

ANEXO

GUÍA DE PREGUNTAS DE LA ENTREVISTA

A. Descripción del profesor/a

Sexo, Edad, especialidad (licenciatura), años de experiencia docente, años de experiencia de uso de las tecnologías en clase, y materias que imparte.

B. Cuestiones

1. ¿En su centro se utiliza algún medio tecnológico para impartir las clases? ¿Cuál/es?
2. ¿Usted utiliza algún medio tecnológico en su clase?, ¿Cuál?, ¿Con qué frecuencia?, ¿En qué asignatura/s? y ¿Cómo lo utiliza?
3. ¿A nivel organizativo qué obstáculos encuentra para su uso?
4. ¿Tiene formación acerca del uso de la tecnología?
5. En caso afirmativo ¿lo ha recibido en cursos de la administración o por su propia cuenta?
6. ¿Piensa que necesita más formación en medios tecnológicos?
7. ¿Cree que la administración potencia el uso de tecnologías?
8. ¿Cómo valora las iniciativas y ayudas de la administración?
9. ¿Se siente seguro o inseguro cuando utiliza la tecnología en clase?
10. ¿Cómo definiría usted las TIC? ¿y la pizarra digital?
11. ¿Cuándo tuvo su primer contacto con las Tecnologías?
12. ¿Con qué medios ha trabajado anteriormente (en el pasado)?
13. ¿Qué efecto piensa que ejerce el uso de la tecnología en el aprendizaje de los alumnos?
14. ¿Cree que el disponer de tecnología -como pizarras digitales y ordenadores- influye en el método de enseñanza que utiliza? En caso afirmativo ¿Cómo piensa que influye?
15. ¿Qué posibilidades cree que tienen los medios tecnológicos?
16. ¿Diseña y/o crea sus propios materiales para usarlo con los medios tecnológicos que tiene a su alcance?
17. ¿Qué criterios tiene en cuenta a la hora de seleccionar y/o crear los materiales a utilizar con la tecnología?
18. ¿Utiliza materiales didácticos creados por otras personas (por ejemplo, páginas web, diapositivas, grabaciones de video, etc...)? En caso afirmativo ¿realiza algún tipo de evaluación de dichos materiales? ¿Cuáles?
19. ¿Qué propondría para una mayor inserción y utilización de los medios tecnológicos tanto por los profesores como por los alumnos?
20. ¿Cree que el tener una pizarra digital en clase tiene algún impacto en la enseñanza?
21. ¿Ha tenido alguna experiencia con el uso de la pizarra digital en alguna clase? En que ha consistido
22. Si utiliza la pizarra digital ¿cómo la utiliza en clase? ¿para visualizar video, para hacer actividades, para hacer presentaciones de contenidos,....?
23. ¿Cree que el uso de la pizarra digital ofrece ventajas en el proceso de aprendizaje? En caso afirmativo cuales.
24. ¿Piensa que la pizarra digital ha mejorado su manera de dar las clases y el aprendizaje de los alumnos? ¿cómo? ¿en qué sentido?
25. ¿Cómo percibe el uso de la pizarra digital (o en su defecto la tecnología) en el aula?
26. ¿Cree que el uso de pizarras digitales interactivas tiene limitaciones en el proceso de enseñanza?

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Teachers of higher education: Analysis of Brazilian publications in chemistry Investigaciones brasileras sobre los profesores universitarios de química

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Abstract

Even though it is important, there are only a few works in science education that deal with academic professors as a research subject. Thus, to contribute to the understanding of researches conducted with these professionals who are so important to the development of an academic career, this work presents a document analysis of the papers published in two Brazilian chemistry teaching events: ENEQ and SIMPEQUI. The researches were categorized from 2008 to 2014 and divided according to their levels of education, in which those of higher education were classified with respect to their research subject. The findings showed a deficiency in the research field, since among more than four thousand papers, the university teacher is the research subject in only thirteen. Even though the discussion about the academic professors is necessary, there have been few studies on the subject in the scientific research.

Key words: educational practice; higher education; ENEQ; SIMPEQUI.

Resumen

A pesar de su importancia, hoy son pocas las investigaciones que desde la didáctica de las ciencias abordan a los docentes universitarios como sujetos participantes de éstas. Así, para contribuir en la comprensión de las investigaciones realizadas con estos profesionales tan importantes en el desarrollo de carreras académicas universitarias, este trabajo hace un análisis documental de las publicaciones presentadas en dos eventos brasileños de didáctica de la química: El Encuentro Nacional de Enseñanza de la Química o ENEQ y el Simposio de Investigaciones en enseñanza de la química o SIMPEQUI. Para esto fueron analizadas las publicaciones de estos eventos correspondientes al periodo 2008 a 2014; se hicieron categorizaciones por temáticas o líneas de investigación de acuerdo con los niveles de enseñanza, y para el caso de las del nivel universitario, fueron clasificadas en cuanto al sujeto de pesquisa (el profesor universitario). Lo encontrado muestra una deficiencia en esta área, pues de los más de cuatro mil trabajos revisados, solamente trece tienen al docente universitario como sujeto de investigación. Así, a pesar de ser necesaria

la discusión sobre los docentes universitarios, éstos todavía no son participantes de las investigaciones en didáctica de las ciencias o lo son en menor medida.

Palabras clave: prácticas docentes; enseñanza superior; ENEQ; SIMPEQUI.

INTRODUCTION

In the studies conducted in the teaching of sciences it is perceived that the focuses of the studies are different; for instance, the curriculum, the programs, the attitudes, the beliefs of kindergarten, primary and secondary teachers, the students, among others. Nevertheless, the question for the role of teacher of higher education in this research context is, "Is he the subject of research or does he only do the research?"

The answer seems clear: Today university researchers investigate the curricula and methodologies of kindergarten, elementary and high school teachers. However, what's the effect this research on training in general of teachers? The Teacher Training in Brazil requires the undertaking of "a major effort in teacher initial and continuing training. Work done on the national board of education showed there is today the deficit of 250,000 teachers, particularly located in chemistry, physics and mathematics disciplines" (ORLIK, 2013, p. 16).

And what's going on with the teacher of higher education? In this sense, Cortela (2013, p. 16) points out that the university teaching has constituted a research field, highlighting in Brazil the papers of Almeida 2012; Cunha 1998, 2006; Ghedin, 2005; Masseto, 2002, 2003; Pimenta; Anastasiou, 2002; Pimenta; Ghedin, 2006; and in the international context, Alarcão, 1998; García, 1999; Gauthier, 1998; Novoa, 1992; Zabalza 2004, among others.

It seems contradictory that today we discuss and do little research on the formation of the teachers in higher education (Cortela, 2013), because there are several demands in which these professionals have to answer to the universities, in particular, the ones who educate other educators.

Even though this occurs, Porto and Mosteiro (2014) say that professors' training and professional development is a key element of quality in the university education. Thereby, it is believed that an assessment of what has been produced by academia and what is disclosed in the chemistry teaching events held in Brazil on the subject is needed.

This survey is important in two senses: first, it allows identification of whether there are lines of research related to the natural sciences university teacher, how these lines are related to what the non-academics focus on the research, how the research impacts on the university to its qualification and continuous improvement; second, it has to do with the theoretical references that identify the formation of the higher education teacher, how the knowledge produced in the studies allows the improvement of the university teacher formation.

One issue to be raised is the lack of studies that reveal research on teachers own practice. An initial assumption is placed, that the research is concentrated in the non-teachers of higher education and students, and there are only a few of them that describe the professor of higher education as its participant.

Therefore, the goal of this study was to reflect on the topic and to analyze the papers published in two of the main Brazilian events regarding the publications on teachers of higher education. Therewith, it was possible to characterize the lines of research addressed regarding the training of teachers of higher education.

In order to begin the analysis, we chose the most significant events on chemistry teaching that took place in Brazil within the last several years. Among the events identified there were the Brazilian Education Symposium in Chemical Education (SIMPEQUI – Simpósio Brasileiro de Educação em Química) and the National Meeting of Chemistry Teaching (ENEQ – Encontro Nacional de Ensino de Química), at the national level. Several regional and local events have been found: Chemistry Education Event (EVEQ – Evento de Educação em Química); Paulista Research Meeting in Chemistry Teaching (EPPEQ – Encontro Paulista de Pesquisa no Ensino de Química); Mineiro Symposium on Chemical Education (SMEQ – Simpósio Mineiro de Educação Química); Paranaense Congress of Chemistry Education (CPEQUI – Congresso Paranaense de Educação em Química); Professionals Symposium of Chemistry Teaching (SIMPEQ – Simpósio de Profissionais do Ensino de Química); among others.

In order to analyze the most significant papers in the area, we chose the two national events. Table 1 shows, in a synthesized way, the characteristics of each event.

Table 1. Characteristics of the events selected for the research.

	Simpósio Brasileiro de Educação Química (SIMPEQUI)	Encontro Nacional de Ensino de Química (ENEQ)
Periodicity	Yearly	Biennial
Organization	Associação Brasileira de Química (Brazilian Chemical Society)	Divisão de Ensino da Sociedade Brasileira de Química (Teaching Division of the Brazilian Chemical Society)
Target audience and goals	Students and other professionals from all over Brazil who are interested in discussing issues related to Chemistry Education	Search for innovative approaches to the educational process through different subjects related to Chemistry Teaching
First edition year	2003	1982
Researched period	2008 - 2014	2008 - 2014
Focused theme in the research period	Chemistry teaching and multiculturalism; Green and sustainable chemistry; sustainability in education; and new technologies in chemistry teaching	Chemical knowledge; formation of a chemistry professor and the challenges of the classroom; chemistry teaching; and the integration between research and school
Researched Issues	7th to 13th	14th to 17th
Type of Work	Oral communication and panel	Oral communication, panel and exhibition of chemistry didactic materials
Total number of works in the analyzed period	1135	2958

Source: Adapted from SIMPEQUI, 2015 e MILARÉ, 2008.

CONCEPTUAL REFERENCES

A reality today is that the university has direct or indirect influence on the formation of teachers at all stages of the educational process. However, how is the actual training done and what are the procedures that the university considers? In other words, does the university evaluate the necessities of the society in the matter of the teacher that it needs and the impact of such training? From the focus of this article, it is clear that the University, and especially its teachers, organize and concentrate on the initial training for elementary and high school levels, mainly to train teachers for these educational levels.

In countries such as Colombia, Mexico, and Venezuela, there are colleges of education or pedagogical universities that grant the titles of Licentiate Degree. The undergraduates of these institutions are teachers who will act in elementary and high schools and, even then, training programs focus on the academic and pedagogical/didactic contents in their training, but still in a mono-disciplinary, compartmentalized or separated way. On the other hand, there are also masters, doctorates and other programs offered, in which the participants intend to work as teacher of higher education. Thus, the teacher who becomes a teacher of higher education either holds a degree with a masters or a doctorate, or has another professional title beyond the licentiate degree.

So far, we see that the focuses of the training of the teacher in higher education do not seem to be the same as the university's own interest. However, in recent years, we can see a concern for the training of a professor in higher or university education. As Ibernón (2014) says, documents on training, programs, institutional policies and researches on the subject start appearing. However, according to this author, the 1980s was the preparation of the teachers not in higher education, the first 2000 decade may be the decade of training the teacher of higher education, or at least have a greater concern for them in Brazil. The focus of the topic in the higher education teacher training is centered on short courses, which should be revised within the universities policies.

Furthermore, what happens in the research by the teachers of higher education should be revised because, to them, the study subjects are the teachers of other educational levels, curriculum materials, training programs, students of all levels, but the teacher of higher education himself is not the research subject. As Tardif (2004) says, this is not subject knowledge. This can result in a vicious circle that does not allow better training programs for professors of the university.

In this sense, it is proposed that the action research or inquiring model be considered as a model for higher education teachers' own training, but it seems that the teacher does not use it because it calls for a transformation of the elementary and high school teachers. However, will the university teacher change his own practice when researching? Ibernón (2014) proposes this model because: he considers that it allows reflection on what is done uniting the training to a project of change. It should be a process oriented in collaborative decisions, which may establish communication bridges between colleagues, in the interest of the democratic development of the curriculum, the proximity between theory and practice, and a democratic form of research; and it allows working with real education problems.

The teacher of higher education researches, or investigates, producing knowledge about the teaching of the teachers outside higher education, most of the time considering them as objects and not as collaborators or co-researchers. As Tardif (2004) says the elementary school teachers criticize the competence and the value of the administrators; these administrators and teachers criticize the teachers of higher education whose research they consider useless and too abstract; the teachers of higher education, often consider themselves guardians of knowledge, they are full of their own knowledge and criticism of professional teachers because they think that we are adhering to the traditions and routines (p.179).

Doing research about the university professor (of his teaching, his beliefs, his didactics) is necessary, not as a criteria of evaluating the quality of the teacher, which most often is focused on academic production, but because, according to Cortela (2013), he/she rarely appreciates the act of teaching, not giving importance to the didactics and pedagogical dimension.

METHODOLOGY

The methodology used was qualitative, characterized by the depth of the data and interpretative richness, which were contextualized within the scope of chemistry education events in Brazil. Although the events are national, they have specific features and ways to systematize the work. In the case of ENEQ jobs are already organized by themes, namely: concepts; science, technology and society; curriculum and assessment; environmental education; teaching and learning; teaching and culture; teaching and inclusion; non-formal spaces; experimentation in teaching; teacher training; history, philosophy, sociology of science; language and cognition; educational materials; display of teaching chemical materials; public policies; information technology and teaching communication.

Therefore, the first step of the analysis was to separate the papers of SIMPEQUI in the mentioned themes, getting a standardization of both events. Then, we classified the work according to the levels of education, namely: elementary school (ES), high school (HS), higher education (HE), non-formal education (NFE) and others (O). This last category was created to classify the papers that had no explicit level, as in the case of philosophical discussions.

As the focus of interest is higher education, what was analyzed was the works classified at this level and identified the research subjects. Beyond that, we detailed the searches according to the professional profile and the lines of research of the authors from the articles whose subject was professor of HE.

RESULTS AND DISCUSSION

The first categorization was made with respect to the themes of the event. The results show that most of the work is about “teaching and learning” – representing approximately 25% of the research presented at both events. The categories that appear next are, respectively: teacher training; experimentation and curriculum; and assessment.

Then, the papers were classified according to the levels of education ES, HS, HE, NFE and O. Table 2 presents in detail the quantification of the work with respect to the separation by the level of education. What we found when analyzing the themes by level was that the higher education works appeared largely in both the SIMPEQUI and the ENEQ, on the theme “teacher training”. Another major part of the HE works are in “teaching and learning” and “experimentation” and few of them are distributed in other categories.

Table 2. Quantification of SIMPEQUI and ENEQ works by categories of educational levels from 2008 to 2014.

	Year	Amount	ES	HS	HE	NFE	O	Total
SIMPEQUI	2008	Absolute	4	27	21	1	0	53
		Percentage (%)	7,5	50,9	39,6	1,9	0,0	100
	2009	Absolute	3	55	22	2	0	82
		Percentage (%)	3,7	67,1	26,8	2,4	0,0	100
	2010	Absolute	19	102	40	2	0	163
		Percentage (%)	11,7	62,6	24,5	1,2	0,0	100
	2011	Absolute	11	68	46	0	0	125
		Percentage (%)	8,8	54,4	36,8	0,0	0,0	100
	2012	Absolute	11	120	52	0	0	183
		Percentage (%)	6,0	65,66	28,4	0,0	0,0	100
	2013	Absolute	35	172	55	1	0	263
		Percentage (%)	13,3	65,4	20,9	0,4	0,0	100
	2014	Absolute	32	147	83	4	0	266
		Percentage (%)	12,0	55,3	31,2	1,5	0,0	100
ENEQ	2008	Absolute	19	357	47	25	14	462
		Percentage (%)	4,1	77,3	10,2	5,4	3,0	100
	2010	Absolute	16	408	123	32	13	592
		Percentage (%)	2,7	68,9	20,8	5,4	2,2	100
	2012	Absolute	23	700	126	35	25	909
		Percentage (%)	2,5	77,0	13,9	3,9	2,8	100
	2014	Absolute	27	776	106	55	31	995
		Percentage (%)	2,7	78,0	10,7	5,5	3,1	100
TOTAL	Period	Absolute	200	2932	721	157	83	4093
		Percentage (%)	5,0	72,0	17,0	4,0	2,0	100

Source: Authors.

By analyzing Table 2, we notice that the major focus of Brazilian research in the chemical education area is targeting high school (72%), which is perhaps related to the growing initiative of PIBID (Programa Institucional de Bolsas de Iniciação a Docência, which in English means: Institutional Program for Grant in Teaching Initiation – from CAPES). In the featured column on Table 2 we find the numbers of papers related to each year for HE, considering that this is the second most discussed level in the polls. Note, also, that is an oscillating theme, where the number of published works varies up and down (see percentages highlighted in HE column).

As the focus of interest is higher education, we analyzed the works classified at this level to identify the research subjects. Thus, according to Table 2, from the 4093 works analyzed, 721 are related to HE (17%). Among this total, as illustrated in Figure 1, only 13 papers have researches focusing on the teacher at this level, while the rest focus on students and document analysis.

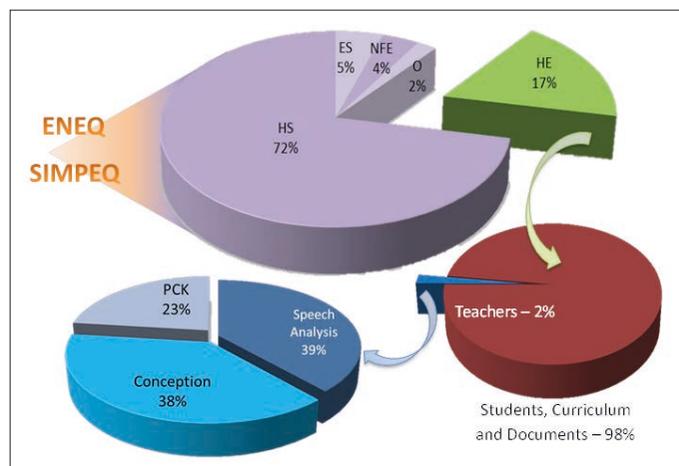


Figure 1. Outlining of the papers related to higher education professors.
Source: Authors.

Also as shown in Figure 1, from thirteen papers (100%) on the higher education professors (one of SIMPEQUI and twelve of ENEQ), five (38%) address the conceptions of teachers about concepts, such as: chemical phenomenon, enzyme kinetics, experimentation, playfulness, teacher training, environmental education and nature of science. Three surveys (23%) are on the pedagogical content knowledge (PCK) and five (39%) deal with speech analysis (semiotics) through gestures for teaching organic chemistry. The description of the work is on Table 3.

The five works that address the theme about discourse analysis are the research group led by Professor Eduardo Fleury Mortimer (UFMG). This professor works in the research line of “elaboration of concepts in science and teaching”, “training of chemistry and science teachers”, “language and cognition in the classroom”, “teaching and learning chemistry and science”, “discursive interactions in science classroom”, “discursive interactions in science classroom” (MORTIMER; MACHADO, 2013). Although not specifically dealing with the teacher of higher education as a research area, Mortimer brings great contributions to this research subject, and it is possible to infer that he might be a reference in the area.

Three other works that address the PCK theme are of Professor Carmen Fernandez (USP – University of São Paulo), whose research line are: “chemistry teacher training”, “knowledge of chemistry teachers”, “knowledge base for teaching”, “pedagogical content knowledge”, “professional development” (FERNANDEZ, 2015). Again, despite not having a line or specific training to deal with higher education teachers, Fernandez addresses the issue of the PCK, which is a recent topic of research in Brazil, suggesting that the first works on the HE of this area are beginning to be developed.

The other works in this category have different authorship. Two of these works are from the same author: Lisandro Bacelar da Silva, Master in Education, History and Philosophy of Sciences from the Federal University of Bahia (UFBA) and an expert on higher education teaching by UNIFACS. They show a concern of the researcher with the teacher of higher education as a research subject.

Through the analyses done, we note that there is a low amount of research focused on the higher education teachers, because from a total of 4093

Table 3. Papers focusing on the teacher of higher education in both events.

Year	Title	Category
2010	Multimodal language: the classes of the Higher Education Professor	Speech analysis
2012	Conceptions of teachers of higher education about the function of experimental activities in a course of licentiate degree in Chemistry	Conception
2012	Pedagogical Content Knowledge of an experienced teacher in a discipline of General Chemistry at the higher education level	PCK
2012	The pedagogical content knowledge of a teacher of Higher Education on the concepts of "Enzyme Kinetics"	PCK
2012	Conceptions of Higher Education Teacher in Chemistry about the implications of the graduate programs in the teacher training	Conception
2012	Multimodal interactions in Higher Education Chemistry classes	Speech analysis
2012	Semiotic analysis of the ways in Higher Education Chemistry classes.	Speech analysis
2012	The conceptions of the teachers of the courses of licentiate degree in chemistry about the concept of chemical phenomenon	Conception
2014	Aspects of the formative action of higher education teachers incorporated into the PCK of its undergraduates	PCK
2014	Deictic gestures in higher education chemistry class	Speech analysis
2014	The interaction of recurrent gestures with other semiotic ways during the sharing of meanings in classes of organic chemistry	Speech analysis
2014	Conceptions of chemistry teachers about the teaching of green chemistry: an investigation*	Conception
2014	Conceptions of chemical phenomenon of teachers who teach specific subjects in a licentiate degree chemistry course	Conception

*The only paper of the SIMPEQUI on the analyzed period. Source: Authors.

works analyzed, only 0.3% have this research subject. The main references are Mortimer and Fernandez, in the areas of discourse analysis and PCK, respectively. This implies that there are only a few research works with a focus on higher education teachers and they need further development.

It is important to continue inquiring about the trends that are in the research teachers of higher education because as argued several authors (S. da Silva and A. de Oliveira, 2009 apud Orlik, 2013) large number of teachers working in undergraduate courses do not have didactic training. For many, the choice of a profession at the university is based on career search as a researcher and not in its function of teaching. It's because of "systemic processes of training science teachers still oriented to different levels of teachers to university" (MOSQUERA, 2014, p.63) It is necessary to know how the professor is involved in the new research lines that he uses when he asks the teacher, for example, about epistemology or PCK as a way to represent and differentiate their pedagogical / didactic knowledge of the discipline (GUISASOLA, et al, 2014; PARGA; MORA, 2014).

CONCLUSIONS

The teachers of higher education are a research object that requires more work in several areas. As explained throughout this writing, few studies deal with the teacher of higher education as the subject of the research. Through the executed analysis in two major events in the area of chemistry teaching, we notice that there really are deficiencies in the researches that focus on the higher education teacher.

The results show that there is a gap in the research with this theme and that further research is necessary. Besides that, in Brazil, the main references in the area of chemistry teaching that investigate the teachers of higher education are Mortimer and Fernandez, within the discourse analysis and the PCK areas, respectively.

It is necessary that the higher education teacher begin to value his/her act of teaching, giving the necessary importance to the didactic and pedagogical dimension. Moreover, the teacher should allow himself/herself to be part of his/her own research, being a contributor to the expansion of his/her research area of expertise.

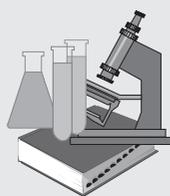
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