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Bibliometric characteristics of articles on key competences indexed in ERIC from 1990 to 2013

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\section*{Abstract}
This paper analyses the bibliometric characteristics of 616 journal articles on key competences indexed in ERIC in a 23-year-period following documentary analysis. This observation method allowed us to highlight key elements like the population, educational level, topics, etc. to focus whether this literature contributes towards implementing competence-based education. The findings of key competence-based articles confirm that competence discourse in education has become a highly rated topic of debate from 1999 to 2013. In the two last decades, there has been a gradual increase in articles based on research combined with a decline in articles of a descriptive nature. The main contributions of articles on competency-based education are significantly in line with topics related to reflection on competence discourse and education policies that should be implemented. There is still a clear need for publications which provide examples and empirical evidence aimed at developing basic competences.

\section*{Introduction}
Competency-based education is one of the issues which currently occupies and concerns European educational systems and organisations. It is a relatively new epistemological discourse which goes beyond simple curricular reform or innovation in teaching and learning (Aguerrondo 2009; Delors 1996; Halász and Michel 2011; Moon 2007; OCDE 1994, 2005; OECD 1999, 2005; Rychen and Salganik 2001; Tedesco, Opertti, and Amadio 2013).

One indicator of the impact of this discourse on education has been the huge number and variety of resources published over the last decade. Given this overwhelming body of evidence, the authors of this paper consider it necessary to determine to what extent this literature contributes towards actually implementing competence-based education in the classroom and, by extension, enables the achievement of strategic objectives promulgated by institutions and European educational organisations. With this in mind, we consider it essential to highlight the main aspects that characterise bibliographic resources on key competences published to date, and to determine how appropriate and transferable these contributions are.
We believe that our approach to this study is warranted in the face of the widespread proliferation both of terminology and of existing resources on the subject of competences. Our study aims to contribute to the discussion on the urgent need to build a solid theoretical framework for competence-based education, given evidence that it does not yet have a clear epistemological and practical body of reference to guide practitioners who have to implement and evaluate it in classrooms.

Competency-based education within the framework of the European Union

In March 2000, the Lisbon European Council (European Commission 2006) proposed that the European Union should be the world’s most competitive knowledge economy. To achieve this strategic objective, it stipulated that education and training systems should adapt to the demands of the knowledge society, and improve the level and quality of work. For this reason, one of the main action points focused on the development of European citizens’ key competences.

This decision required a commitment to the notion of competence – or the skills essential for full participation in society – as central to the processes of teaching and learning. From an epistemological point of view, the origin of this construct is broad and diverse. However, thanks to new trends in international assessment processes, such as, for instance, the Programme for International Student Assessment (PISA), the concept of competence transcends these contexts to become the core of the educational framework (Tiana 2011). As a result, key competences are now considered to be the object of basic compulsory education. Learning objectives are no longer the exclusive domain of the skills associated with an academic discipline. Now, the challenge is to develop individuals’ abilities to deal with problems and complex demands, mobilising psychosocial resources, knowledge, skills and attitudes previously acquired in learning situations similar to the contexts which they will come across in their daily, professional or academic lives (Tiana, Moya, and Luengo 2011).

As a result of these developments, the Council of Europe considered it necessary to identify and define those competences which once integrated into the curricula of European educational systems, would best contribute to students leading successful lives. In the first instance, this aim was addressed via the DeSeCo project (OECD 2005). This initiative, besides contributing to the dissemination of the concept of key competences, represented a step forward in establishing a set of key competences as the key of basic education (Tiana 2011).

Drawing on developments arising from the DeSeCo project, the European Parliament approved recommendation 2006/962/EC in which, after expert involvement through a so-called Open Method of Cooperation, eight key competences were defined, and a framework for further implementation and development outlined (European Commission 2006). The eight key competences are:

- Communication in the mother tongue
- Communication in a foreign language
- Mathematical competence and basic competences in science and technology
- Digital competence
- Learning to learn
- Social and civic competence
- Sense of initiative and entrepreneurship
- Cultural awareness and expression.
Competence-based education implied curriculum change, but above all, it represented a new way of thinking about education. There was also at that time a political and ideological dimension that was evident in the definition of criteria for selecting and implementing competence development in schools (Perrenou 1999; Morin 1999).

The result of this whole process came down to two broad approaches: an educational approach based on fundamental skill development and learning for life, and a highly professional approach based on drawing on established standards from the world of work (Climent 2010). Evidence suggests that the balance is tilting towards the professional approach. In other words, the specification of educational curricula and learning outcomes are adjusting to criteria dictated by economic globalisation and market needs. However, we should not lose sight of the fact that competency-based education also involves addressing educational theories aimed at combating social exclusion (Includ-ed consortium 2009; Kraft 1999; Resnick 1987; U.S. Department of Education 2013) in order to prepare people for the challenges of the digital age. There is, in a sense, a tendency towards promoting lifelong learning, and a need for people to be capable of critically analysing and dealing with any type of problem or social injustice (Halász and Michel 2011, 290).

The problem of implementing competence-based education

On the basis of recommendations made by the Council of Europe regarding the need to promote the acquisition of key competences, all member states have adopted measures for curricular implementation. Currently there are numerous studies and reports whose main objective is to analyse the means and impact of policies and strategies developed to this end (Dąbrowski and Wiśniewski 2011; Dobber et al. 2013; European Comission/EACEA/Eurydice 2012; European Union 2013; Gordon et al. 2009; Halász and Michel 2011; IBE-UNESCO 2007; Krause 2010; Moon 2007; OECD 2013; Pepper 2011; Solzbacher 2006; Tawil and Cougoureux 2013; Tiana, Moya, and Luengo 2011; Urban et al. 2012).

Irrespective of whether these studies affect all or only some of the eight competences strategically selected and defined in the Council of Europe recommendations, the main conclusion is that implementation and evaluation of key competences is occurring unevenly across European Union member states.

While the framework for implementation states that curricular integration of key competences should be carried out in a balanced way, it also appears that this process only focuses on those skills related to academic disciplines likely to be assessed by certifying organisations. Transversal competences which are not specifically assigned to any academic discipline are barely dealt with at all (Centre for Educactional Research and Innovation 2008; European Comission/EACEA/Eurydice 2012). Ambrós (2014) provides a clear example of the development of Audiovisual Competence, by incorporating it into the Catalan educational programme because of the lack of a subject to address this competence.

According to Halász and Michel (2011), some of the factors that might explain the reasons for this imbalance are the following: the proliferation of terminology and the diversity of theoretical perspectives that are used to define the concept of competence; social and cultural characteristics of countries or regions designing new curricula; the relationships between commitments made by states, educational policies and their implementation at grassroot level; and the existence and accessibility of referents and resources that enable the development and assessment of key competences in the classroom. In this respect,
although there is still a strong focus on traditional academic discipline curricula, institutions and education professionals have at their disposal a number of recommendations, materials and reports to try to reverse this trend (Council of The European Union 2010; European Comission 2012; European Union 2013; Krause 2010; OECD 1999).

Nonetheless, policy and curriculum innovation, as well as a proliferation of resources do not necessarily ensure a transformation in the discourse surrounding competences or lead to effective and tangible action. The biggest challenge facing those responsible for the implementation of competence-based education is to change the thinking and practice of teachers in the classroom (Halász and Michel 2011). Some of the obstacles to overcome relate to academic traditions of basic education and teacher training, or the pressures of state educational institutions to achieve optimal results in international rankings.

This article explores the impact of another possible factor: the contribution of resources published on this subject. In particular, this study focuses on identifying and describing the bibliometric characteristics of articles on key competences indexed in ERIC from 1990 to 2013.

Method

To address this objective, we opted for descriptive analysis as a research method. This method allowed us to analyse the content of bibliographical sources selected and highlight his key elements.

Population and sample

On the basis of a search for resources indexed in the Educational Resources Information Centre (ERIC) database, we established a population composed of 2016 references published from 1990 to 2013. This database, sponsored by the United States Department of Education is considered one of the most wide-ranging reference sources in the field of education. To date, it contains over one million records obtained from a variety of sources: books, academic papers, government documents, theses, teaching materials and journal articles.

Secondly, we used the keyword ‘key competence’ and the option search ‘peer reviewed’ to select just a sample of journal articles. This decision was made for the following reasons: (a) we were dealing with resources considered by the scientific community as highly regarded rigorous studies; (b) due to their relatively uniform format, it was easy to analyse and compare resources, regardless of the journal in which they were published; (c) ERIC provides a considerable and up-to-date volume of bibliographic resources while also providing good advanced search and retrieve functions.

As illustrated in Table 1, we had a sample of 616 articles. Allowing for a 5% margin of error and a 95% confidence interval, the minimum number of items required would be 323. Consequently, we concluded that our sample was more than adequately representative.

Data analysis

As shown in Table 2, data analysis was carried out using a variety of descriptive and inferential statistical tests.
Descriptive analyses consisted of studying frequency distributions and percentages, and applying Coefficients of Variation (CV) of the results obtained according to the number and type of journal articles published resulting from the search term ‘key competences’. Other variables we took into account were: period (1990 to 2013), kind of articles, level (infant, primary, secondary and university) and topic.

With regard to inferential statistical tests, we applied the chi-square ($\chi^2$) test to determine whether the number of published articles was conditioned by the publication period or the educational level of reference. We used the Pearson correlation coefficient to determine the degree of relationship between the number of published articles and the educational level. Finally, we performed a Student-$t$ test to compare Fisher samples in order to classify the number of articles published according to reference topic and to verify the predominance of publications by specific topics.

### Results

In this section, we first present the findings of our basic bibliometric analysis of key competence-based articles. We then examine the educational context and topics of these articles.

**Basic bibliometrics of competence-based articles**

First, we should emphasise that the total number of articles indexed in ERIC since the 1990s is considerable. Our search for the phrase ‘key competences’ produced 616 results. As we can see in Figure 1, more than half these items (329) were published from the year 2000 onwards.
However, we should clarify that, although at the time the search was conducted, not even five years of the current decade had passed, the number of articles published at that point (270) was almost equivalent to the number of articles published between 2000 and 2009. We were curious to know whether there was a significant relationship between the articles published in both periods. By calculating the Pearson correlation coefficient ($r = .960; 4\text{df}, P < .01$), not only did we confirm this relationship among the number of journal articles published in a particular period of time, but we also found grounds to assert that the number of articles published in both periods was relevant. In other words, it was confirmed that the key competences were a very important topic for the educational system.

It is therefore highly likely that the number of articles published in this decade will be significantly higher than previous ones. If this trend is confirmed in future studies, there will be clear evidence to conclude categorically that the discourse of competence education has been a key topic in the field of education for the past 20 years.

We see that ERIC presents four types of articles on competences: research, descriptive, evaluative and opinion. The first set of bars in Figure 1 represents the total number of published articles. We will explain type of article in detail.

(a) articles based on research projects; (b) descriptive articles that review existing literature on key competences; (c) articles based on internal or external evaluation reports focusing on the implementation process of key competence programmes; (d) opinion and promotion articles. As can be seen in Figure 1, research and descriptive articles account for most of the articles published from 2000 to the present. Although in each decade studied research articles are the most common, together with descriptive articles they have consistently outnumbered evaluation and opinion articles. However, in the present decade, there seems to have been a certain turning point with regard to evaluation articles, which are now practically on a par with descriptive ones. Whatever the case, this new trend should be confirmed in the next few years.

These results allow us to venture various hypotheses regarding the relevance of these publications.

First, we needed to confirm whether this increase in articles was conditioned by the widespread implementation of a competence discourse in education. Judging by the results,

![Figure 1. Number and type of competence-based articles published since 1990 (Source: ERIC).](imagelink)
there is evidence for a statistically significant increase in articles published from 2000 to 2013 \( (\chi^2 = 7.818; 2 \text{df}, P < .025) \).

Secondly, we wanted to determine whether there are variations regarding the type of published articles over time. As stated above, the results of Figure 1 clearly show that the majority are research articles, especially since 2010. However, we need to address the data shown in Table 3 (below) to qualify this trend. In this respect, if we look at the Coefficient of Variation (CV) of articles published since the year 2000, besides there being an increase in published articles, there has also been an increase in the spread of such contributions to journals (1990–1999, CV = 37; period 2000–2009, CV = 3055; period 2010–2013, CV = 4523). Therefore, the CV suggests that an increase in the number of published articles is accompanied by a broadening in the range of topics discussed in these articles.

**Context and topics of articles published**

Although bibliometric results obtained in the previous section provide us with key information to determine the relevance of articles on educational competence, we need to deepen our understanding of additional factors in order to provide more relevant evidence regarding their primary contributions.

One of these factors is related to the educational context these articles reference (Figure 2). Contrary to what might be expected, regardless of the generic category ‘Others’, many of the articles are situated in a higher education context (40%). This clearly contrasts with the small percentage (barely 10%) of articles which deal with different stages of compulsory education. However, when we tested whether this difference is significant, the results indicate

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<td>N</td>
<td>17</td>
<td>329</td>
<td>270</td>
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<td>Mean</td>
<td>4.25</td>
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<td>Variance</td>
<td>1.58</td>
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<td>CV (%)</td>
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**Figure 2.** Percentage of articles published by level of education (Source: ERIC).
that, from a statistical point of view, there is no apparent reason to conclude that the number of articles about competences depends on the educational level which they reference ($\chi^2 = 2.844; 5\text{df}, P > .10$).

Moreover, it is also important to note the topics addressed by articles on key competences. The information provided by ERIC shows a variety of different topics (Figure 3). Taking as a reference the number of items associated with each of these thematic areas, we see a predominance of topics related to competence discourse and its implementation in various educational systems (Foreign Countries: 238 and Competence: 146). These outnumber topics related to classroom application (Intervention: 51; Skill Development: 32; or Assessment: 22). From a statistical standpoint, these differences are confirmed by comparing each of these two groups of concepts composed by didactic topics or educational issues ($t = 47, P < 0.02$).

**Discussion and conclusion**

The large number of references generated in recent decades confirms that competence discourse in education has become a highly rated topic of debate. This trend might be explained by considering some tendencies which have emerged since the year 2000: the appearance of a competence discourse in education (Brown, Lauder, and Ashton 2008; Hozjan 2009; Mulder, Weigel, and Collings 2008; Weinert 2004); the implementation of competences in state curricula based on recommendations by European institutions (Council of The European Union 2010; European Comission 2012; European Council 2009) and the reputation of external evaluation tests conducted by national and international organisations (Centre for Educactional Research and Innovation 2008; OECD 1999).

In addition, since 2000 there has been a gradual increase in articles based on research, combined with a decline in articles of a descriptive nature. These results might indicate that once a competence discourse has become established on the basis of reviews and theoretical reflections, empirical evidence based on scientific rigour is needed in order to guide the implementation of competency curriculum projects (Aguerrondo 2009; Dobber et al. 2013; Mulder, Weigel, and Collings 2008; Solzbacher 2006; Urban et al. 2012).
Moreover, the number of articles and the variety of topics might be an obstacle in establishing a clear line of applied research in education competencies in school and teacher education. This is a key factor that impedes us from narrowing the subject of research in studies into competence-based education. In this regard, the clear imbalance between the number of publications in the area of basic education and higher education may be a further example of the problem in deciding whether competency development is a matter for compulsory education, or is exclusively the domain of post-compulsory and university education (Goody 2004; Mulder, Weigel, and Collings 2008; Weinert 2004).

This study also shows that the main contributions of articles on competency-based education are significantly in line with topics closely related to reflection on competence discourse and education policies that should be implemented, at the expense of publications which provide examples and empirical evidence aimed at developing basic competences. Therefore, these results confirm the opinion of those who consider that professionals responsible for the teaching and assessment of competences in the classroom have precious few references on how to do it (European Comission/EACEA/Eurydice 2012; Goody 2004; Mulder, Weigel, and Collings 2008; Pérez 2008; Weinert 2004).

**Implications**

Processes related to the implementation and development of educational projects based on key competences are complex. Consequently, it is difficult to establish a relevant theoretical and practical framework of reference simply on the basis of reviews and studies which focus on analysing the test results of external evaluations prepared by supranational organisations and educational administrations. With this in mind, there is a need to promote studies that focus on teaching and learning processes in the classroom to develop key competences.

It has been claimed that criteria for the selection and definition of key competences, and learning results obtained from teaching them, cannot be performed outside the social and cultural characteristics of each educational system (Morin 1999). This implies that the ultimate purpose of implementing key competences should not focus solely on expected results and compare them for the sole purpose of classification. Nor should we rely on these results to justify the supremacy of some educational policies and knowledge about certain areas over others. This paper highlights the need to reorient competence studies towards more applied contexts. In other words, studies should be oriented towards processes closely linked to the development of key competences in the classroom. The aim should be to ensure that people acquire the knowledge, skills and resources necessary to enable them to develop their personal potential, and in turn, to achieve their academic and professional goals.

The proliferation of research articles and, by extension, articles set in a university context, may be an indication that research on key competences is not in line with the real needs of professionals who need to implement the competency curriculum in schools. Furthermore, one wonders whether the objectives and results of this research are accessible, meaningful and transferable to such practitioners. These questions highlight the need to promote studies which focus on establishing a framework of best practice directed both at designing activities and projects, and the extent of teaching–learning methodologies with regard to different ways of thinking about cognitive processes (Sternberg 1997). Some initiatives, such as UNESCO’s ASPnet (Associated Schools Project Network) project, are working in this direction,
creating a collection of Good Practices that provides empirical examples to generate ideas for teachers and contribute to the improvement of educational practice. In other words, these studies and best practices should become the main reason for promoting a methodological change in teacher education. We need to see real advances in what students do in alternative systems of assessment as formative-assessment, shared-assessment or self-assessment, and in teachers mastering methodologies such as PBL, learning by doing, case studies. (Boud and Falchikov 2007; Czerniawski, Guberman, and McPhail 2016; A.Fullan and Langworthy 2013; Lave and Wenger 1991; Yorke 2003). The purpose of this is twofold: first, to enable students to develop higher cognitive processes, and therefore, attain key competencies, secondly, to enable teacher trainees to teach these competencies in the classroom, having developed them during their training at university.

**Future studies**

The present study needs to be complemented by content analysis of the main articles in impact journals. This is the only way to obtain a more precise and tangible idea of the contributions of journal articles, but also of other existing bibliographic resources, for the implementation of competency-based curriculum projects.

Furthermore, it would be useful to conduct a study on basic competences articles published in non-indexed journals, such as Guix, Aula de Innovación Educativa and Aula de Secundaria, published by Graó in Spain, French journals, like La Classe and Cahiers pédagogiques. Materials and manuals for teacher development, produced by Associações de Professores in Portugal and Teach Primary and Teach Secondary on-line journals in UK.

Moreover, this and similar studies should usher in qualitative applied research that focuses on the teaching and learning of competences in the classroom. In this way, scientific output would come closer to the real needs of practitioners who have to take on the social responsibility of implementing the competency curriculum in the classroom.

We believe that by adopting such an approach to qualitative studies we are more likely to find answers to the following questions: What are the purposes of educational competences and from what knowledge or experiences are they drawn? What criteria have to be taken into account for the selection, and operational and functional definitions of competences? What action should be encouraged in the classroom to achieve significant development of selected key competences? What criteria should be taken into account in order to claim that the results obtained are relevant to the aims of the competency curriculum? What indicators need to be present in order to verify students’ level of performance in the key competencies in a credible and relevant way?

**Note**

1. Last retrieved data 29 November 2013.

**Disclosure statement**

No potential conflict of interest was reported by the authors.
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