, the program has had no dropouts, and its graduates work in research and university teaching teams.

The academic staff comprises 13 permanent professors, 9 of whom are faculty members and 4 are collaborators. In addition, the program has 6 visiting professors. The faculty members are all Ph.D. holders in disciplines related to the program profile. Their productivity is 0.6 Wos publications per academic between 2014 and 2018. Likewise, 8 Fondecyt projects have been awarded as responsible researchers. There is evidence that all the lines of the program are supported, although the area of mathematical thinking does not have any academician of its own.

Conclusions

Through this study, it has been possible to explore the reality of graduate programs in Chile in general and, in particular, that of doctoral education programs. According to the SIES (2021 and 2022), of the total number of universities in Chile (58), 70.7% have doctoral programs; practically half of the enrollment (47.71%) of doctoral programs is centered in three houses of studies: Universidad de Chile and Pontificia Católica de Chile with 37.88% and Universidad de Concepción with 9.83%. It was also identified that there is a correspondence between the universities with the highest number of Ph.D. students enrolled and the number of articles published in journals indexed in the Scopus database.

Regarding doctorates in education, of the 10 currently in force, 60% are accredited (doctorates from the following universities: UDP/UAH, PUC, UMCE, UBB/UCM/UCSC/UCT, PUCV and UTA). The fact that two of the programs are associative, the other one from an entity specialized in education and the remaining one from one of the universities that produce the most research and postgraduate training in Chile, supposes as a possible obstacle to offering these programs, the difficulties in forming an academic staff, due to the requirements related to scientific

production and the awarding of sufficient projects that allow accrediting them (even though since 2019 the productivity guidelines of the certifiable academics have decreased).

Another factor to be considered is the number of research areas offered by these programs, given that the more lines, the more academics the programs need to increase the number of academics. The information available on the respective web pages shows that the doctoral programs report a low number of academics; it is possible that this information has not been updated, though except for those programs that are accredited, most of them have fewer reported academics than those they should have to accredit the programs.

Furthermore, the scholarships granted by the State -such as the National Agency for Research and Development (NARD) scholarship for doctoral studies- are only awarded to people who are enrolled in or applying to programs that are accredited; this implies that the demand for the programs cannot be higher unless they are accredited. Consequently, as has become noticeable, we only had access to information on accredited programs, and in these cases, the demand far exceeds the available quota.

It was interesting to observe that among the doctoral programs -in the areas of education- that trained the most PhDs, there were or are institutions that no longer exist or are in the process of closing, either because of their low levels of quality or their financial problems (Universidad Bolivariana, Universidad del Mar, Universidad de la República, Universidad ARCIS). Among these institutions, they trained 78 PhDs. However, suppose we add institutions without institutional accreditation (Universidad de Aconcagua) and institutions that have not yet obtained autonomy (Universidad de los Leones). In that case, they total 159 PhDs, representing 29.34% of the total number of PhDs trained between 2007 and 2022 in the areas of education.

Another interesting factor to highlight among these educational entities is the number

of different educational programs they provide, to the extent that in the case of the Universidad de Aconcagua and the Universidad de los Leones, three different programs could be observed in the course of only a few years.

Regarding the research areas of the doctorates, those of mathematics teaching and science didactics are noteworthy. Concerning the doctorates in education that do not have a declared line -at least in the name of the programs- these usually have elements of teacher training, philosophy, and historical and sociological bases of education or similar; there are also areas such as public policies and management, and initial or higher education, depending on the emphasis of the programs, following the same pattern with leadership and the areas related to physical activity.

It is disturbing to observe so few institutions with doctoral programs in force and, even more so, to realize that not all institutions have them. It could be thought that Chile does not need more academics with this degree, but the opposite proves to be true since out of a total of 34,558.8 academics (JCE), only 30.48% have it.

This line of research is not limited; in the future, the reasons for this scarce doctoral offer in the educational field should be explored from the point of view of the different interest groups, extending this research to the rest of Latin America and the Caribbean.

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