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Educational Research, Sapele : International Research Journals, v. 2, n. 6, p. 1237-1242, June 2011
<http://www.producao.usp.br/handle/BDPI/50058>

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Full Length Research paper

Profile of Brazilian Academic Production in Science Education for Individuals with Special Educational Needs: 1979-2010

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Accepted 22 June, 2011

In this article, we characterize the Research in Science Education for Individuals with Special Educational Needs based on the academic production published in national scientific periodicals (magazines) in the area of Science Education, in the period 1979 to 2010. The methodology used included routines of bibliographical and documentary research. The results highlight recurring themes, tendencies and topics insufficiently explored.

Keywords: Science education, special educational needs, inclusive education, physics education

INTRODUCTION

The present work deals with the problematic of science education for individuals with special needs in the context of inclusive education (The current proposal for Inclusive Education is based on the Salamanca Statement (Brazil, 1994) –a Document approved on 10 June 1994, at the World Conference on Special Needs, in Salamanca, in Spain–, which aims to ensure the integration of individuals with special needs into the school environment and the development of their capabilities using suitable means. It is a process that seeks to guarantee to everyone the universal right to education, independently of individual differences or limitations, with equality of opportunities, conditions of access and quality (Veríssimo, 2001).

In Brazil, despite four decades of tradition in science education research, there is still little known about this respect, it being the case, therefore, of a question that has not been sufficiently explored in a systematic manner (Costa, 2004).

In this study, we map and evaluate the knowledge produced in the area of Science Education, between 1979 and 2010, (Founding of the first Brazilian periodical in the area of science education: the Revista Brasileira

de Ensino de Física [The Brazilian Journal of Physics Teaching]) with the aim of outlining a profile (“state of the art”) of Brazilian academic production focused on individuals with special educational needs in this context (Ferreira, 2002). Among other aspects, we were interested in the identification of the most recurrent themes of study, present tendencies and topics not sufficiently explored.

In this sense, decidedly bibliographical in character and restricted to the academic production in science education, the main source of data for the research was the national academic periodicals that publish the results of research in this field of knowledge, in the period mentioned; we limited our attention to this modality of data source due to the fact that academic magazines concentrate significantly on this type of production.

Furthermore, it should be noted that it is starting from the decade of the 1970s and, more systematically, at the beginning of 2000 that the problem of school inclusion (The process by which the school system adapts so as to be able to include every individual adequately in the ordinary school. This is essentially a process in which the aim is to effectively offer equal opportunity of schooling for all with equal conditions of access and quality. To include everyone the existing school has to be modified on the basis of understanding that it is the school itself that needs to be capable of meeting the needs of its

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Table 1. Articles Published from 1979-2010: General.

Periodical														YE A R	T O T A L
RBEF	CBEF		RIEC	RCE	REPEC		RFNE		RAbrapec						
Magazine Issues/Articles Published															
2	16													1979	
4	35													1980	
4	29													1981	
1	7													1982	
2	17													1983	
2	14	1	9											1984	
2	14	3	24											1985	
1	7	3	25											1986	
1	4	3	29											1987	
1	13	4	37											1988	
1	12	4	33											1989	
1	13	4	31											1990	
1	12	3	26											1991	
4	39	3	31											1992	
1	20	3	32											1993	
1	14	3	26											1994	
4	38	3	22											1995	
4	36	3	21	3	14									1996	
4	51	3	25	3	9									1997	
4	58	3	25	3	11									1998	
4	73	3	30	3	10	2	17	1	5					1999	
4	83	3	29	3	11	2	14	2	9	1	10			2000	
4	63	3	30	3	14	2	17	2	10	2	22	3	36	2001	
4	52	4	40	3	15	2	20	2	10	2	23	3	20	2002	
4	52	3	24	3	13	2	20	2	12	2	28	3	16	2003	
4	62	4	70	3	13	3	41	2	10	2	23	3	24	2004	
4	81	3	26	3	18	3	37	3	16	2	36	3	17	2005	
4	69	3	24	3	18	3	26	2	12	2	33	3	12	2006	
4	83	3	26	3	18	3	28	2	18	2	31	3	12	2007	
4	35	3	33	3	18	3	39	2	18	2	29	3	18	2008	
4	67	3	31	3	24	3	36	2	18	2	20	3	20	2009	
4	65	4	33	3	16	3	45	3	33	1	12	3	15	2010	
T o t a l	Issues	93	85	45	31	25	20	30						329	
	Articles	1234		792		222		340		153		267		190	3198

pupils (Mendes, 2006) is considered more seriously (Brazil, 2008; Mendes, Id.), becoming the object of public policies and shaping demands for scientific research (development of technological resources, content and teaching materials etc.) and teacher training in the light of the observed scenario.

Below, we describe the methodological procedures employed in this investigation.

METHODOLOGY

The methodology employed consisted of the application of procedures of bibliographical and documentary research, incorporating a bibliographical survey, analysis of the works identified (study of the content of the documents found) and a description of the whole corpus of documents.

The survey of the bibliographical data of interest to the research included direct consultation with the résumés of issues of the periodicals considered, from the

period 1979 to 2010. We analyzed the information extracted from the main national periodical publications for the dissemination of science educational research, namely: 1) Revista Brasileira de Ensino de Física [The Brazilian Magazine of Science Teaching] (RBEF); 2) Caderno Catarinense de Ensino de Física [The Caterinense Journal of Physics Teaching] (or the Caderno Brasileiro de Ensino de Física [The Brazilian Journal of Physics Teaching]) (CBEF); 3) Revista Investigações em Ensino de Ciências [Research into Science Teaching Journal] (RIEC); 4) Revista Ciência & Educação [Science & Education Journal] (RCE); 5) Revista Ensaio-Pesquisa em Science Education [Experiment-Research in Science Education Journal] (REPEC); 6) Revista A Física na Escola [Physics in the School Journal] (RFNE); and, 7) Revista da Associação Brasileira de Pesquisa em Educação em Ciências [Journal of the Brazilian Association for Research in Science Education] (RAbrapec).

Above in Table 1, we present the quantitative distribution

Table 2. Articles Published from 1979-2010: Specifics.

	Periodical						YEAR	TOTAL
	RBEF	CBEF	RIEC	RCE	REPEC	RFNE		
0	0	0	0	0	0	0	1979	0
0	0	0	0	0	0	0	1980	0
0	0	0	0	0	0	0	1981	0
0	0	0	0	0	0	0	1982	0
0	0	0	0	0	0	0	1983	0
0	0	0	0	0	0	0	1984	0
0	0	0	0	0	0	0	1985	0
0	0	0	0	0	0	0	1986	0
0	0	0	0	0	0	0	1987	0
0	0	0	0	0	0	0	1988	0
0	0	0	0	0	0	0	1989	0
0	0	0	0	0	0	0	1990	0
0	0	0	0	0	0	0	1991	0
0	0	0	0	0	0	0	1992	0
0	0	0	0	0	0	0	1993	0
0	0	0	0	0	0	0	1994	0
0	0	0	0	0	0	0	1995	0
0	0	0	0	0	0	0	1996	0
0	0	0	0	0	0	0	1997	0
0	0	0	0	0	0	0	1998	0
0	0	0	0	0	0	0	1999	0
0	1	0	0	0	0	0	2000	1
0	0	0	0	0	0	0	2001	0
0	0	0	0	0	0	0	2002	0
0	0	0	0	0	0	0	2003	0
0	0	0	0	0	0	0	2004	0
0	0	0	0	0	0	0	2005	0
0	0	1	2	0	0	1	2006	4
1	0	0	0	0	1	0	2007	2
2	0	0	0	0	1	1	2008	4
0	0	0	0	0	1	1	2009	2
0	0	0	3	1	0	1	2010	5
Total	3	1	1	5	1	3	4	18

of articles published in these periodicals, between 1979 and 2010.

Similarly, Table 2 outlines the distribution of articles identified in these periodicals, between 1979-2010, which deal with science education for individuals with special needs. Table 3 presents the bibliographical descriptors of the works analyzed.

In addition, Table 4 outlines the distribution of the topics of a didactic-pedagogical nature, by focus and type of special need, dealt with in the articles analyzed.

RESULTS AND CONCLUSION

The survey of the articles published in the period 1979-2010 in the periodicals selected from the area of science education reveals that this type of production grew significantly in this period, increasing from 40, in 1994, to

219, in 2010, with an accumulation of 3,198 studies between 1979 and 2010.

Of this total, 18 articles tackled questions pertinent to the education of individuals with special needs, with 5 of these focusing on the teaching of optics, 6 on the teaching of mechanics, 1 on the teaching of astronomy, 1 on the teaching of modern physics, 2 concentrating on general aspects of the physics teaching to individuals with special educational needs and 3 on inclusive education.

These papers represent approximately 0.6 per cent of the total production accumulated in the period 1979-2010, with one being published in 2000, four in 2006, two in 2007, four in 2008, two in 2009, and five in 2010. In addition, out of all these papers, thirteen take experimentation as the main didactic component, and only two of them deal with hearing loss, the rest, exclusively with visual impairment. In general terms, the

Table 3. Bibliographical descriptors.

1. DOMINICINI, T.P.; OLIVEIRA, E.; SARRAF, V.; GUERRA, F.D. Atividades de observação e identificação do céu adaptadas às pessoas com deficiência visual. [Activities of observation and identification of the sky adapted for individuals with visual impairment.] *Rev.Bras.Ens.Fís.*, São Paulo, v. 30, n. 4, p. 4501/1-4501/8, 2008.
2. CAMARGO, E.P.; NARDI, R.; VERSZTO, E.V. A comunicação como barreira à inclusão dos alunos com deficiência visual em salas de óptica. [Communication as a barrier to the inclusion of pupils with visual impairment in optics classes.] *Rev.Bras.Ens.Fís.*, São Paulo, v. 30, n. 3, p. 3401/1-3401/13, 2008.
3. CAMARGO, E.P.; NARDI, R. Dificuldades e alternativas encontradas por licenciandos para o planejamento de atividades de ensino de óptica para alunos com deficiência visual. [Difficulties and alternatives encountered by trainee teachers in the planning of activities for the teaching of optics to pupils with visual impairment.] *Rev.Bras.Ens.Fís.*, São Paulo, v. 29, n. 1, p. 115-126, 2007.
4. VILELA-RIBEIRO, E.B.; BENITE, A.M.C. A educação inclusiva na perspectiva dos professores de química. [Inclusive education from the perspective of chemistry teachers.] *Ciência & Educação*, Bauru, v. 16, n. 3, p. 585-594, 2010.
5. BORGES, F.A.; COSTA, L.G. Um estudo de possíveis correlações entre representações docentes e o ensino de ciências e matemática para surdos. [A study of possible correlations between teacher representations and the teaching of science and mathematics to the deaf.] *Ciência & Educação*, Bauru, v. 16, n. 3, p. 567-583, 2010.
6. CAMARGO, E.P. A comunicação como barreira à inclusão de alunos com deficiência visual em aulas de mecânica. [Communication as a barrier to the inclusion of pupils with visual impairment in mechanics classes.] *Ciência & Educação*, Bauru, v. 16, n. 1, p. 259-275, 2010.
7. CAMARGO, E.P.; SILVA, D. O ensino de física no contexto da deficiência visual: análise de uma atividade estruturada sobre um evento sonoro: posição de encontro de dois móveis. [Physics teaching in the context of visual impairment: analysis of a structured activity around an acoustic event.] *Ciência & Educação*, Bauru, v. 12, n. 2, p. 155-169, 2006.
8. COSTA, L.G.; NEVES, M.C.D.; BARONE, D.A.C. O ensino de física para deficientes visuais a partir de uma perspectiva fenomenológica. [Teaching physics to individuals with visual impairment from a phenomenological perspective.] *Ciência & Educação*, Bauru, v. 12, n. 2, p. 143-153, 2006.
9. CAMARGO, E.P.; NARDI, R.; CORREIAO, J.N. A comunicação como barreira à inclusão de alunos com deficiência visual em aulas de física moderna. [Communication as a barrier to the inclusion of pupils with visual impairment in modern physics classes.] *Rev.Abrapec*, Belo Horizonte, v. 10, n. 2, 2010.
10. BENITE, A.M.C.; PEREIRA, L.L.S.; BENITE, C.R.M.; FRIEDRICH, M. Formação de professores de ciências em rede social: uma perspectiva dialógica na educação inclusiva. [Training of science teachers in the public school network: a dialogic perspective on inclusive education.] *Rev.Abrapec*, Belo Horizonte, v. 9, n. 3, 2009.
11. DICKMAN, A.G.; FERREIRA, A.C. Ensino e aprendizagem a estudantes com deficiência visual: desafios e perspectivas. [Teaching and learning for students with visual impairment: challenges and perspectives.] *Rev.Abrapec*, Belo Horizonte, v. 8, n. 2, p. 38-51, 2008.
12. PAIVA, A.P.S. Utilizar as TIC para ensinar física a alunos surdos: estudo de caso sobre o tema "a luz e a visão". [Using TICs to teach physics to deaf children: case study on the topic of "light and vision".] *Rev.Abrapec*, Belo Horizonte, v. 6, n. 3, p. 1-28, 2006.
13. CAMARGO, E.P.; SILVA, D.; BARROS FILHO, J. Ensino de física e deficiência visual: atividades que abordam o conceito de aceleração da gravidade. [The teaching of physics and visual impairment: activities that deal with the concept of the acceleration of gravity.] *Inv.Ens.Ciênc.*, Porto Alegre, v. 11, n. 3, p. 343-364, 2006.
14. CAMARGO, E.P.; SCALVI, L.V.A.; BRAGA, T.M.S. Concepções espontâneas de repouso e movimento de uma pessoa deficiente visual total. [Spontaneous conceptions of rest and movement of an individual with complete visual impairment.] *Cad.Cat.Ens.Fís.*, Florianópolis, v. 17, n. 3, p. 307-327, 2000.
15. CAMARGO, E.P.; BIM, C.; OLIVO, J.S.; FREIRE, R.L.H. Disco de newton multissensorial. [Multi-sensory Newton's disk.] *Fís.Esc.*, São Paulo, v. 10, n. 2, p. 36-37, 2009.
16. CAMARGO, E.P.; NARDI, R.; MACIEL FILHO, P.R.P.; ALMEIDA, D.R.V. Como ensinar óptica para alunos cegos e com baixa visão? [How to teach optics to blind and partially-sighted pupils?] *Fís.Esc.*, São Paulo, v. 9, n. 1, p. 20-25, 2008.
17. CAMARGO, E.P. É possível ensinar física para alunos cegos ou com baixa visão? Proposta de atividades de ensino de física que enfocam o conceito de aceleração. [Is it possible to teach physics to blind and partially-sighted pupils? Proposal for teaching activities that center on the concept of acceleration.] *Fís.Esc.*, São Paulo, v. 8, n. 1, p. 30-34, 2007.
18. CAMARGO, E.P.; NARDI, R. Contextos comunicacionais adequados e inadequados à inclusão de alunos com deficiência visual em aulas de mecânica. [Adequate and inadequate communication contexts for the inclusion of pupils with visual impairment in mechanics classes.] *Ensaio-Pesq.Ed.Ciênc.*, Belo Horizonte, v. 12, n. 2, p. 27-48, 2010.

Table 4. Topics, Type of Special Need and Methodological Focus.

Topics (Specific Subjects)	Special Need	Focus	Occurrence
Inclusive Education (Representations)	Hearing Loss	Descriptive	1
Inclusive Education (General Aspects, Teacher Training)	-	Descriptive	2
Teaching of Optics (Technologies of Information, Communication and Light)	Hearing Loss	Experimental	1
Teaching of Optics (Communication; Planning; Method)	Visual Impairment	Experimental	3
Teaching of Optics (Experimentation)	Visual Impairment	Experimental	1
Teaching of Physics (General Aspects Gerais)	Visual Impairment	Descriptive	2
Teaching of Mechanics (Propagation of Sound; Acceleration of Gravity; Rest/Motion)	Visual Impairment	Experimental	4
Teaching of Mechanics (Communication)	Visual Impairment	Experimental	2
Teaching of Modern Physics (Communication)	Visual Impairment	Experimental	1
Teaching of Astronomy	Visual Impairment	Experimental	1
Total			18

examination of the academic production in the area of science education published in these periodicals, between 1979 and 2010, reveals that:

- from the point of view of content, there is a wide range of physics topics that have yet to be sufficiently explored by educational research aimed at the education of individuals with special needs (modern and contemporary physics, electricity, magnetism, waves etc.);

- the most recurrent topics identified belong to: geometrical optics, classical mechanics and astronomy;

- the pedagogical aspects included in the approach to these topics were: teacher representations, teacher training, information technologies, didactic planning and communication;

- although the promulgation of the *Salamanca Statement*, in 1994, established the guidelines for inclusive education, there is still a dearth of research in the areas aimed at the education of individuals with special needs.

Finally, the hope remains that science educational research will become linked to the training of teachers (Fonseca and Costa, 2010), and that its results will serve to enrich curriculum components such as “Special Didactics” or “Instrumentation for Teaching” keeping in mind the challenge of improving teacher performance in the light of the contemporary demands of special educational needs.

ACKNOWLEDGMENTS

This work was partially supported by FAPESP (State of

São Paulo Research Foundation) and by CNPq (National Council for Scientific and Technological Development).

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