Bibliographical Survey on Special Education and Teaching Science in Brazil[1]

Levantamento Bibliográfico sobre Educação Especial e Ensino de Ciências no Brasil

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ABSTRACT: With the World Declaration of Education for All, Brazil has opted to build an inclusive education system. Thus, it is necessary that Special Education is also the subject of research on Teaching Science, but studies indicate that there is little research in this area. As such, the aim of this work was to carry out a national bibliographical survey to evaluate how the research area of teaching Science has approached the Special Education theme. The bibliographic research was carried out in line with the revision procedures defined by Content Analysis and used six journals of strata A1 and A2 defined by CAPES qualis as corpus of information. The searches were carried out from five descriptors: inclusion, inclusive education, special education, special educational needs and teacher education. According to the selection criteria, only 28 papers were found: 15 on teaching Science and learning; 12 on the education of Science teachers from the perspective of Special Education and one on evaluation and curriculum for Special Education. Most of these works were written by Éder Pires de Camargo and Anna Maria Canavarro Benite, and the teaching of Physics for the visually impaired is the theme that has been published the most. The publications began in 2006, reaching the largest number of publications in 2015. The results show that the amount of research in this area is still incipient, having little representation compared to the total number of publications in the best evaluated journals.

KEYWORDS: Teaching Science. Special Education. Bibliographic survey.

RESUMO: Com a Declaração Mundial de Educação para Todos, o Brasil optou por construir um sistema de educação inclusivo. Desse modo, é necessário que a Educação Especial seja também objeto de pesquisa sobre o Ensino de Ciências, mas estudos indicam que há pouca pesquisa na área. Assim sendo, o objetivo deste trabalho foi realizar um levantamento bibliográfico nacional e avaliar como a área de pesquisa em ensino de Ciências tem abordado a temática Educação Especial. A pesquisa bibliográfica foi realizada por meio dos procedimentos de revisão definidos pela Análise de Conteúdo e utilizou como *corpus* de informação seis periódicos acadêmico-científicos de estratos A1 e A2 definidos pelo *qualis* da CAPES. As buscas foram realizadas a partir de cinco descritores: inclusão, educação inclusiva, educação especial, necessidades educacionais especiais e formação de professores. Em função dos critérios de seleção, foram encontrados apenas 28 artigos: 15 sobre ensino e aprendizagem de Ciências; 12 sobre formação de professores de ciências na perspectiva da educação especial e 1 sobre avaliação e currículo para a Educação Especial. Esses trabalhos, em sua maioria, foram escritos por Éder Pires de Camargo e Anna Maria Canavarro Benite, e o ensino de Física para deficientes visuais é a temática que mais tem sido publicada. As publicações tiveram início em 2006, com o maior número de publicações em 2015. Conclui-se que ainda é incipiente o número de pesquisas na área, possuindo pouca representatividade frente ao total de publicações nas revistas mais bem avaliadas da área.

PALAVRAS-CHAVE: Ensino de Ciências. Educação Especial. Levantamento bibliográfico.

1 Introduction

Between 1990 and 2000, Special Education assumed the form of an educational modality regulated by laws and guidelines. Due to the World Conference on Education for All, organized by UNESCO in 1990, the World Declaration on Education for All was established with the aim of boosting efforts to provide adequate education for the whole population at different levels of education and to set objectives and goals to meet basic educational needs

[1] http://dx.doi.org/10.1590/S1413-65382418000300003

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for children, youth and adults (Organização das Nações Unidas para a Educação, a Ciência e a Cultura [UNESCO], 1990). In 1994, a meeting was held in Salamanca with the purpose of providing principles, policies and practices on Inclusive Education, in addition to expanding the concept of Special Educational Needs (Declaração de Salamanca, 1994).

Indeed, when agreeing to the World Declaration on Education for All, Brazil opted to build an inclusive education system, initiating a legal process of transformation in the educational system. Article 58 of the *National Education Guidelines and Framework Law*[4] (LDB), from 1996, defines special education as '[...] the modality of school education, preferably offered in the regular network of education, for students with special needs [...]' (Lei nº 9394, 1996, p. 25).

In 2001, the National Guidelines for Special Education (DNEE) regulated the articles present in LDB and normalized the inclusive premises that were in international debates on school inclusion (Garcia & Michels, 2011). Between 2003 and 2010, according to Garcia and Michels (2011), the Federal Government implemented programs that delimited new forms for education policies regarding Special Education: Program of implementing multifunctional resource rooms (it implemented rooms with resources necessary for the specialized educational service); Inclusive education program: the right to diversity (education of teachers and managers to transform educational systems into inclusive systems); and Inclusion Program (proposes actions for the access of people with disabilities to Federal institutions of Higher Education).

In line with LDB and DNEE proposals, data from the 2009 school census regarding the enrollment of students with disabilities in the regular school system showed a significant increase: from 43,923 in 1998 to 387,031 in 2009 (Camargo & Anjos, 2011). Therefore, it is evident that the inclusion of students with disabilities in Brazilian Basic Education schools has been advancing.

In spite of these quantitative advances, there are still several difficulties for the construction of an inclusive educational system. According to Garcia (2006), Brazilian politics defined groups of people who need specific policies for their schooling, when the term Special Educational Needs (NEE) was established. To the author, this term refers to students who do not follow the pedagogical work of the regular school, emphasizing the individual differences, as proposed by the Declaration of Salamanca. Thus, when the separation of students into specific target groups is established, the Brazilian education policy establishes that the school must adapt to the diversity of students (Garcia, 2006). However, establishing

> […] the conception of special needs present in the documentation collected is not enough to overcome a clinical approach, besides making the obscurity of inequalities present in the current learning processes possible and placing once again the responsibility for success or failure on students, individually, it contributes to the diffusion of a 'democratic' and 'politically correct' school image (Garcia, 2006, pp. 304-305).

[4] Note of translation: The translation used here was the same used in the document *World data on Education*, compiled by UNESCO. Retrieved February 10, 2018 (Available from http://www.ibe.unesco.org/fileadmin/user_upload/Publications/WDE/2010/pdf-versions/Brazil.pdf).

In this way, instead of including all students, the Brazilian educational system paradoxically excludes certain individuals based on their disabilities. On the curricular contents, Garcia (2006) points out that in the regular classroom, students with disabilities must learn contents with practical and instrumental applicability and in the special class, they must learn activities related to autonomy and social life. Therefore, restricted access to scholarly knowledge is evident.

The author calls curricular flexibilization the choice of what should be taught to students with disabilities. In the context of Special Education, this implies the reduction of contents to be learned according to the Special Needs of each student (Garcia, 2006). The National Curricular Guidelines (known as PCN) contemplate individual differences and diverse treatment within the same curriculum, proposing diversified resources and methods (Parâmetros curriculares nacionais, 1998). However, what happens in practice is the elimination of basic contents of the curriculum when the student does not have the conditions to achieve it (Garcia, 2006). In view of this, the Brazilian Special Education policies propose flexibility for students with disabilities that deplete the historically accumulated content. Therefore, by not democratizing the knowledge produced by man, the school, from a historical-critical perspective, will not fulfill its legitimate job of enabling the humanization of individuals with disabilities (Saviani, 2011).

Thus, we note that public policies that regulate the education of people with disabilities have presented significant legal advances, as observed by the implementation of measures that emphasize the differences of the students and establish methods and resources so these students may learn. However, when we consider what has been done, we find that in spite of the current political discourse, the schooling of students with disabilities still happens based on social assistance and social integration. In an inclusive educational system, Brazilian schools should provide students with and without disabilities, the adequate means for appropriating the knowledge historically accumulated by humanity and legitimized in the curricular structures of formal education at different levels.

Thus, including students with disabilities in the regular education network implies giving them the same learning opportunities as the curricular contents defined for all, as well as a space for socialization and minimum qualification. In this regard, considering that the 1996 LDB ratifies the compulsory teaching of Natural Science in Basic Education, it is imperative that students with disabilities also have the opportunity to learn this area of knowledge.

According to Bego (2016), as an area of knowledge, as well as Arts, Languages and Human Sciences, Natural Sciences are a historical and sociocultural heritage of humanity to which every citizen has the right of access. Considering school as the institution whose role consists of the socialization of systematized knowledge (Saviani, 2011), it is up to these formal spaces to democratize this knowledge in order to broaden students' worldview and culture so that they act in a competent and critical way in the society in which they live (Bego, 2016). Thus, school education has the central objectives of identifying the cultural elements that need to be assimilated by individuals so that they become humanized and discover the most appropriate methodologies for this process (Saviani, 2011).

Thus, in order to provide an educational environment that is considered inclusive, Viveiro and Bego (2015, p. 10) affirm that '[…] the challenges posed by the inclusive educational process are multifaceted, encompassing different aspects of school education and social dynamics'. For the authors, among the various aspects of the problem to be addressed, one of the imperative aspects is precisely the '[...] need for investments in research that allow the specific needs of each special educational need to be addressed and lead to the advancement and consolidation of inclusion in order to guarantee the academic success of the students' (Viveiro & Bego, 2015, p. 6).

Regarding the research aspect of the Teaching of Sciences and Special Education interface, the work of Lippe and Camargo (2009) had already pointed out that there is little research in the area. According to the authors, until the 1990s, the area did not investigate themes about Special Education and that, despite the recent growth of research within the theme, there were still many investigations to be carried out, since many schools (public and private) had already initiated actions of school inclusion and various challenges were beginning to emerge.

In this sense, the important work of Camargo and Anjos (2011) presents a historical retrospective on the development of the line of research of inclusive education within the area of Teaching Science, when they analyzed works of conclusion of disciplines and courses; pre-projects and projects for scientific initiation, master's and doctoral studies; mini-courses and papers. The work highlights that, from 2005 to 2010, 46 works related to this line were published. Of that total, 39 dealt with teaching Science and visual impairment and addressed the subject of multisensory materials, conducting teaching activities, teacher education, teaching and learning, bibliographic survey and alternative conceptions. Seven papers dealt with teaching Science and visual impairment, with the teaching and learning and teacher education topics being those worked on.

In the last century, there have been two major meetings to establish guidelines for Special Education and, from this, the creation of public policies so that the inclusion of people with disabilities in the education system is effective. However, for this to occur, it is necessary that Special Education be the subject of research on teaching Science. Hence, this paper aims to map the main research approaches in the area of teaching Science and Special Education, in papers published in journals A1 and A2 of the teaching area. Thus, we try to answer two questions: 'What approaches have been used in the researches in Special Education in the best academic-scientific journals in the area of teaching Science?'; and 'What are the main aspects absent in research in the area of teaching Science and Special Education?'.

2 Development

In view of the proposed objective, this research used the bibliographic review procedures defined by Content Analysis (CA) proposed by Bardin (2011). According to the author, CA is a systematic analytical method that assists in the organization and standardization of the data collected, analysis of the text and its meaning. Vosgerau and Romanowski (2014) argue that a bibliographic review requires a systematic and organized analysis of the data, due to that we chose CA.

The data corpus was constituted from academic-scientific journals of the strata A1 and A2 in the area of teaching Science defined by CAPES qualis, in the evaluation carried

out in 2014. The delimited strata are justified as the system of classification of national and international journals Qualis-Periodicals of CAPES and indicates the periodicals in which there are publications that represent the intellectual production of Brazilian excellence postgraduate programs of a certain area of knowledge. Thus, six journals were selected for analysis of all online digital collection available on their respective websites: Annals of the Brazilian Academy of Sciences - Annals of ABC (A2); Science and Education - C&E (A1); Research Essay on Science Education - *Ensaio* (A2); Investigations in Education in Sciences - IENCI (A2); Brazilian Journal of Special Education - RBEE (A1); and Brazilian Journal of Research in Education in Sciences - RBPEC (A2).

After this process we selected the terms that relate to teaching Science and Special Education. We have defined the following search descriptors: *inclusão*, *educação inclusiva*, *educação especial*, *necessidades educacionais especiais* e *formação de professores* (respectively *inclusion*, *inclusive education*, *special education*, *special educational needs* and *teacher education*). In relation to the journal RBEE, due to its specificity of publication in the area of Special Education, the term *special education* was replaced by *teaching Science*, since the journal is not specific to the area of teaching Science.

The searches related to the journals Annals of ABC, C&E, *Ensaio* and RBEE were carried out using quotation marks and the terms were typed without accent on the SciELO platform. The IENCI and RBPEC journals have the search tool on their websites and the terms were searched using quotation marks. The searches were carried out in December 2016. In order for the survey to be homogeneous, we selected only papers in which the descriptors mentioned above existed in the title, abstract or keywords.

2.1 Quantitative distribution

From the search descriptors of the six journals and the defined sampling criteria, we selected 28 papers, presented in Table 1.

Category	Annals of ABC	C&E	*Ensaio*	RBEE	RBPEC	IENCI
Available works	*	572	369	*	386	394
Retrieved works by search tool or manually	13	91 (15.9%)	61 (16.5%)	192	52 (13.5%)	80 (20.3%)
Selected	0	9 (9.9%)	4 (6.6%)	5	5 (9.6%)	5 (6.3%)
Excluded	0	82 (90.1%)	57 (93.4%)	0	47 (90.7%)	75 (93.7%)

Table 1 - Quantitative distribution of the works according to the sources with the respective percentages of selected works in relation to the total available and excluded works in relation to the analyzed ones
Source: Elaborated by the authors.
* Total number of works not available at the time of search.

According to the data presented in Table 1, in the journal Annals of ABC, 13 papers were found using the search terms; however, none fit the desired theme. In the C&E journal, only 15.9% of the works were related to the terms used in the research, and of the 91 papers found, only 9 (9.9%) dealt with the theme of Special Education and Teaching Science. In

the journal *Ensaio*, the percentage of papers found was slightly higher, at 16.5% (61 papers); however, only 6.6% (four) of the papers dealt with the desired theme. In RBEE, we found 192 using the search terms and only 5 were selected for analysis. In RBPEC, the number of papers retrieved in the search was lower than in the previous two journals, only 52 (13.5%). The number of papers on Special Education and Teaching Science is comparable to the C&E journal, with a total of 9.6% (5 papers). In the last researched source, IENCI, there was a significant increase in the number of papers retrieved by the research using the terms selected, totaling 20.3% (80 papers), but only 5 (6.3%) addressed the research topic. Since the total number of papers published in the Annals of ABC and RBEE within the period of the research was not available, it was not possible to show the percentage of papers found and selected.

Thus, in spite of the small number of papers that deal with the theme of Special Education in the field of Teaching Science, we can affirm that C&E and RBPEC journals have been the ones with the highest relative percentage of papers published within the theme since its creation, since both have a higher percentage of publications, about 10% of the total, in relation to the total number of papers retrieved by the search with the selected terms. In absolute terms, C&E stands out with the publication of 9 papers on the subject.

2.2 General characterization of texts on Special Education and teaching Science

In addition to the quantitative survey about the frequency with which this theme appears in journals A1 and A2 of Teaching Science and Special Education, we sought to identify: the main authors and the frequency with which they appear in the 28 papers selected; the Institutions of Higher Education (IHE) in which these surveys were carried out; the keywords, the research methodology and the main conclusions. The results were organized in Tables 2 to 6.

Source	Year	Title	Authors	IHE
C&E	2006	The Physics education for visually impaired people from a phenomenological perspective	Costa, Neves, & Barone	IFG; UFG; SEDUC
C&E	2010	Communication as a barrier for including visual handicapped pupils in mechanics classes	Camargo	UNESP
C&E	2010	Inclusive education in trainee teachers' perception of licensed [sic] in Chemistry	Vilela-Ribeiro & Benite	UFG
C&E	2012	Training of Physics Teachers: the question of inclusion of students with visual impairments in mainstream education	Lima & Castro	UERJ; UNIGRANRIO
C&E	2013	Scientific education and inclusive education in the discourse of Science teacher trainers	Vilela-Ribeiro & Benite	UFG
C&E	2013	Inclusion of a blind student in a chemistry education teachers' undergraduate program	Regiani & Mol	UFAC; UnB
C&E	2015	The sharing of meaning in Physics class and the work of the interlocutor of Brazilian Sign Language	Pessanha, Conzendey, & Rocha	UFSCar; USP
C&E	2015	Trajectory of the training of Science teachers for inclusive education in Goiás, Brazil, from the perspective of participants in a collaborative network	Pereira, Benite, Padilha, Mendes, Vilela-Ribeiro, & Benite	IFG; UFG; SEDUC
C&E	2016	The emergence of algebraic thinking in the activities of deaf learners	Fernandes & Healy	UNIAN

Table 2. Comparative survey of the texts analyzed in the journal C&E
Source: Elaborated by the authors.

Source	Year	Title	Authors	IHE
Ensaio	2010	Adequate and inadequate communicational context for the inclusion of visually-impaired students in Mechanic classes	Camargo & Nardi	UNESP
Ensaio	2011	Social representations of undergraduate Physics students regarding social inclusion of visually impaired persons	Lima & Machado	USP; UNIRIO
Ensaio	2011	Inclusive education and Science teacher training: the role of universities in the preparation of future teachers	Oliveira, Antunes, Rocha, & Teixeira	UFG
Ensaio	2012	Analysis of inclusive process in a state school in the municipality of Bauru: the voice of a student with vision impairment	Lippe, Alves, & Camargo	UNESP

Table 3. Comparative survey of the texts analyzed in the journal *Ensaio*
Source: Elaborated by the authors.

Source	Year	Title	Authors	IHE
IENCI	2006	Physics teaching and visual deficiency: learning activities about the concept of acceleration of gravity	Camargo, Silva, & Barros Filho	UNESP; UNICAMP; USM
IENCI	2007	Future high school teachers' difficulties and alternatives found to planning electromagnetism activities designed for visual handicapped students	Camargo & Nardi	UNESP
IENCI	2012	Social networks as space for discursive interactions on the training of science teachers for inclusive education	Pereira & Benite	UFG
IENCI	2015	The importance of tutoring in teaching Natural Sciences with special student	Costa, Lima, Stadler, & Carletto	UTFP
IENCI	2015	Analysis of teacher relations with teaching in classroom with prospects to be inclusive	Passos, Arruda, & Passos	UEL

Table 4. Comparative survey of the texts analyzed in the journal IENCI
Source: Elaborated by the authors.

Source	Year	Title	Authors	IHE
RBEE	2008	Using accessible language with students with visual impairment when studying Optics	Camargo & Nardi	UNESP
RBEE	2013	Rereading concepts related to Astronomy in Brazilian sign language dictionaries: implications for translation/ interpretation	Alves, Peixoto, & Lippe	USP; UNICAMP
RBEE	2014	Teaching mathematics to students with intellectual disability in youth and adult education	Brito, Campos, & Romanatto	UNESP; UFSCar
RBEE	2014	Interactions between deaf students, teachers and interpreter in physics classes: a Vygotskian perspective	Vargas & Gobara	UFMS
RBEE	2016	Blind students and the learning of Genetics in classroom: teacher's and student's perceptions	Rocha & Silva	UFF

Table 5. Comparative survey of the texts analyzed in the journal RBEE
Source: Elaborated by the authors.

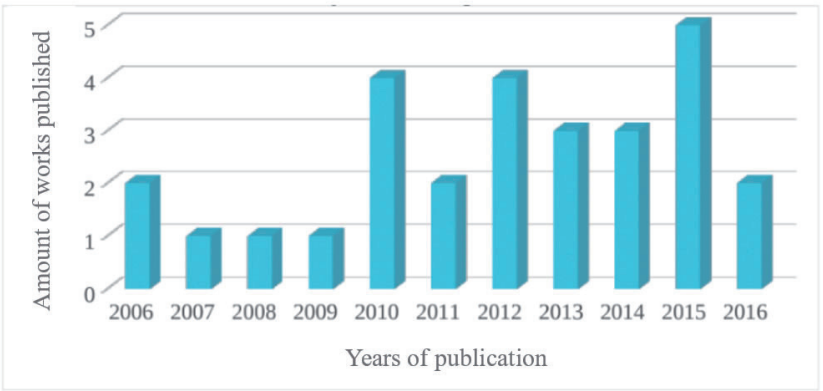
Fonte	Ano	Título	Autores	IHE
RBPEC	2009	Science's Teachers Formation in Social Network: A dialogical perspective on Inclusive Education	Benite, Pereira, Benite, Procópio, & Friedrich	UFG
RBPEC	2010	Communication as a barrier to the inclusion of visually impaired students in Modern Physics classes	Camargo, Nardi, & Correia	UNESP
RBPEC	2012	Didactic material for Biology Education: Inclusion possibilities	Vaz, Paulino, Bazon, Kiill, Orlando, Reis, & Mello	UNIFAL; UFSCar
RBPEC	2014	Teaching Solar System for students with and without visual impairment: proposal for an inclusive education	Rizzo, Bortolini, & Rebeque	IFRS
RBPEC	2015	Studies about the relationship between the LIBRAS interpreter and teacher: implications for the science education	Oliveira & Benite	UFG

Table 6. Comparative survey of the texts analyzed in the journal RBPEC
Source: Elaborated by the authors.

In the four sources studied, we found a total of 61 distinct authors, of whom 4 were repeated with different frequencies. The author that appears the most is PhD Prof. Éder Pires de Camargo, with a total of 7 (25%) papers found. Then, PhD Prof. Anna Maria Canavarro Benite appears in 5 (17.9%) of the works found. Another 2 researchers appeared more than once in the works, with a frequency of 14.3% (4 papers) and 10.7% (3 papers): PhD Prof. Roberto Nardi and PhD Prof. Eveline Vilela-Ribeiro, respectively. The other authors appeared only once or twice among the 28 papers analyzed. Therefore, the main researchers of the theme in the country are Éder Pires de Camargo and Anna Maria Canavarro Benite.

About the Institutions of Higher Education, 22 different ones appear. Of this total, UNESP is indicated in 8 papers (28.5%). Another IHE with considerable frequency is UFG with 7 papers, representing a frequency of 25%, followed by USP, with a total of 5 papers (17.9%). Finally, UNICAMP and UFSCar both appear in 3 studies (10.7%). The other Institutions are pointed out once. It can be affirmed that the State of São Paulo has been one of the most prominent research centers on Special Education in the area of teaching Science. Regarding the research methodology, all the papers were made up of empirical research with a qualitative approach. This fact reveals the absence of more comprehensive research on the subject in the form of large surveys or researches with qualitative-quantitative delineations.

Regarding the temporal distribution, we can see in Graph 1 that in the year 2015, 5 papers were published, followed by 4 papers published between the years 2010 and 2012. In 2013, there were 3 papers, while in 2006, 2011 and 2016, 2 papers were published in the sources researched. Finally, during the years 2007, 2008 and 2009 only 1 paper was published.



Graph 1. Amount of papers published over the years
Source: Elaborated by the authors.

Although the *National Education Guidelines and Framework Law* (LDB) has defined Special Education as a modality of teaching in regular schools since 1996, the publications referring to the subject studied are recent, with greater representativeness in the years 2010, 2012 and 2015. The data found corroborate Lippe and Camargo's findings (2009), since, according to the authors, until the 1990s, the area of Science Education did not address the theme of Special Education. It is possible to affirm that the implementation of a specific line of research on inclusive education, around 2005 (Camargo & Anjos, 2011), has boosted the publications within the area in the last 5 years, demonstrating a gradual development.

2.3 Keywords and themes involved in the works analyzed

When we analyzed the 28 papers on School Inclusion and Teaching Science, we noticed 57 different keywords, shown in Table 7. The most frequent term, used 12 times, was 'deficiência visual' (visual impairment), followed by 'inclusão' (inclusion), which appears 10 times. The terms 'ensino de física' (teaching Physics); 'ensino de ciências' (teaching Science) and 'educação inclusiva' (inclusive education) were indicated 8 and 7 times, respectively. 'Formação de professores' (Teacher education) appears 5 times and, finally, 'inclusão escolar' (school inclusion) and 'educação especial' (special education) 4 times. Other terms are indicated only once or twice. These data show that most of the works are related to the teaching of Physics for the visually impaired and to the education of teachers in the scope of inclusive education, besides showing that the most used terms to refer to the researched theme are inclusion, school inclusion, inclusive education and teaching Science. According to the keywords and titles of the papers analyzed, it is possible to perceive that the teaching of Physics for the visually impaired is the most published theme in the reviewed journals. In contrast, few studies dealt with other disabilities, such as auditory and mental disabilities. In addition, there are few works within the theme in the context of teaching Chemistry, Mathematics and Biology.

Keywords	Frq	Keywords	Frq	Keywords	Frq
Physics Teaching	8	Digital learning environment	1	Multisensory teaching	1
Visual impairment	12	Conceptions	1	Teaching of Astronomy	1
School inclusion	4	Mechanics	1	Modern Physics	1
Hearing deficiency	1	Communication	2	Courseware	1
Deafness	1	Special education	4	Network teacher education	1
Brazilian Sign Language	2	EJA – Education of Youth and Adults	1	Discursive interactions	1
Inclusion	10	Deaf students	1	Acceleration	1
Discourse Analysis	1	Interaction	1	Gravity	1
Initial education	1	Educational Inclusion	1	Activities of teaching of electro-magnetism	1
Teacher education	5	Mechanics teaching	1	Physics teacher education	1
Teaching Science	8	Communication context	1	3x3 Matrix	1
Inclusive education	7	Teachers' relationships	1	Teaching of Natural Sciences	1
Content analysis	1	Relationship with knowledge	1	Tutor teacher	1
Visually impaired	1	Intellectual disability	2	Education	1
Special educational needs	1	Social representation	1	Teaching aids	1
Higher education	1	Educational Inclusion	1	Teaching	1
Chemistry teaching	1	Undergraduate teaching courses	1	Astronomy	1
Mathematical education	2	Curriculum	1	Algebraic thinking	1
Deaf learners	1	Deaf	2	Interpreter of Brazilian Sign Language	1

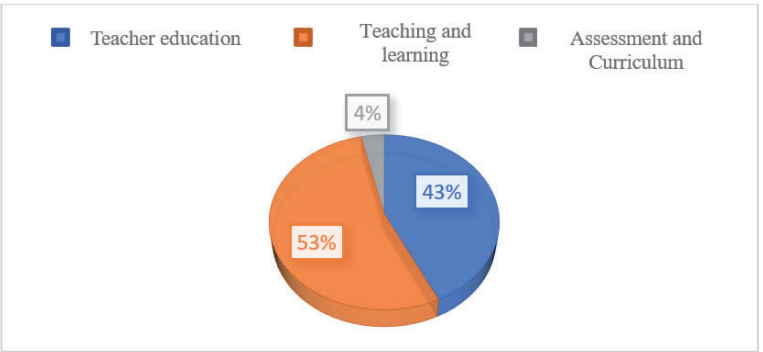
Table 7. Keywords and frequency (frq) in the selected papers
Source: Elaborated by the authors.

Regarding the themes, 15 papers (53%) addressed Teaching and Learning in Teaching Science for students with some type of Special Educational Need, representing more than half of the works analyzed. These papers emphasize that communication acts as the main barrier to the inclusion of these students in regular classrooms. In addition, the importance of planning is evident, which should happen together with the resource room teacher, and the application of classroom activities that stimulate student learning through the diversification of didactic strategies.

In relation to teacher education in the perspective of Special Education, 12 studies were found (43%), whereas only 1 (4%) addressed the evaluation and curriculum in the perspective of school inclusion. The investigations point out that, in general, there is a lack of preparation by teachers towards inclusion, but collaborative networks can be a good space for teacher education, both initial and continuing, as they favor the exchange of experiences, specialized reading of the topic and discussions. The only paper that addressed Evaluation and Curriculum for special education highlights the lack of disciplines on the subject in the initial education of teachers, stating that the lack of preparation of the teacher in the regular network derives from the lack of contact with the subject during the undergraduate studies.

It is interesting to note that, when we analyzed the production of the latter years of the area investigated, it is possible to identify a dialectical relationship between research interests arising from intrinsic academic concerns and the demands from programs instituted by the State. In the period from 2003 to 2010, the programs of the Federal Government, previously mentioned, aimed at the implementation of the resource rooms for specialized

assistance for students with disabilities, which demanded research on teaching Science and the learning of students with disabilities, as well as the education of teachers and managers for the inclusive school, requiring systematic research on initial teacher education. This fact shows the importance of public policies related to the promotion of academic research on the subject. The themes were defined based on the full reading of the texts (Graph 2).



Graph 2. Thematic areas involved in the analyzed works
Source: Elaborated by the authors.

From the data listed in the previous sections, we can see the scarce number of publications in the analyzed journals compared to the total number of publications since the creation date. Lippe and Camargo (2011), in a survey of the main approaches to research in the area of Special Education and Teaching Science in papers published in the same journals analyzed in this work and in the annals of the National Encounter of Research in Education in Science (ENPEC) showed the same tendency pointed out in our discussion. There is a predominance of research related to teaching Physics for the visually impaired, while other areas and disabilities have been poorly researched, indicating that in the last five years this trend has not undergone significant variations within the area. This fact points to both the need of the quantitative extension of the research within the thematic and to the necessity of diversification in regard to the disabilities investigated in the context of teaching Science.

3 Conclusion

Faced with the number of papers available for research in the 6 delimited journals, only 28 papers dealt with the theme of Teaching Science associated with Inclusion, Inclusive Education, Special Education, Special Educational Needs and/or Teacher education. Of these 28 papers selected for analysis, 9 were from the C&E journal, the RBPEC, IENCI and RBEE journals each contained 5 papers, and *Ensaio* had 4 papers. The C&E and RBPEC journals presented the highest percentage of papers in total, approximately 10%, that discussed the theme of inclusive education and teaching Science. However, it is possible to affirm that the number of publications on teaching Science and Inclusive Education interface is still very small compared to the total number of publications of these journals to this day.

Regarding the affiliations and authorship of the publications, the authors Éder Pires de Camargo and Anna Maria Canavarro Benite have been the greatest national exponents of Inclusive Education in the area of Teaching Science. With the exception of UFG, the public universities of São Paulo are the institutions where the most research has been done on the subject. This evidences that the researches in the area have been carried out mainly by the same research groups, since two authors are responsible for most of the publications in quality journals. This fact also indicates the need for actions aimed at the expansion of research groups that focus on the subject of Inclusion in the field of Teaching Science in other regions of the country.

Regarding the methodological approach, all the works analyzed present a qualitative approach, very characteristic in the area of Education, in general, and Teaching Science in particular. This data reveals the absence of more comprehensive work with quantitative approaches. On the one hand, according to the keywords present in the selected papers, it is possible to conclude that the teaching of Physics for the visually impaired has been the most published theme in the reviewed journals. On the other hand, few studies dealt with the teaching of Chemistry, Mathematics and Biology, as well as other disabilities, such as auditory and intellectual. The most used terms to refer to the research topic are inclusion, school inclusion, inclusive education and teaching Science.

The publications in the reviewed journals began in 2006, with the largest number of publications in 2015. Therefore, despite the fact that the implementation of a specific line of research on Inclusive Education has driven the publications within the area in the last 5 years, it is concluded that the number of researches is still incipient, having little representation compared to the total number of publications in the best evaluated journals in the area. It is worth mentioning that publications on inclusive education within the area of teaching Science began only 10 years after Inclusive Education became a teaching modality in Basic Education, showing that this area is very recent and arose from the demand for actions for inclusion of students with disabilities regarding Natural Science learning.

The regulatory-normative acts in force in the country and the pedagogical practice about Special Education, when giving a caring and inclusive character to the inclusion of students with disabilities in the regular school and guiding towards a flexible curriculum as a legitimate possibility (Garcia, 2006), paradoxically point out, from a historical-critical perspective, for the non-inclusion of students with disabilities. If schooling is responsible for the process of humanization of individuals through educational work, and this consists of the '[…] act of producing, directly and intentionally, in each individual, the humanity that is produced historically and collectively by all men' (Saviani, 2011, p. 13), students with disabilities cannot be deprived of access and conditions for appropriation of knowledge of real world (Science), valorization (Ethics) and symbolization (Art) properties.

Finally, we emphasize that the evidence of the still small number of researches in the teaching Science/Special Education interface, although growing, reflects the lack of academic interest in the subject; additionally it reflects the need for public policies to foster and support the academic community with regard to the theme of Inclusive Education in all its dimensions for all the contents of the school subjects. Thus, we agree with Viveiro and Bego (2015, pp. 11-12) that '[…] inclusive education, speaking in Kantian terms, presents itself as a categorical

imperative for a society that calls itself democratic', and, in this sense, the academic-scientific community plays a fundamental role in its realization.

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Received on: 12/14/2017

Reformulated on: 03/10/2018

Accepted on: 03/20/2018