RESEARCH ARTICLE

The unfinished business of defining competences for 21st century curricula—a systematic research review

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Abstract

Eighty-four articles are examined in this systematic research review, to provide a synthesis of the state of art with regard to educational research that focused on competence-based education (CBE) and curricula covering a period of 20 years from 1997 to 2017. Relying on PRISMA methodology and framed by discursive institutionalism, and curriculum and Didaktik traditions theoretically, the review was guided by two overarching research questions, focusing first on how much and what educational research on CBE approaches is available, and secondly, primarily in the present article, on the definitions that are reported in CBE research in terms of explicit and systematic versus implicit and tacit references, main educational perspectives/paradigms and academic versus applied orientation. Findings show Spain and New Zealand with most articles related to educational research on CBE, and identify four sources of competence definitions: OECD/DeSeCo, European Commission, national policy documents and the academic literature. It is concluded that there is still unfinished business for educational researchers in critically engaging with framing and defining competences for the twenty-first century, their causes, impact and consequences for schooling and learning internationally, as well as how CBE is recontextualised into specific national contexts.

Keywords Competences/competencies · Competence-based education · Curriculum policy · Systematic review

Introduction and purpose

During the 1990s, the curriculum-Didaktik dialogue made similarities and differences visible between what is viewed as core curriculum and core Didaktik approaches to education, primarily highlighting the reliance of the Didaktik paradigm on educational content, and of the curriculum paradigm on educational standards (Tahirsylaj 2019; Westbury et al. 2000). The emphasis on standards and accompanying standards-based education reforms during the 1990s led to another major development in education contexts globally—the turn of the education discourse and reform towards competence-based education, skills-based education and/or learning outcomes. An emphasis on skills-based approaches was initiated in the mid-1990s by UNESCO under Jacque Delors' leadership (Delors 1996), followed by the Organisation for Economic Cooperation and Development (OECD) Definition and Selection of Competencies (DeSeCo) project, which then led to the European Reference Framework (ERF) of key competences (OJEU 2006). Recently, the European Commission (EC) proposed 'A New Skills Agenda for Europe', which emphasises its push towards more skills-based education as '[…] pathway to employability and prosperity' (EC 2016, p. 2). Lastly, the OECD 2030 Education project is underway, and aims to develop a learning framework with a worldwide reach that builds on a competence-based education model (OECD 2018; Tahirsylaj, Matson and Gashi 2019).

Anderson-Levitt (2017) published an examination of the worldwide spread of competence-based education (CBE) from an educational policy perspective, and concluded that CBE is widespread but not global—and mostly present in Europe and Africa, but not in the USA and UK. Buscà Donet et al. (2017) examined the presence of research related to 'key competences' for the period from 1990 to 2013,

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relying only on the ERIC education database. They identified some 600 articles related to 'key competences' but did not undertake a content analysis of those articles. As a result, very little is known from the educational research perspective about how CBE approaches have been taken up by researchers internationally, or what research questions have been addressed when examining competence-based curricula. Davies (2000) argued that educational policy and practice gain much from systematic reviews and research syntheses. In our systematic review, 84 articles are examined to explore the CBE approaches through an educational research lens. The review aims to provide a synthesis of the state of the art with regard to educational research focused on competence-based education and curricula, covering a period of 20 years—starting with 1997, as the first year after Delors' report in 1996—to 2017.

The starting point for the review was guided by a two-part overarching research question, asking (a) How much research is reported in the peer-reviewed literature about competence-based education, competence-based curricula, key competences, and key competencies? and (b) What are the geographical distribution, topical categories, education levels, subject matter domains, research methodologies, and key findings of studies in CBE research? In the present article, we also focus on the definitions and operationalisation of key terms such as competence/competences and competency/competencies, asking (c) What definitions are reported in CBE research in terms of explicit and systematic versus implicit and tacit references, main educational perspectives/paradigms, and academic versus applied orientation? The rest of the article is structured as follows: first, a brief summary of competence-based education approaches and ERIC-based review on 'key competences' is provided; next, an elaboration of theoretical framework is offered; then, results and findings are presented organised around guiding research questions, and lastly, the article ends with a critical discussion of the results and conclusions.

Competence-based education approaches in previous research

Anderson-Levitt (2017) and Buscà Donet et al. (2017) are again the two most recent and comprehensive studies before this article, which builds on their findings, and expands and complements their scopes of coverage and analyses. Anderson-Levitt's (2017) study based on policy document analysis encountered issues with definitions of competences and competence-based education. Anderson-Levitt (2017 par. 15) provides a definition of 'key competencies' as proposed by the OECD's DeSeCo project, and the present article adopts her definition of competence-based education, which 'refers to any approach aiming to enable students to develop particular competences'. Our review sheds further light on a larger

number of definitions of competence, covering a broader set of source definitions. Anderson-Levitt further lists the European Commission, OECD, UNESCO and European Union as key international and multi-national institutions from which CBE approaches originated, lists France (in 1992) and Belgium (1994) as the first two countries in the world to have adopted CBE in their primary and secondary curricula and also shows the spread of CBE approaches to other regions such as Africa and Australia. Enthusiasm for CBE has waxed and waned over the years as countries have had to navigate competing interests nationally and transnationally. Anderson-Levitt's (2017) findings can be compared with those of the present study as regards whether a 'different' geography of CBE approaches emerges when examining them from an educational research rather than an educational policy perspective.

Buscà Donet et al.'s (2017) analyses included basic bibliometric characteristics, articles and corresponding descriptive statistical analyses. Their results show that the largest number of articles was related to higher education and the 'Other' category, rather than primary and secondary education, and therefore we expect that our results will differ, and complement their study's findings. They also found that the majority of articles in their sample were about competence discourse and implementation issues, significantly outnumbering those related to classroom application. Interestingly, Buscà Donet et al. (2017) did not examine the geographical distribution of 'key competence'-related articles, and rely on the definition of 'competence' in the European Commission and European Union's recommendation for eight key competences proposed in 2006 (OJEU 2006), relating the rise of key competences movement in European Union to OECD's DeSeCo project. In this regard, the present article will substantially contribute to a broadening of definitions and understandings of 'key competences', competences and/or competencies.

Theoretical framework

The purpose of exploring and mapping the way that competence-based education has been framed and defined in research calls for a theoretical framework that can differentiate the different aspects of discursive processes at play (Wahlström and Sundberg 2018). When examining definitions of competences, it is not only the explicit definition that is of interest. Implicit taken-for-granted assumptions are also important, as they provide the philosophical and ideational substance of the definitions. Nordin and Sundberg (2016) for example found that the four most well-spread global frameworks for competence-based education came from learning theories and learner-centred curriculum ideology (in broad terms, behaviourism and

constructivism), which provide both foundational premises and the framing of definitions. These assumptions could be termed 'the background ideas', following Vivien Schmidt and her work on discursive institutionalism (Schmidt 2015). According to Schmidt (2015), background ideas are core principles that are taken-for-granted and institutionalised, and rarely contested except in time of crises. 'Foreground ideas', on the other hand, are the ideas and concepts structuring education programs and reforms in policy-making. These ideas and definitions are used in discursive interaction to maintain and/or alter institutions and their patterns of actions. The theoretical point of departure in this study is to direct attention to the background ideas and implicit knowledge traditions in curriculum policy-making through the use and framing of the key concepts and definitions that are placed as foreground ideas (Wahlström and Sundberg 2018). In other words, specific knowledge traditions (Whitty and Furlong 2017) provide the background assumptions for the common and widespread definitions of CBE that are rarely made explicit. Only a few studies have specifically looked into the issue of how education research has contributed to the transnational discourse on CBE in terms of explicit/implicit references, background ideas and the academic/applied orientation (see for example Voogt and Roblin 2012).

The second definitional aspect concerns the background ideas that frame the most commonly used definitions of competence-based education. Deng and Luke (2008) and Schiro (2013) differentiate between four main curriculum paradigms with historical and current influence on the purposes of schooling, curriculum content, the definition of subject matter and the framing and definitions of competences. *Academic rationalism* (with emphasis on disciplinary knowledge) involves content-oriented curricula where competences are subsidiary to mastering disciplinary knowledge in problem solving situations. In a similar vein, in *social reconstructionism* (emphasising the use of schooling for social reforms), knowledge and competences are generally instrumentally framed to achieve future-oriented societal aims such as justice, equality and equity. *Social efficiency* focuses on equipping future adult citizens with the requisite skills, knowledge, and capital for economic and social productivity under current conditions. According to *human capital theory*, education is primarily a form of capital, similar to financial instruments, since with more education and investment in skills and knowledge, individuals become more employable and increase their economic value in the job market (Becker 1962; Schultz 1961). These propositions grew out of economic research that linked investment in human capital to national economic output (Schultz 1961). Since OECD, as an economic think tank, has focused closely on the competence movement and the European Commission recommended eight key competences to make European Union more competitive economically (Buscà

Donet et al. 2017; OJEU 2006), it is important to revisit the competence definitions from the economic perspective of human capital, as the foreground idea, as well as, and perhaps more importantly, background ideas, which place the emphasis more on skills and knowledge, and primarily on the technical skills that make individuals employable and productive. *Learner-centred curriculum ideology*, lastly, places emphasis on the development of individual learners who pursue personal development, self-actualisation, innovation and creativity to adapt to the ever-changing knowledge economy in a flexible and accommodating way.

The third definitional aspect concerns theoretical versus applied orientations of the used definitions. Furlong and Whitty (2017) proposed a three-cluster categorisation of knowledge traditions in education, *academic*, *practical* and *integrated*, based on the findings from seven countries: England, France, Germany, Latvia, the USA, China, and Australia. In Furlong and Whitty's (2017) conceptualisation, the *academic cluster* covers 'singulars' within the field of education, which are well-defined and bounded, and the individual disciplines of education and the German educational theory of Didaktik are included. The other traditions falling under academic categorisation are those that define education as a 'region' and 'applied' educational research and scholarship and the 'new science' of education are included here, as well as the Anglo-Saxon version of curriculum research. The second cluster of *practical knowledge traditions* included four other candidates: education as 'generic' (competences and standards), the 'normal' college tradition of teacher education, liberal education plus craft knowledge and networked professional knowledge. Lastly, in the third cluster of *integrated knowledge traditions*, Furlong and Whitty (2017) list *Pedagogija* (based on Latvian practise), practitioner enquiry/action research, research-informed clinical practice, and learning sciences (for further elaboration see Whitty and Furlong 2017). It is useful for the present review to discuss the findings related to academic versus applied knowledge traditions, and how they have framed and informed the various definitions used in CBE.

Methodology

This study is a systematic review, and more specifically falls within the 'narrative reviews' category, as the goal is not to seek generalisations but to identify and analyse key issues related to CBE from an educational research perspective (Davies 2000; Educational Research Review n.d.). The search strategy relies on the preferred reporting items for systematic reviews and meta-analyses (PRISMA) framework (Liberati et al. 2009), which is one of the most well-established frameworks for systematic reviews and meta-analyses. The
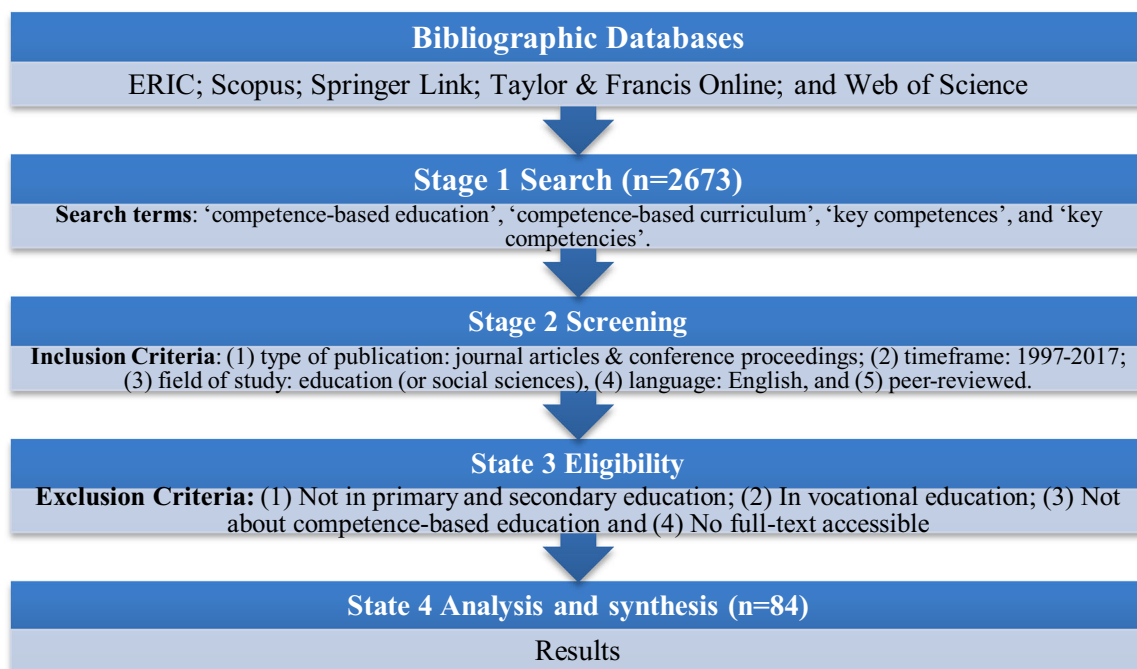
PRISMA framework outlines key stages in order to search for articles, develop inclusion and exclusion criteria and evaluate articles that are part of the sample. We used the following four search terms: 'competence-based education', 'competence-based curriculum', 'key competences', and 'key competencies' in five major international social science databases: ERIC, Scopus, Springer Link, Taylor & Francis Online and Web of Science. The inclusion criteria were based on (1) the type of publication, including journal articles and conference proceedings; (2) timeframe: 1997–2017; (3) field of study: education (or social sciences), (4) language: English and (5) peer-review. Exclusion criteria were (1) not primary or secondary education; (2) vocational education; (3) not about competence-based education and (4) no full-text accessible. Whenever possible, the inclusion criteria were applied using filters available in the databases, and exclusion criteria were applied by reading article abstracts. For the content analysis in the final stage, first, a sample of five articles were reviewed by both authors to reach a consensus on data/topic/concept extraction from articles, and the rest of the articles were divided between the two authors and reviewed individually. As the results are categorised into topics, definitions, genres and methods, the study offers a valuable explorative map of research into competence-based education. The state-of-the-art review thus summarises existing and the emerging policy, and practice trends, as well as research priorities and issues for further research. Table 1 briefly summarises the search framework based on the PRISMA model, including the four stages,

initial and final number of records in the data pool, and inclusion and exclusion criteria.

To ensure consistency in the analytical step between the reviewers/authors, we next developed a matrix template as an analytical tool with which to extract relevant and consistent information from each of the articles in the final pool. Table 2 shows the specific entries on which the review was based on.

In order to provide an in-depth analysis and synthesis of the articles in Stage 4 ($n = 84$), we divided the work into three parts (and eventually three articles). First, we provide a general overview of the articles in Stage 4 ($n = 84$), and then narrow the focus to definitions and operationalisations of key terms *competence/competences* and *competency/competencies*; the second part focuses on records grouped around curriculum policy ($n = 38$); and the third part covers records in the curriculum implementation category ($n = 45$). The present article focuses on the first part (see Table 3 under results and findings for details on topical categories). We first offer a general overview of articles in the final sample, and then we focus on the definitions of the key terms, an issue that emerged inductively as we processed with the review, and which begs for a detailed critical analysis in its own right in order to capture the broad and diverse spectrum of definitions, and potentially clarify their use in future research.

Table 1 Search strategy framework (PRISMA model)

Bibliographic Databases
ERIC; Scopus; Springer Link; Taylor & Francis Online; and Web of Science

Stage 1 Search (n=2673)
Search terms: 'competence-based education', 'competence-based curriculum', 'key competences', and 'key competencies'.

Stage 2 Screening
Inclusion Criteria: (1) type of publication: journal articles & conference proceedings; (2) timeframe: 1997-2017; (3) field of study: education (or social sciences), (4) language: English, and (5) peer-reviewed.

State 3 Eligibility
Exclusion Criteria: (1) Not in primary and secondary education; (2) In vocational education; (3) Not about competence-based education and (4) No full-text accessible

State 4 Analysis and synthesis (n=84)
Results

Table 2 Matrix template for competency-based education (CBE) systematic review

1. Country/ region
2. Education level
   (Primary, Lower-secondary, Upper-secondary or a combination thereof)
3. Subject matter
4. Main topic(s)/ objective(s)
5. Competence or competency, and is it defined?
   Provide definition if Yes.
6. Main research question(s) (if any)
7. Theoretical framework(s) / if any
8. Data, participants, & sampling (if applicable)
9. Methods (qualitative or quantitative)/ briefly describe
10. Key results/ findings / conclusions
11. Does article report use of research funding? If Yes, provide details

Table 3 Emerging topical categories identified and grouped at different stages of review

Initial categories (7)	Then, collapsed into 5 categories	Final categories (3)
Curriculum policy/key competences (38)	Curriculum policy/Key competences (38)	CBE Curriculum Policy/Key competences (38)
Curriculum implementation/-key competences development (22)	Curriculum implementation/key competences development (22)	CBE Curriculum implementation (Curriculum Implementation + Student-related+ Teacher-related + Educational Leadership (22 + 12 + 8 + 3 = 45)
Teacher-Related (8)	Teacher-related + educational leadership (8 + 3) = 11	
Educational leadership (3)		
Student assessment (7)	Student-related (student assessment + student perceptions of CBE/key competences) (7 + 5 = 12)	
Student perceptions of CBE (5)		
ERIC-based review (1)	ERIC-based review (1)	ERIC-based review (1)

Results and findings

As regards the first part of the overarching question about how much research pertains to the four search terms of interest, the initial search for articles across the five databases returned the following results: 1284 articles related to 'key competencies', 847 related to 'key competences', 371 related to 'competence-based education' and 171 related to 'competence-based curriculum'—2673 articles in total. Different databases returned different numbers of articles as expected, with 253 articles in ERIC, 380 in Springer Link, 467 in Scopus, 590 in Web of Science and 983 in Taylor and Francis Online. The results suggest an overlap of articles across both the four search terms and the databases, due to cross-indexing. Figure 1 summarises the results per search term and per bibliographic database.

Certainly, there is more peer-reviewed literature in other databases, which was not indexed in the searched databases. Eighty-four records remained after applying inclusion and exclusion criteria in Stage 4 (as shown in Table 1), with the majority of excluded articles belonging to one of the following five main categories: medicine, vocational education and Training (VET), higher education, duplicates and not in English. Nevertheless, considering the number of search terms applied and the number of databases covered, our review captures a representative sample of records belonging to the field of educational research on competence-based education in formal schooling, covering primary, lower-secondary and upper-secondary general education levels. While the total number of articles returned in the initial search across databases is relatively large, the final number of records in Stage 4 ($n = 84$) shows that the overwhelming majority of articles did not belong to the narrow scope of our study: the majority of the articles did not 'survive' the inclusion and exclusion criteria applied. The results of the second part of the overarching research question follow, focusing only on the records in Stage 4 ($n = 84$).

General overview of records in Stage 4 ($n = 84$)

The second part of the overarching research question focuses on a number of descriptive indicators, such as geographical distribution, topical categories, education levels, subject matter domains and research methodologies, in order to obtain a broad overview of the records, before delving into the in-depth analysis, which focuses on the definitions of key terms such as competence/competences and competency-competencies.

Figures 2 and 3 illustrate the distribution of records in Stage 4 ($n = 84$) across countries/regions and continents/regions respectively. The 'international' designation in the two figures indicates studies that focused on two or more countries, or had a broad focus without specifying any country in particular.

Fig. 1 Initial number of records per search term per bibliographic database (Stage 1, *n* = 2673)
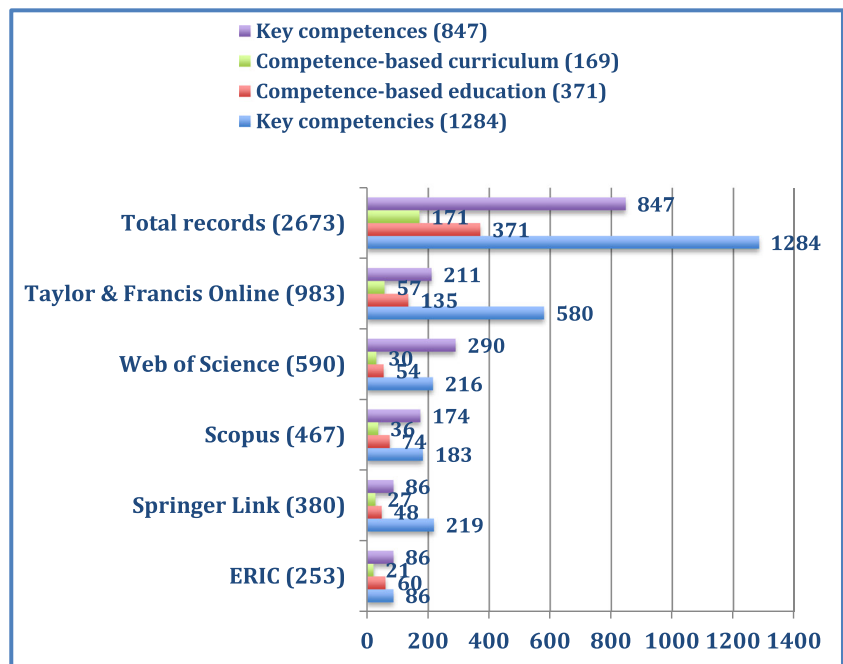

A few results need highlighting from Figs. 2 and 3. The records related to individual European countries and Europe as a continent far outnumber the others, with nearly 60% of articles (*n* = 47) falling into this geographical area, indicating that competence-based education in formal primary and secondary schooling has largely been a European affair so far, at least from the educational research perspective. Secondly, the complete lack of records from South America, and almost complete lack of records covering North America (*n* = 1, from Canada) and Africa (*n* = 2) show that educational

Fig. 2 Number of records per country/region (Stage 4, *n* = 84)
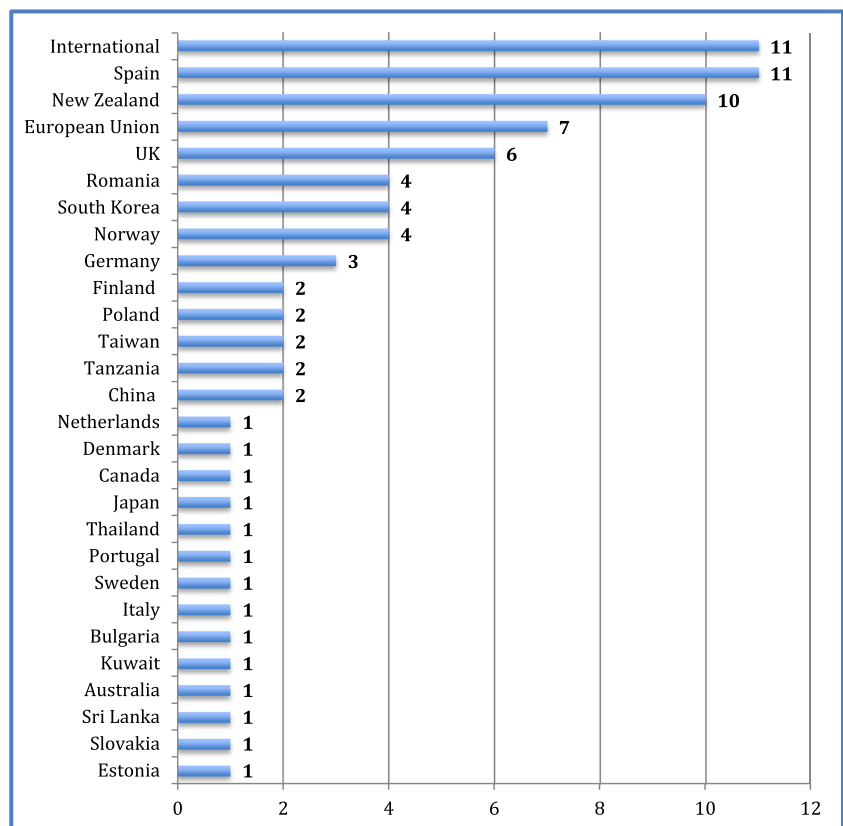
Fig. 3 Number of records per continent/region (Stage 4, *n* = 84)
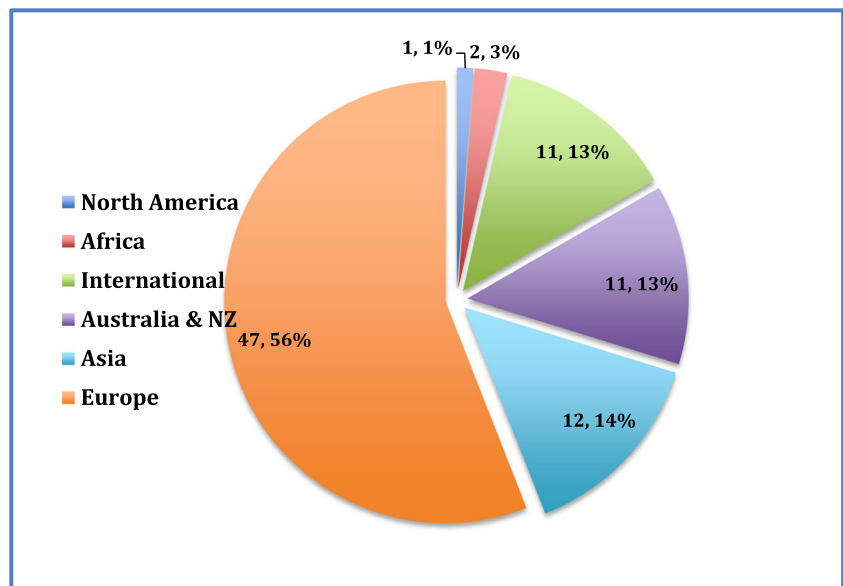
research into CBE in these continents has been missing, according to our scope, and inclusion and exclusion criteria. Asia (*n* = 11) and Oceania (Australia and New Zealand) (*n* = 11), are in the middle of the spectrum, as are studies with an international focus (*n* = 11). As regards individual countries, the records from Spain (*n* = 11), New Zealand (*n* = 10), the UK (*n* = 6), and the other countries in the European Union as a region (*n* = 7) significantly outnumber the rest in our final pool. Spain and New Zealand are clearly outliers, with studies focusing on CBE approaches, mirroring the comparatively early adoption of CBE curriculum policies in these two countries—Spain in 2006, and New Zealand in 2007. Again, the geographical distribution here only indirectly indicates the spread of CBE policies internationally through educational research related to CBE, and primarily shows the focus of educational researchers on CBE policy and implementation. Of 84 records, 75 (89%) were journal articles, and 9 (11%) were conference proceedings articles.

We next grouped records into topical categories, first to have a broad overview of what the articles are primarily about, and secondly, to make the in-depth analysis more manageable. The topic categories emerged inductively after a detailed reading of abstracts and full articles, and we provide them accordingly for each stage of our analysis, in Table 3.

In the final categorisation, the articles were divided into those focusing on *CBE curriculum policy*, which discussed CBE and/or key competences approaches through policy analysis, mostly theoretically, and overwhelmingly through qualitative methodology, and *CBE curriculum implementation*, where all articles deal with aspects of CBE implementation, either focusing on specific key competences within certain subjects, or related to teacher understandings of, or competence regarding CBE, or related to student perceptions of CBE or student assessment in CBE. The ERIC-based review was

part of the final pool, but stood out as a comprehensive review, as presented and discussed in the introduction to the present article. As already noted, an in-depth analysis of articles focusing on curriculum policy and curriculum implementation is not part of the present article, instead it focuses on the conceptualisations of the competence/competences and competency-competencies key terms.

Figure 4 presents the distribution of records across various education levels, and Fig. 5 shows the distribution of records across various subjects.

In terms of education levels, most records were either broad in their scope and do not specify any particular education level, or focus on upper-secondary education levels. This even more so regarding the subject matter domains, with 59 out of 84 records (nearly 70%) being general and not specific in scope. In terms of research methodologies, 66 records out of 84 (78%) were qualitative, 15 (18%) were quantitative and 3 (4%) were mixed-methods in nature.

Figure 6 shows the distribution of records according to year of publication.

As Fig. 6 shows, the distribution follows the adoption of CBE as a policy, with the majority of the records published after 2010. Funding was not reported by 64 out of 84 (76%), and in the 20 (24%) that reported funding, it was mostly from the relevant national ministries of education.

Definitions of competence/competences and competency/competencies

Findings related to the second research question on definitions concerning competenc(i)es are presented here. The articles in the final pool of our systematic review seem to use key terms such as 'competence/competences' and 'competency/

Fig. 4 Distribution of records according to education levels (Stage 4, *n* = 84)
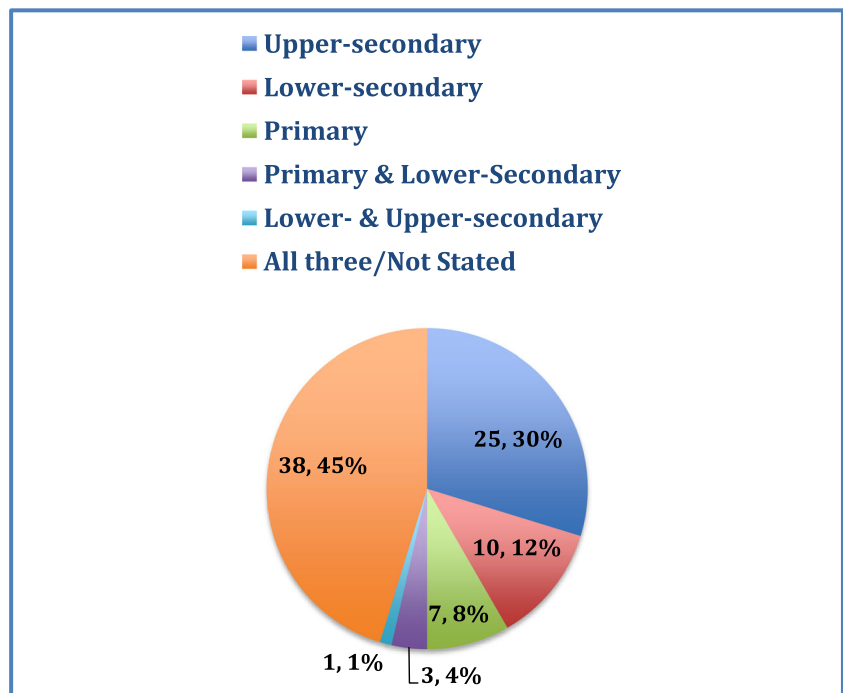
competencies' interchangeably. Figure 7 shows this varied distribution.

As shown in Fig. 7, 31 out of 84 articles (or 37%) used competences, 23 (or 27%) competencies, and 30 (36%) used both. In terms of defining these concepts, 58 out of 84 (69%) provided a definition, and no specific definition was offered in 26 (31%). Appendix 1 in the supplemental material shows the list of all 84 articles, and whether they provided a definition for 'competences' and/or 'competencies' or not, as well as information about the source of the definition, and whether the definition focused on 'competences/competencies' in general, or specifically, such as on an individual competence such as 'learning to learn competence', for example, and references articles used to support their use of definitions.[1]

The variations and consistency in spellings of 'competences' and/or 'competencies' was an unexpected result of the review that might not be resolved in the near future. Variations in the use of either competences or competencies only add to the linguistic confusion surrounding these terms. The DeSeCo publications during the late 1990s and early 2000s, for example, use 'competence' and 'competency' in singular and then switch to 'competencies' and/or 'key competencies' in plural only, and 'competences' is not used at all (OECD 2005; Rychen et al. 2002). The European Union and the European Commission in the European Reference Framework (OJEU 2006) use 'competence' and 'competences' only. In our review, we find that the countries which used the European Reference Framework as a source for CBE

policy also follow the European Commission convention of using 'competence' and 'competences', with Spain being the major example, and countries that used OECD as a source for CBE policy follow the OECD/DeSeCo convention of 'competency' and 'competencies', such as New Zealand. Neither OECD/DeSeCo nor EC documentation explains the rationale for the use of one versus the other version of the terms. Further, when examining the OECD and European Commission English style guides (European Commission 2019; OECD 2015), both note that British English language convention is to be followed, and therefore the problem does not stem from language variations between British and American English. Lastly, the UK-based Oxford Online Dictionary ('Competence' 2019) and the US-based Merriam-Webster ('Competency' 2019) define 'competence' and 'competency' similarly and synonymously, and therefore linguistically there is no differentiation in meaning between the British and American English. Ultimately, the source of confusion regarding the use of different variations of these terms seems to lie in efforts to define 'competence' and 'key competencies' in the DeSeCo 1.0 project in the late 1990s and early 2000s. Indeed, the DeSeCo documentation, and key DeSeCo 1.0 programme managers, which included Swiss experts from the Swiss Federal Statistical Office and American experts from the American Institutes for Research, provide one definition for 'competence' and another for 'key competencies' (Rychen et al. 2002). In this regard, our review does not clarify why these key terms have been used inconsistently across international organisations, national contexts and educational research so far. As already recognised in the DeSeCo 1.0 project, the use and '[…] conceptualizing key

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[1] A complete table with definitions is available upon request, and not provided here due to space and word limitations.

Fig. 5 Distribution of records per subject matter domains (Stage 4, $n = 84$)
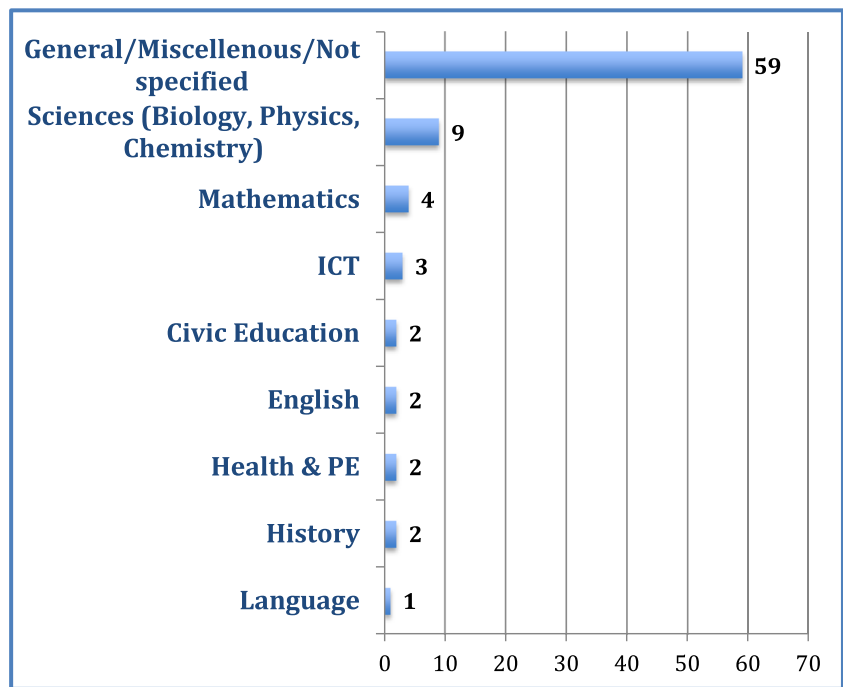
competencies is influenced by what societies value and what individuals, groups, and institutions within those societies consider important' (Rychen 2002).

Researchers relied on a number of sources to substantiate the definition(s) provided for competences and/or competencies, and in 58 articles that provided a definition, the source was academic 29 times, OECD 18 times, European Commission/European Union Reference Framework 18 times and a national law or policy document eight times. In terms of generic or specific definitions, 39 out of 58 articles relied on generic definitions, 16 were specific and three used both. Due to the focus of the paper on *competences* and *(key)*

competencies as generic concepts, we further narrowed the focus to articles with generic definitions ($n = 42$), and the 16 articles that provided a specific definition were mainly about learning to learn competence, digital competence or scientific literacy competence. In the 42 generic definitions, in 17 cases, the source for the definition was the OECD or authors associated with the OECD through the Definition and Selection of Competencies (DeSeCo) project (e.g. OECD 2005; Rychen and Salganik 2003; Weinert 2001), in 14 cases the European Commission (EC)/European Union (EU) and its work on Key Competences for Lifelong Learning (OJEU 2006) is referenced, in 12 articles, the definitions were substantiated with

Fig. 6 Distribution of records per year of publication (Stage 4, $n = 84$)
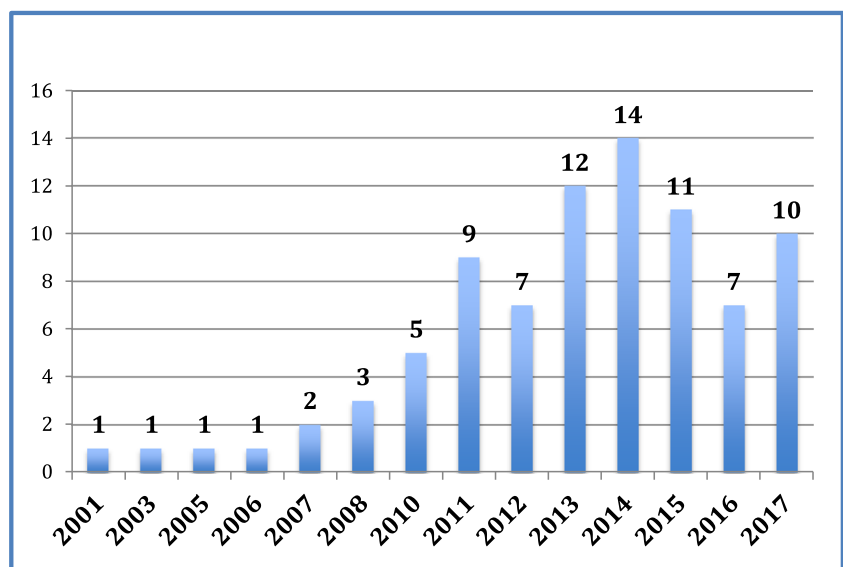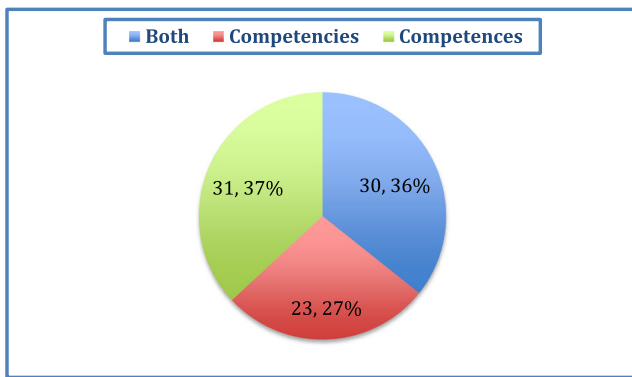
Fig. 7 Distribution of records whether they used competences, competencies or both (Stage 4, $n = 84$)

an academic source, and in eight articles, the source of the definition was a national law or policy/curriculum document. Some articles provided definitions from more than one source, such as OECD and academic, or academic and national policy document. An overview of each of these source definitions is offered as follows, and Table 4 shows the core definitions in each of these four categories.

OECD-related definitions

Our systematic review shows that the OECD's DeSeCo project and its associated publications have been the most influential and referenced sources for educational researchers when defining competences, competencies or key competencies. Interestingly, as the three definitions provided under OECD in Table 4 show, there is no consistency in terms of definitions, with researchers opting for either a core definition, as in Rychen and Salganik (2003), and working definition developed by one of the scholars involved in DeSeCo project, as in Weinert (2001), or different categories of key competencies proposed by DeSeCo project, as in OECD (2005). Although a few publications have examined competences/competencies critically (e.g. Takayama 2013; Westera 2001), most researchers seem to use competence-related definitions as established, even when DeSeCo contributors themselves had challenges constructing a broadly agreed definition, and indeed had different definitions for 'competence' and 'key competencies' (Rychen 2016).

EC/EU-related definitions

The definitions related to the European Commission or European Union relate to the 'Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning' adopted in December 2006 (OJEU 2006) even when authors use names of the references interchangeably. These definitions do not deviate significantly from those developed and proposed through OECD work, primarily through the DeSeCo project,

and it had the added value of clearly defining eight key competences recommended for adoption within the European Union, communication in the mother tongue, communication in foreign languages, mathematical competence and basic competences in science and technology, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship and cultural awareness and expression, which overlap with the three broad categories of key competencies developed through the DeSeCo project, namely, acting autonomously, using tools interactively and functioning in socially heterogeneous groups.

Definitions associated with a national law or policy/curriculum document

As noted previously, a reference for competences was drawn from a national law or national policy or curriculum document in eight instances. These cases primarily related to the two individual countries with the largest number of articles in the final pool ($n = 84$) as shown in Fig. 2: Spain ($n = 11$) and New Zealand ($n = 10$). In Spain's case, references were made to the first Spanish law introducing competences into the curriculum (Ley Orgánica 2/2006; Real Decreto 1513/2006), which interestingly came into effect earlier in 2006 than the European Commission recommendation on key competences for lifelong learning, which was adopted in December 2006. Nevertheless, the definition is still very close to the one from the European Commission (OJEU 2006), especially in terms of defining the eight recommended key competences—the Spanish law also stipulated eight key competences and the wording is similar to OJEU (2006)—apparently Spanish policy makers were well aware and familiar with the ongoing work of the European Unions and its associated institutions, the European Parliament and the European Commission. The spelling of 'competences' in Spanish law—at least in the English translation or as researchers are using it—follows the EC convention of 'competence/competences'. In New Zealand, on the other hand, a different convention is followed, with the definition being much closer to the future-oriented definitions developed by the OECD and its associated projects, including the spelling convention of 'competency/competencies/key competencies' as shown in Gillespie et al. (2013) and the New Zealand curriculum (NZ Ministry of Education 2007).

Academic-related definitions

As expected, the definitions relating to an academic source independent of OECD, EC or another international organisations or national law or policy are more diverse. As shown in Table 4, the definition attributed to Wesselink et al. (2010), where '[…] competence is defined as an integration of knowledge, skills, and attitudes that enable a person to perform a

Table 4 Sample of generic definitions on 'competences' and/or 'competencies' present in records

OECD related	EC/EU related	National law/policy related	Academic related
'A competence is defined as the ability to successfully meet complex demands in a particular context through the mobilisation of psychosocial prerequisites (including cognitive and non-cognitive aspects)…[and] the internal mental structures in the sense of abilities, dispositions or resources embedded in the individual in interaction with a 'specific real world task or demand''…' (Rychen and Salganik 2003, p. 43 as quoted in Leat et al. 2012, p. 401). -- According to Weinert's work in the DeSeCo project (2001, p. 45), competence may be interpreted as 'a roughly specialized system of abilities, proficiencies or skills that are necessary or sufficient to reach a specific goal. This can be applied to individual dispositions or to the distribution of such dispositions or an institution (eg. a firm)'. (Weinert 2001, p. 45, as referenced in Willbergh 2015, p. 337). -- A study undertaken under the OECD's auspices, Definition and selection of competencies identifies nine KCs under three broad categorizations: (1) acting autonomously, (2) using tools interactively and (3) functioning in socially heterogeneous groups (OECD 2005 as referenced in Takayama 2013, p. 69).	'Competences are defined here as a combination of knowledge, skills and attitudes appropriate to the context. Key competences are those which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment' (European Union 2006, as quoted in Lleixà et al. 2016, p. 507). -- The European Reference Framework defined key competences as knowledge, skills and attitudes appropriate to context. It identified eight: communication in the mother tongue, communication in foreign languages, mathematical competence and basic competences in science and technology, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship and, cultural awareness and expression. Each has a concise definition of its scope and all emphasise critical thinking, creativity, initiative, problem solving, risk assessment, decision taking, and constructive management of feelings (OJEU 2006, as referenced in Pepper 2011, p. 335).	'Initially, the 2/2006 Education Bill established eight key competences in the primary education curriculum (Ley Orgánica, 2/2006; Real Decreto 1513/2006): (1) competence in linguistic communication; (2) mathematic competence; (3) knowledge and interaction with the natural world; (4) information handling and digital competence; (5) social and citizenship competence; (6) cultural and artistic competence; (7) learning to learn competence; and (8) autonomy and personal initiative. However, Royal Decree 126/2014 of the Education Bill to Improve Educational Quality (LOMCE) 8/2013 reduced the key competences to seven (Ley Orgánica, 8/2013; Real Decreto, 126/2014), recuperating the headings established by the European Union some years earlier (2006) […]' (Meroño et al. 2017, p. 280). -- 'Development of key competencies is identified in the New Zealand Curriculum (NZC) (Ministry of Education 2007) as "both an end in itself (a goal) and the means by which other ends are achieved" (p. 12). Key competencies are thus intended to provide a focus for learning and enable learning that is fundamental to all young people's future lives and participation in communities and society' (NZ Ministry of Education 2007, p. 12 as referenced in Gillespie et al. 2013, p. 11)	'On the basis of this review, it seems that there are (roughly!) two distinct denotations of 'competences' in education. From a *theoretical* perspective, competence is conceived as a cognitive structure that facilitates specified behaviours. From an *operational* perspective, competences seem to cover a broad range of higher-order skills and behaviours that represent the ability to cope with complex, unpredictable situations; this operational definition includes knowledge, skills, attitudes, metacognition and strategic thinking, and presupposes conscious and intentional decision making' (Westera 2001, p. 80) -- '[…] the term competence must refer to Basil Bernstein (1990, 1996), one of the first researchers to point out the difference between the two sets of logic (one economic, the other social) which vie for construction of its meaning. The differences become apparent in their respective conceptualisations. According to social logic, the idea is closely associated with a democratic perspective of social development. Economic logic, on the other hand, links the term to a new vision of human capital' (Tiana et al. 2011, p. 307). -- 'Therefore, competence is defined as an integration of knowledge, skills, and attitudes that enable a person to perform a certain task in ill-defined and unique environments (Wesselink et al. 2010 as referenced in Egodawatte 2014, p. 49).

certain task in ill-defined and unique environments' (Egodawatte 2014, p. 49), does not differ from the generic definition of competence as an integration of *knowledge, skills* and *attitudes* (and sometimes *values*), which seems to be the most dominant and straightforward (short) definition of competence across all articles. However, as Tiana et al. (2011) note, there are different logics behind the definition of competence, including economic and social, where 'According to social logic, the idea is closely associated with a democratic perspective of social development. Economic logic, on the other hand, links the term [competence] to a new vision of human capital' (Tiana et al. 2011, p. 307). Westera (2001) differentiates between theoretical and operational perspectives when defining 'competences'.

From a *theoretical* perspective, competence is conceived as a cognitive structure that facilitates specified behaviours. From an *operational* perspective, competences seem to cover a broad range of higher-order skills and behaviours that represent the ability to cope with complex, unpredictable situations; this operational definition includes knowledge, skills, attitudes, metacognition and strategic thinking, and presupposes conscious and intentional decision making' (Westera 2001, p. 80, emphasis in the original).

While Westera's definition is not identical to those of the OECD or EC for example, similarities are clearly observed when focusing on often same keywords used to define 'competence'—most prominently the use of knowledge, skills and attitudes from an operational perspective. In conclusion, Westera (2001) was very critical of the concept of competence, stating that '[…] the term competence is too problematic and lacks an appropriate and commonly accepted definition', and that the use of '[…] competences within educational research should be restricted to a class of cognitive sub-skills involved in coping with complex problems' (Westera 2001, p. 87). For better or worse, Westera's call to reject 'competences' in education has not materialised to a large extent, considering the expansion of CBE approaches, even though, as we have shown through this systematic review, at least from an educational research perspective, the CBE approaches have been limited to a small number of countries, with Spain and New Zealand being outliers.

Conclusions

Four conclusions were drawn based on the findings and related to the theoretical framework and previous research. The section ends with limitations of the review and some suggestions for further research.

The first conclusion is that while the search resulted in a huge number of hits for references involving competence-based education, the number of educational research articles is proportionally very few. The overwhelming majority of items are located in the area of grey literature, policy-reports with no requirements for scientific review, or at other school levels outside the pre-university education covered by this study. As our research review only covers peer-reviewed articles, one would expect to find detailed definitions in most texts in our selection; however, only the slight majority of publications refer to an academic definition, and in most cases, this does not include any systematic account for, or elaborated discussion of, the definitions used. Our review shows that only 58/84 studies provide definitions of competences, but not always in a systematic way and not only to academic research. Generally, the OECD definition (DeSeCo) is used

as an authoritative source that is not questioned, scrutinised or expanded. Although the number of hits peaked around 2013, there has been a clear increase since then compared to the prior period of 1997 to 2013. Few attempts to review and revise definitions of CBE have fuelled the increase in the transnational discourse on CBE. These findings suggest that CBE is primarily a fast travelling foreground policy idea that carries a number of implicit taken-for-granted assumptions on the philosophical and ideational substance of the definitions (Schmidt 2015). Ultimately, without a well-established and consistent definition of competenc(i)es, both variations and definitions in use will continue to appear inconsistently across organisations, countries and researchers. The present article thus suggests that educational researchers and policy makers in governmental, non-governmental and international organisations need to pay attention to the definitional issues prior to embarking on further CBE research or policy work.

The second conclusion of this research review is that a comparison of our general findings and prior research (Anderson-Levitt 2017; Buscà Donet et al. 2017) reveals some contradictory findings; for example, Anderson-Levitt (2017) identified France as one of the core countries in which CBE approaches were implemented, but France is completely missing in our study. Conversely, New Zealand and Spain appear as outliers in the number of studies focusing on CBE approaches, but neither appear in Anderson-Levitt (2017) at all. In some countries, evidently, CBE has largely been a national matter. While, we cannot compare our findings with Buscà Donet et al. (2017), since their study did not explain its geographical distribution, their sample also consisted primarily of articles focusing on higher education and we excluded those articles and focused only on primary and secondary education. Our study generally confirms Anderson-Levitt (2017), however, that while CBE is major global reform phenomena, the number of case-countries represented in the international research literature is very limited and selective. This is not only the case for national adaptations, but also for topic categories, education levels and subject matter domains. There is a clear bias for addressing general education and not specifying any education level. Where it is specified, it usually includes upper-secondary rather than primary schooling. When it comes to the content of school knowledge, there is equally a non-specific account of general subject matter in most cases, and if specified, science, mathematics and ICT are shown to be heavily over-represented as subject domains. This implies that further research on CBE would benefit from a broader scope across subject domains and education levels.

The third conclusion to be drawn from the study involves the background ideas that frame the most commonly used definitions of competence-based education (i.e. what we have labelled the second definitional aspect). A large proportion of articles do not define or elaborate on their definitions of CBE: they use implicit and tacit references. In coding the theoretical

frameworks used in the corpus, a clear pattern has nevertheless been identified. The background ideas and dominant paradigms influencing definitions used in the literature can primarily be related to social efficiency and human capital theory as the provider of background assumptions (Deng and Luke 2008; Schiro 2013). Competences are framed as the most important resources, and instrumental for individuals to adapt to the knowledge economy; however, the dominating foreground ideas and explicit references used in defining CBE do not come from human capital theory. Instead, the learner-centred curriculum ideology is the main source for references and theoretical arguments, when such are presented.

The fourth conclusion concerns the definitional aspects of how academic versus applied knowledge traditions have framed and informed the various definitions used in CBE (Furlong and Whitty 2017). Although the most common source for defining CBE is from 2003, the DeSeCo project, it still serves as the main reference, generally without any major revisions. For example, it is possible to discern a move from DeSeCo 1.0 to DeSeCo 2.0 in the major curriculum reform programme of the OECD, Education 2030 and related work and publications. Rychen has also been heavily involved in Education 2030 (Rychen 2016). One significant feature of this framing and definition of CBE is its applied and operational orientation. It links a predominantly technical and instrumental understanding of the curriculum and teaching practices that are decontextualised from its societal, cultural and political embeddedness. This may at least partially explain the fast and global spread of the CBE reforms. The influences from, for example, the north-continental Didaktik tradition have only been peripheral despite the numerical dominance of studies from Europe in our sample (see Fig. 3).

A general and final conclusion from our study is therefore that educational researchers have unfinished business in critically engaging with framing and defining competences for the twenty-first century, its causes, their impact and the consequences for schooling and learning internationally, as well as how CBE is recontextualised into specific national contexts.

Limitations and further research

As we have clearly shown in the methodology section, a clear series of steps has been followed in line with PRISMA methodology to execute the study in order to meet its aims and objectives; however, some limitations need to be recognised. The review suffers from limited language resources, and as such it excluded all articles not in English. Admittedly, some studies in certain languages will always be excluded in any review; however, researchers from other major international languages such as Chinese, Spanish, and French, to name a few, could conduct focused reviews in those specific languages to further explore the issues surrounding CBE policy and implementation, and definition of competences with specific national and/or linguistic contexts. Second, and beyond the language resource limitations, all systematic reviews are prone to be affected by inclusion and exclusion criteria, and therefore researchers, depending on their research interests and backgrounds, might either consider the criteria used in this review or narrow or expand the list to better serve their research goals. In this regard, and as our findings show, there is still a gap in educational research on how to define 'competences' and/or 'key competences' for the twenty-first century curricula, and further research efforts need to focus on the issue in order to assist further curriculum policy-making and implementation, nationally and internationally.

Compliance with ethical standards

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